The IT Industry: An Analysis

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Preamble

Team Website: https://blehcjhunter.github.io/IITAssignmentTwo/ProjectIdea.html

The Project:
As a team, we selected "Automating the Clinical Coding System" as our intended project. This was decided by vote on the team Slack channel. This project is an iOS or Android application (app) that will be developed for use on whichever mobile devices are employed by hospitals, and will aid in data processing. The group expanded on this concept to increase its utility at Point of Care.

Team Dynamics:
In order to effectively utilise our time as a group, we decided to delegate tasks to one another. Callum created the team GitHub, and consolidated a lot of our individual information on the team website. Brendan established a shared Google Drive so that as a team, we could individually upload our reports, which included tasks like: IT reports, Industry Data Analysis and the IT Professional Interview. We were then able to complete tasks based on our personal schedules. Checks and balances were set by the team via weekly team meetings on Wednesdays and Sundays where the team would meet and discuss tasks, provide progress reports and discuss expectations for future work. The meeting minutes were then stored in the Google Drive for members to read later if required.

Audit Trails:
Team progress was mainly tracked using status updates during the team meetings, and group messages (using the #700-assessment-task-2 and #general group chats in Slack as discussed below) where each member announced when they had completed relevant tasks and uploaded these to the group's shared Google Drive. Slack updates were also used for those working on the website and contents, who were also monitoring Git commit trails. For example, after making edits to the website, Callum would announce the changes in Slack.
As the report and its contents were collated using Google Drive, the GitHub audit trail for this assignment focuses mainly on changes relating to the website and its contents. This audit trail shows continued work on the website throughout the assignment, and reflects well on the team's ability to meet deadlines.

Team Communication Tools:
Tool 1: Trello (https://trello.com/b/8CIO9AaZ/assignment-2)
A Kanban-style online board was set up by the team as a backup communication and repo tool for resources, documents and task breakdown. Each member had their own tile, which they could choose to fill out if required.

Tool 2: Slack (Team Chat) (https://a2group14.slack.com)
Slack was the primary communication platform for the team. Team meetings were held in the #meetings slack channel every week on Wednesday and Sunday. Discussions regarding the assignment occurred in #700-assessment-task-2, and status updates and queries were placed in #general. Additionally, Trello and Google Drive were integrated in the team Slack.

Tool 3: Google Drive
(https://drive.google.com/drive/folders/12PI9cuwe_SIu5ZuvGv0cPJPTesvu7ROv)
All the team documentation was saved in the team Google Drive. This allowed people to review and edit drafts and communicate to the team what they had completed.

Tool 4: GitHub (Code Repository) (https://github.com/BlehCJHunter/IITAssignmentTwo)
All work relating to the website, as well as final copies of documents, were uploaded to the team GitHub repo.

Team Dev Tools:
Tool 5: Notepad++ (Text Editor)
Notepad++ is a plain text editor for Windows that is well designed for coding. It was primarily used in producing the website contents.

Tool 6: GNU Nano (Text Editor)
GNU Nano is a terminal-based plain text editor primarily for UNIX-like systems. It comes pre-supplied on Windows with Git Bash and was also used in production of the website.

Tool 7: Git Bash
Git Bash is a command-line interface for Windows that allows Windows users to interact with the Git command line interface using a UNIX-like interface.

Tool 8: GitHub Desktop
GitHub Desktop is an alternative to the traditional command-line interface used to interact with Git repositories. It was used by our team to upload and push code into the team GitHub repository.

Industry Data

Job Titles by Demand, All Group Members

(Using Burning Glass data supplied via Canvas and available <u>here</u>.)

Four of our team members' ideal jobs were ranked by Burning Glass in a listing of 25 'Top Titles' for Information Technology. The remaining two ideal jobs were not included in this data set and as such cannot be ranked numerically alongside the first four. These have instead been ranked objectively using other available data.

Numerical Rankings, Burning Glass:

Name	Job Title	Rank
Jess	AWS Cloud / DevOps Solutions Architect	987
Callum	Desktop and Systems Administrator	681
Brendan	IPNOC Engineer	666
Michael	DevOps Lead – AWS	344

Objective Rankings, JobOutlook (DESSFB 2019):

Joe	Data Analyst – Highly sought after*, strong future growth^	DESSFB 2019a
Won	Cloud Solutions Sales Specialist – Sought after, stable future growth	DESSFB 2019b

A 2018 report by Deloitte Access Economics lists data science as a rapidly growing industry, whose workers are in high demand from employers. This workforce is expected to grow by 2.4% between 2016-17 and 2021-22, a rate almost 1% faster than the average Australian workforce (Deloitte Access Economics 2018).

IT Specific Skills, Ranked by Demand

The group's core IT-specific skillset is comprised of a large portion of the skills listed in the Burning Glass data. The group's required IT-specific skills, as derived from the Burning Glass data, are:

- SQL (3,570)
- JAVA (2,860)
- Microsoft Windows (2,699)
- Project Management (2,252)
- Building Relationships 2,119
- Business Analysis (2,096)
- Technical Support (1,830)
- C# (1,643)
- Customer Service (1,411)
- Software Engineering (1,372)
- Microsoft Office (1,341)
- ITIL (1,257)
- Python (1,150)
- Scrum (1,043)
- Systems Engineering (1,033)
- Business Processes (1,033)
- Microsoft Excel (936)

Brendan: IPNOC Engineer

- Project Management (2,252)
- Technical Support (1,830)
- Customer Service (1,411)
- Systems Engineering (1,033)

The "IT specific" skills required for this position fall mostly within the middle third of Burning Glass' top 25 skills in greatest demand. Technical support and customer service are the basic definers of the IP NOC Engineer position, which primarily involves liaising with multiple parties to perform network maintenance and fault rectification. Similarly, network traffic management and network provisioning forms part of the systems engineering skillset, whilst supporting planned outages, network maintenance and upgrades draws from the project management skillset. The positioning of the identified skillsets amongst others in the Burning Glass data is influenced by a correlation between the top 3 skills in greatest demand and the top occupation in the Burning Glass datasets; 'Software Developer / Engineer' ranks first in the "top occupations" dataset, and the corresponding programming / database languages skillsets rank in the top 3 skills in greatest demand.

Callum: Desktop and Systems Administrator

- Technical Support (1,830)
- Software Engineering (1,372)
- Systems Engineering (1,037)

Though Desktop and Systems Administrators (Sysadmins herein) are expected to have skills in most, if not all, directly technical areas of IT, there are three skills listed in the Burning Glass data that are absolutely required to get the job done. The first and potentially most important skill is the ability to provide support when technical issues arise, which requires an ability to understand the issue and find the correct solution. Coming in second and third are

skills in software and systems engineering and the associated ability to maintain and improve backend systems, such as servers and networking equipment, both physically and in software.

Jess: AWS Cloud / DevOps Solutions Architect

- JAVA (2,860)
- Project Management 2,252
- Building Relationships 2,119
- Business Analysis (2,096)
- Technical Support 1,830
- C# (1,643)
- Software Engineering 1,372
- Python (1,150)
- Scrum (1,043)
- Business Process (1,033)

According to the the Burning Glass Data, the IT-specific skills applicable to this role include Project Management, SAP, Business Analysis, Business Processes, Scrum and dev languages such as JAVA, C# and Python. The AWS Cloud / DevOps Solutions Architect requires the individual to have both technical and business skills. This is a role is a highly specialised role that requires the individual to be able to code. Coding and scripting are integral to this role as it demonstrates the individual's ability to build the solution that they architect. It also helps to have these skills as it allows a better understanding of the technical capabilities and limitations of that solution.

As this is a highly specialised role, coding and scripting abilities are fundamental for the solution design component of the job. Additionally, core business skills are a must, simply because this is also a very high level role which requires the individual to work in a collaborative team with multiple stakeholders. Having business skills like Project Management, Business Analysis and Scrum is beneficial to the stakeholder management requirements of the role. The AWS Cloud / DevOps Solution Architect is distinct from other software engineering or ops roles as it places emphasis on understanding its stakeholders, and not just focusing on the delivery of the application itself.

Joe: Data Analyst

- SQL (3,570)
- Microsoft Windows (2,699)
- SAP (2,189)
- Business Analyst (2,096)
- Microsoft Office (1,341)
- ITIL (1,257)
- Python (1,150)
- Business Process (1,033)
- Microsoft Excel (936)

The IT-specific skills required of a data analyst are broadly spread throughout the Burning Glass data for IT-specific skills in highest demand. In the top 20 skills listed in high demand, I believe 7 of these skills would be expected to be in the toolkit of an experienced Data Analyst. They are; SQL, Microsoft Windows, SAP, Microsoft Office, Python, and Microsoft Excel. The popular query language, SQL, which is a necessary skill for a Data Analyst, was ranked number one on the Burning Glass list of highest demand IT-specific skills. However, this high demand for SQL skills may not necessarily be for data management/analysis positions alone, but also for general development positions, as many would argue developers must have at least a basic understanding of the query language. Microsoft Windows, Microsoft Office and Microsoft Excel (part of Microsoft Office) are all fairly generic skills expected from most employers in this day and age and are not exclusive to the IT industry. Python is the standard language every data analyst or scientist should have in their toolkit. Python is renowned for its easy useability, large data science community and extensive statistical libraries.

Michael: DevOps Lead – AWS

- Microsoft Windows (2,699)
- Project Management (2,252)
- Building Relationships (2,119)
- Technical Support (1,830)
- Customer Service (1,411)
- Software Engineering (1,372)
- Python (1,150)

While AWS does utilize scripting languages, only Python ranked on Burning Glass. In the position as team lead in DevOps, you will have to interface with the client and your team that designs, builds, analyses and supports projects built around machine learning (algorithms that allow machines to make choices without human intervention). The job description hammers the need for best practices and working well in a team environment.

Won: Cloud Solutions Sales Specialist – Inside Sales at Microsoft

- Microsoft Windows (2,699)
- SAP (2,189)
- Building Relationships (2,119)
- Customer Service (1,411)

In accordance to the Burning Glass Data, the IT-related skills required as a Cloud Solution Sales Specialist at Microsoft are all ranked in the top half, with two of the skill sets (Microsoft Windows and SAP) ranked highly. This role requires the least amount of specifically IT related skills, as the skills required for this role are more business orientated. However, although it's not critical to have a great deal of IT specific skills for this role, it is crucial to have enough knowledge in this area to have the ability to explain complex technical solutions to a non-technical clientele, to better connect with clients and build value through a thorough and clear explanation.

General Skills, Ranked by Demand

The group's core general skillset is also comprised of a large portion of the skills listed in the Burning Glass data. The group's required general skills, as derived from the Burning Glass data, are:

- Communication skills (44,367)
- Problem Solving (16,445)
- Organisational skills (15,844)
- Writing skills (15,590)
- Team Work / Collaboration (14,364)
- Troubleshooting (11,471)
- Planning (11,315)
- Detail-oriented (8,298)
- Creativity (7,475)

- Research (7,227)
- Time management (5,059)
- Mentoring (4,538)
- Quality Assurance and Control (4,444)
- Presentation Skills (3,716)
- Meeting deadlines (3,346)
- Analytical skills (2,997)
- Multitasking (2,640)

Brendan: IPNOC Engineer

- Communication skills (44,367)
- Problem Solving (16,445)
- Organisational skills (15,844)
- Writing skills (15,590)
- Team Work / Collaboration (14,364)
- Troubleshooting (11,471)
- Planning (11,315)
- Detail-oriented (8,298)
- Time management (5,059)
- Meeting deadlines (3,346)
- Analytical skills (2,997)

Whilst only four of Burning Glass' top 25 IT-specific skills apply directly to the IP NOC Engineer position, eleven of the top 25 general skills are integral to this role. Many of these requirements are listed directly on the job application, such as an ability to work effectively in a team, having strong organisational, analytical and problem solving skills, and high attention to detail. These skills are integral to successful fault finding and troubleshooting in the dynamic environment of a Network Operations Centre, which often requires that various teams work together to ensure smooth operations. Excellent written and verbal interpersonal communication skills are an inherent requirement of the IP NOC Engineer position, underpinning effective teamwork whilst being integral to accurate note-taking during and after fault rectification. Finally, the ability to meet fault restoration times, a key accountability of this position, draws in all remaining identified skillsets, such as organisational, planning and time management skills.

Callum: Desktop and Systems Administrator

- Communication skills (44,367)

- Problem Solving (16,445)
- Planning (11,315)
- Troubleshooting (11,471)
- Quality Assurance and Control (4,444)
- Meeting deadlines (3,346)
- Analytical Skills (2,997)
- Time Management (2,906)
- Multitasking (2,640)

In general, the skills required for a Sysadmin aren't the highest-demand skills, however, a lot of the skills required are absolutely necessary to get the job done, as a Sysadmin will have to cover a lot of ground very fast to ensure that nothing has failed catastrophically, also while giving technical assistance to people who are using the infrastructure maintained by them, who may not know much about said infrastructure. And to top it all off, they also need to constantly be thinking about ways to optimise what they, and the systems they control, are doing, and are constantly working to a tight timeframe.

Jess: AWS Cloud / DevOps Solutions Architect

- Communication Skills (44,367)
- Problem Solving (16,445)
- Planning (11,315)
- Team Work/Collaboration (14,364)
- Mentoring (4,538)

The AWS Cloud / DevOps Solutions Architect is a role that would require an individual to have at least basic ability to implement all of the 25 skills outlined by the "IT-Specific Skills" Burning Glass data. I've only picked a handful to discuss as these align more closely to what a prospective employer would need as minimum to hire someone for this role.

Joe: Data Analyst

- Communication Skills (44,367)
- Writing (15,590)
- Teamwork/Collaboration (14,364)
- Presentation Skills (3,716)
- Analytical Skills (2,997)
- Problem Solving (16,445)
- Detail-Oriented (8,298)
- Creativity (7,475)
- Quality Assurance and Control (4,444)
- Organisational Skills (15,844)
- Time Management (5,059)
- Meeting Deadlines (3,346)
- Multi-Tasking (2,640)

The number of general skills required of a Data Analyst as listed in Burning Glass' list of highest demand generic skills are extensive. In my opinion, 13 of the top 20 skills in highest demand are skills required of a Data Analyst. These skills fit into three categories: Communication, Analytics and Autonomy. **Communication** skills are required in a Data Analyst role in order to work effectively in a team and convey detailed findings or insights in the form of a presentation or written report. **Analytics** is a crucial skill required of a Data Analyst. In order to perform their role effectively, an analyst must have excellent attention to detail and apply quality control when cleaning and preparing data for analysis. Data Analysts must also possess excellent problem solving skills so that they may look at a problem objectively and form insights and solutions others may not have considered, as well as the creativity to display and present findings in a way that captivates and influences an audience or user. Lastly, a Data Analyst must be able to manage themselves and be able to work **autonomously**. They must have excellent organisational and time management skills in order to meet deadlines, as well as having the ability to multitask, as they may be supporting multiple projects at once.

Michael: DevOps Lead

- Research (7,227)
- Planning (11,315)
- Communication Skills (44,367)
- Organisational Skills (15,644)
- Team Work/Collaboration (14,364)
- Quality Assurance and Control (4,444)

If the position of DevOps Lead was a little bare in the IT-specific skill set, it is the complete opposite in general skills. A DevOps Lead 'does a bit of everything', so general general skills such as the above are key to this position. This position does a lot of work designing and setting up systems with a team they lead, leaning heavily on the planning, organisational skills, teamwork and collaboration skills that are listed in the Burning Glass data, as well as problem solving as they continue to support their designs and implementations.

Won: Cloud Solutions Sales Specialist – Inside Sales at Microsoft

- Communications Skills (44,367)
- Problem Solving (16,445)
- Planning (11,315)
- Presentation Skills (3,716)
- Team Work / Collaboration (14,364)
- Meeting Deadlines (3,346)

The position of Cloud Solution Sales Specialist requires most, if not all of the interpersonal skills that are listed in the Burning Glass data, in addition to the previously identified IT related skills, and a suite of business-oriented skills. This role is very success driven, and requires an individual to be a self-starter, having the ability to work autonomously but also being comfortable to speak to anyone across different industries to identify opportunities. It is clear that the skill ranked at number 1 in the Burning Glass data (communication skills) is the

most imperative skill for this position, as good communication provides the ability to persuade clients. Further, as maintaining Key Performance Indicator values are integral to the role of a Cloud Solutions Sales Specialist, it is fair to say that teamwork, planning and the ability to meet deadlines, which all help to drive KPI targets, are also key skills that this role requires.

Highest Ranking IT-Specific Skills, Not Required by Each Position

Brendan

1. SQL
2. Javascript
3. JAVA

None of the top three highest ranking "IT-specific skills in demand" form part of the required skillset for the IP NOC Engineer position. This is understandable, as the top three skills in demand relate to programming and database languages, and this position is neither programming-oriented or database focussed. While a basic understanding of programming languages may be useful for the position, this is not listed as a requirement for application purposes. The top three IT-specific skills listed by Burning Glass in this dataset correlate with the top three occupations in the Top IT Occupations dataset; proficiency in programming and database languages is likely of greater utility in positions such as those of a software engineer, computer systems engineer or systems analyst.

Callum

1. SQL
2. Javascript
3. JAVA

While one might expect Sysadmins to have almost every directly-technical skill that is listed in the Burning Glass top IT skills data, most of these skills are not actually integral to the position. The three highest ranked IT specific skills fall under this "not exactly required" category; whilst holding skills in SQL, Javascript and JAVA might be beneficial at some point in a Sysadmin's career, the general day to day activities of this position can be undertaken without needing to delve into those areas. If a situation comes about that requires these skills, a Sysadmin could acquire the skills in-practice or enlist the help of other professionals.

Jess

1. Microsoft Windows
2. SAP
3. Graphic Design

Whilst the AWS Cloud / DevOps Solution Architect position is a pretty all-encompassing role, these three "IT Specific Skills" are not a major requirement for this role. Microsoft Windows

has been included in this list at the very top, as the assumption would be the individual aspiring for this role would have at least the basic fundamentals of this and other major operating systems such as Mac/Windows/Linux, therefore making this a moot requirement. Additionally, SAP and Graphic Design seem to veer off too much from the solution design component. Whilst Graphic Design is an integral component of product development, this is its own area of specialty which a Solution Architect would not focus too much on.

Joe

1. JavaScript
2. Microsoft C#
3. LINUX

Although data analysis can be performed using languages such as JavaScript and Microsoft C#, they are not the preferred languages for data analysis and therefore I believe they are not required in my skill set. Python and R are the standout languages used by Data Analysts and Data Scientists as they boast large purpose build libraries for statistics and data visualisation, and are supported by a large community. LINUX is an alternate operating system to Apple's OSX or Microsoft's Windows, and while popular among technical folk due to its open source and customizable nature, I don't believe LINUX is appealing to corporate environments as popular software packages such as Microsoft Office are not easily available on the operating system, it is difficult to source and provide technical support, and LINUX is generally difficult to grasp for general users. For these reasons I do not believe LINUX is a required skill for a Data Analyst.

Michael

1. SQL
2. JavaScript
3. Java

While the DevOps posting might not directly call for skills that are in high demand, this position can benefit from all the top skill sets on this list. Knowledge in SQL is incredibly important to DevOps since they must use tools that will monitor large sets of data. JavaScript and JAVA might not be crucial for DevOps, but knowledge of either languages it would certainly help with Ruby and Python (rajeshkumar, 2017).

Won

1. SQL
2. Javascript
3. JAVA

For my ideal position as a project manager, none of the top 3 highest ranked "Skills in Greatest Demand" are required. Although it may be necessary for a project manager to design custom reports against various project databases, a project manager themself does not require SQL or other database skills as they would normally have access to a programmer or other relevant staff with SQL skills, or project management tools that use

SQL in the backend to track project metrics and perform other tasks. As project managers are more focused on the coordination and influencing of others, rather than the actual ability to use the IT related skills, the above three skills are not an absolute requirement.

Highest Ranking General Skills, Not Required by Each Position

Brendan

1. Creativity
2. Research
3. Leadership

Creativity ranks ninth in the Burning Glass "baseline skills in demand" skillset, followed by research skills at tenth and leadership skills at eleventh. Whilst a level of creativity might be required for positions that involve the production of functional programs or systems, such as games design and general programming, the IP NOC Engineer position is focussed more on troubleshooting and problem solving, and as such doesn't require a great deal of creativity. Similarly, the requirement for research skills in this position would be limited to the likes of pre-implementation or pre-purchase research, which could be considered part of the "planning" skillset. The IP NOC Engineer position description details the requirement to work as part of a functional team, but does not list team management or leadership qualities as required. As leadership based positions generally list this requirement prominently on advertisements, it is assumed that this is not a leadership oriented position and as such this skillset is not required for application. Leadership skills may, however, be required in time as a part of career progression.

Callum

1. Organisational Skills
2. Writing
3. Detail-Orientated

Though organisational skills are 'good to have' in basically every job, they are non-essential in the Sysadmin role, unless working in a large team where poor organisation has the potential to cause disruptions to activities. Typically however, Sysadmins work alone or with only small groups of people, depending on the size of the organisation. In this case, organisational skills aren't overly essential. While writing skills are also 'good to have', technical support situations that require communication with third parties or clients generally involve speaking over the phone, or writing small notes - which may be typed and never need to be handwritten. In terms of the third skill in the list above, it can be argued that optimisation, which is a task performed by Sysadmins and mostly involves making small improvements to parts of a system, requires that one is detail-oriented, as they would be improving small things. From my point of view however, optimisation requires looking at the big picture, rather than the details, as it tends to result in a much more obvious bigger-picture change in performance, and you might de-optimise one area so that another can be more optimised, resulting in a net improvement to the overall bigger picture.

Jess

1. Creativity
2. Mentoring
3. Team-Building

The AWS Cloud / DevOps Solution Architect is a senior role, however it is a team leader role. Whilst this role does leverage off of the user journey and requires the individual to understand how the system interacts with a user, there is no emphasis on, or requirement for graphic design or designing new content from a UI point of view. As such creativity is not a requirement of this position. Additionally, this role does not require the individual to mentor junior members on the team, which means team-building is also not an important component of this role. Solution Architects are not necessarily managers of teams, but they work collaboratively with different teams to create and architect a solution.

Joe

1. Leadership
2. Management
3. Staff Coordination

The role of a data analyst generally involves working with data; collecting data, collating data, forming relationships with different sets of data and then forming insights from the data, usually in the form of a visualisation or table. Although insights drawn by a Data Analyst may directly influence decisions made affecting a project, product or service, these decisions are generally made by the project manager or equivalent, using the insights from the data analysis performed. A senior level analyst may require these leadership skills later in their career, however I do not believe someone entering the industry would be expected to possess skills in leadership, management and staff coordination from the get go. These skills may be acquired over the years in their career, and possibly lead to a promotion to a Senior Data Analyst/Manager role where they would lead a small team of analysts.

Michael

1. Troubleshooting
2. Creativity
3. Presenting Skills

While I'm sure that troubleshooting will be needed on occasion for DevOps in an AWS environment, the planning stages of these data gathering projects using machine learning should remove most situations where troubleshooting is needed. Creativity is not required for the most part. Standard practice for deploying machine learning applications in the cloud require planning and knowledge over creativity. Presenting skills were probably not included because in this position you would work with clients that have had training to use the type of data DevOps teams would be collecting.

Won

1. Troubleshooting
2. Creativity
3. Research

Metaphorically, the main role of a project manager is to steer the boat and to be making the right decisions to direct the entire ship and its crew. To do this, a project manager requires a majority of the skills that are outlined in the Burning Glass "general skills" data. In terms of skills that aren't required by this position, troubleshooting ranks 6th on the list followed by creativity and research skills which are 9th and 10th. These three skills are not critically required, as tasks that require them can be done by a project manager's team members if provided clear instructions and descriptions of the task. As previously discussed, it's fair to say that a successful project manager would require most of the skills on the general skills list, as they are generally required to be an all-rounder to lead the team.

Current Opinion of Job Title, All Group Members

Brendan

I admit, I did not consider industry demand when I came across the IP NOC Engineer position, nor did I consider how the skills and experience required of this position rank in terms of industry demand. Reviewing this data has cemented my original opinion of this position. Where I originally found the role of IP NOC Engineer appealing due to its inherent requirements (ability to problem solve in a fast-paced environment, work to timeframes and liaise with vendors and other NOC staff), knowing that this position sits 4th in the Burning Glass 'Top Occupations', and 9th in the 'Top Titles' rankings for employer demand has justified this position as a worthwhile aspiration. Comparing the skillsets required for this position to rankings provided by Burning Glass, it can be seen that the inherent IT-specific skills are spread equally throughout the 'IT Specific Skills' rankings, whilst this position also requires 4 of the top 5 most sought after generic skills. The acquisition of these sought-after skills in fulfilment of the requirements of the IP NOC Engineer position should therefore also prove beneficial if I was to consider other careers in the IT sector. My review of the Burning Glass data has also helped me to understand that the 2-5 years' experience that has been noted as desirable for this position is not unreasonable, as the industry average for years of experience sits at 3-5 years.

Callum

My opinion has not really changed upon review of the data, as I approached my ideal job with the same general thought I give to everything in life: Select a goal, figure out the details later. Now the details are figured out, and I know what I need to work on doing, to be eligible for a job such as the one I have chosen as my ideal.

Jess

Upon reflection, I don't believe my opinion has changed after looking at the Burning Glass data. This role focuses on both the solution design plus balancing large groups of stakeholders. The "Solutions Architect" position ranked first in the "Top Titles" Burning Glass data report, which I assume is because this is a role that is not only in high demand, but will likely to continue being in high demand into the future. As more companies aim to be more agile, and if they push to develop their solutions in-house, then a role like this will never go out of demand. Although I have only listed a handful of technical skills from the "IT Specific Skills" report, almost all of them could be applicable to this role. This is because a role like this requires additional industry certifications, which are specific technical skills in the industry. From my understanding of the Burning Glass Data, it would require me 5-10 in a technical role, in addition to gaining more accreditation in AWS and cloud services.

Joe

My opinion of my ideal job as a Data Analyst has not changed after review of the Burning Glass Data. Although Data Analysis may sit at rank 95 in a list of the top 200 IT skills in strongest demand, specific skills required of a Data Analyst are prevalent in the top 5 IT-specific and generic skills in highest demand (SQL, Java, communication, problem solving and team work to name a few) according to Burning Glass. After a review of the highest demand IT roles, I have learnt that there are other data centric roles that require a similar (or slightly advanced) skill set that I could potentially transfer in to should my interests change or the demand for Data Analysts becomes weak. These roles include Database Administrator, Business Analyst, BI Developer or SQL developer.

Michael

The core idea of my ideal job hasn't changed after looking at the Burning Glass data, though how I search for jobs in the future will certainly change. There are keywords that I could have included in my job search that may have netted a job with more pay due to its higher demand. As an example, my team member Jess chose a job with a very similar job description and yet because her job has "Solutions Architect" in the title, it's seen as much more in demand. Going forward I will find more data on current jobs in demand so that I have a better chance at securing a position. Another area where I can use the Burning Glass data is when I write my resume as I may be able to include more relevant information outside of just answering the job description, now that I have a better understanding of what employers are searching for.

Won

Coming from a strong sales background, the Burning Glass data has made my opinion on my ideal job a concrete decision. My career has always been about influencing and persuading others, and being a good listener rather than a good speaker, as this makes a great salesman. For an individual to build a good relationship with anyone, they should listen more than they talk, a skill which I am strongly confident in. As a project manager, I can put these skills to good use whilst building my more IT-specific skills. Although some of the skills

listed in the IT related skillset are "nice to have", they are not a compulsory requirement of successful project management. Nonetheless, given that I have no IT related experience so far, these skills are something that I can learn as I start out in the IT industry. Thinking forwards, as I am still young I have time to pick up these skills slowly on my way to a project management role, using my already-acquired people skills as a starting point.

IT Work - Interview with an IT Professional

Interviewer: The Thing Doers (RMIT University Group)
Interviewee: Michael Ranson-Smith
Role: Data Specialist
Interview Held: Thursday 4 July 2019, 8:00pm
(See appendix A for interview transcript)

What kind of work is done by the IT professional?
As a Data Specialist working on Federal Government projects, Michael best describes his role as moving data, engineering data, data analysis, and identifying best practices for organisations to more effectively collect and utilise their data. This description depicts a very hands-on technical role; however, Michael went on to explain that most of his time in this role is taken up by non-technical tasks, mostly by communication with stakeholders (meetings, emails, presentations, document preparation and change management). The technical aspects of his role include analysing existing systems and data sources, auditing of data and it's quality, preparing (cleaning) data so that data quality is controlled, and the design of data management solutions that meet the clients' needs and integrate with any established systems they may have.

What kinds of people does the IT professional interact with? Are they other IT professionals? Clients? Investors? The general public?
Michael mostly works with senior executive level public servants. Interactions early on in the project involve identifying the problem they need to resolve, the strategy they want to take to solve it and then working with them to understand their options. When working with the client to figure out their options, Michael must determine if the solution is fit for purpose. Michael must analyse the problem and decide whether it could be solved more efficiently, and whether the client can support the project financially throughout its life, for example financially with associated costs for development, change management and user training considered. Once a strategy is agreed with the client, Michael then commences the planning of the project. Planning of the project includes planning of procurement, systems maintenance and configuration, and user training. During the life of the project, Michael maintains regular communication with stakeholders, developing reports to keep them up to date on the project's status and seeking input from them when required. Towards the end of a project, Michael's interactions will be more focused on the end-users. This phase of the project is spent delivering end users the training necessary for them to use the system effectively and to its full potential.

Where does the IT professional spend most of their time?

Michael estimated that he spends 80% of his day on non-technical tasks in the current phase of his project. Michael believes that it is a common misconception of IT, that all roles are highly technical and that the majority of IT professionals spend their day in front of a screen. He explained that unless someone is in a Database Administrator role or certain Software Developer roles, most of the time is taken up by non-technical tasks. Instead, the work is more user-centric, focusing more on understanding where new technologies or changes in business processes could be introduced to deliver a product or service more efficiently. This process involves thoroughly understanding a client's business and end goal to be able to analyse the problem and resolve it effectively and efficiently. The examples Michael provided of his daily non-technical tasks were; meetings, presentations, document preparation, and user training.

What aspect of their position is most challenging?

The most challenging aspect of Michael's role was described as corralling enough people toward a common goal to establish a coherent set of decisions and gathering enough momentum to get a project off the ground and running. Michael explained that working in the Federal Government is different from most corporate environments. Generally, corporate environments are far more certain about how and what they want to spend their money on. They have a specific budget to deliver a project with evident profit and ROI motives. The review of money spent and ROI in a lot of Federal departments is very poor or sometimes even absent. This lack of budget constraint can lead to delayed or sometimes even cancelled projects.

IT Technologies Reports

Cybersecurity

Callum Hunter

Cybersecurity refers to the technologies and practices involved in protecting sensitive information and network infrastructure from unauthorised access or damage, and resulting unavailability (Palo Alto Networks n.d.). Cybersecurity, unlike most other modern technologies, is not actually a technology in and of itself; it is a series of actions taken to protect other technologies. For example, a new cloud service is starting up. They have to protect their users' data and payment information from attackers, however they have to use an older version of some software to ensure compatibility, and this version has a known issue that has not had a patch. Because of this, the service must take measures to ensure that they either make a patch for the software, or can set up the software, alongside other pieces of software, in such a way that the issue cannot be exploited. There are some other aspects to cybersecurity, such as the development of encryption standards, however cybersecurity in general refers more to the overall strategies involved in securing systems, as explained in the example above. When making cybersecurity strategies, common areas that require thought are: networks, applications, endpoints, data, identities, infrastructure,

cloud services and mobile services. Disaster recovery and end-user education are also important focus areas (Lord 2019).

Whilst cybersecurity itself is better called 'a series of actions and practices' rather than 'a technology', there are technologies that are developed in aid of cybersecurity; both for end-users and in general. An example of an end-user piece of technology that aids cybersecurity is what is known as a "USB Key". This device contains an algorithm, or 'key' unique to it, which is verified by an authentication service as a second factor in signing into an account, acting similarly to two-factor authentication methods that rely on a service sending an SMS message to the account holder's smartphone or otherwise sending them a secondary PIN via a secure channel, with which to sign in. Another example of a technology to aid cybersecurity is antivirus/anti-malware software; such as AVG or Avast for anti-viruses, or Malwarebytes for anti-malware. They both aim to stop, detect and remove malicious software, though antivirus software aims for older, established threats while anti-malware software aims for newer threats (Zamora 2015). A third kind of technology that attempts to aid in end-user cybersecurity is password management software; which is designed to attempt to counter data breaches by allowing end users to use multiple randomised, high-strength passwords without needing to remember them by themselves. Examples include LastPass and Dashlane; both of which provide facilities for cloud storage of passwords, a master password which is used to encrypt passwords when they are stored, and the ability to generate completely randomised passwords that contain various symbols and are generally hard to 'brute-force', which means they are hard to break by just trying every possible combination. These also make social engineering, or manipulating people to divulge their passwords, difficult as these randomised passwords are likely unrelated to the user personally, as passwords containing names and birthdays would be. However, when using password management software it's likely the user doesn't know what the password for a given service is, as it is saved for them, therefore making it difficult to log in to services using devices that don't have access to their password manager. This technology is itself subject to cybersecurity threats; if a user's master password is compromised, all accounts that have their password stored on the password manager will be subsequently compromised as well, assuming the password manager is synced to the cloud (Hoffman 2018a).

Without cybersecurity, we would be unable to benefit from luxuries such as internet shopping, or even certain aspects of privacy, as all data exposed to the internet would be available to everyone. This would include bank account details and other personal information, such as home addresses, full names and dates of birth. Cybersecurity protects everyone in their daily lives by ensuring that none of this information is easily obtained by unauthorised personnel. The requirement for cybersecurity also brings with it an entire workforce. Without cybersecurity, there would be no requirement for the myriad of cybersecurity related positions available today, including jobs such as penetration testers, who are hired by a company to try and break through, or penetrate, their security; as if there is nothing to try to penetrate, there isn't any testing required.

Improper cybersecurity is just as bad as no cybersecurity. As an example of improper cybersecurity, the Australian government passed legislation in late 2018 to introduce what

they called a "side gate" (more commonly referred to as a backdoor) that the government and police forces could use to force companies to break encryption; which brings with it speculation regarding the potential for abuse by the government for minor offences, and the ability for malicious third parties to gain access to the encryption, and thus the information the encryption was trying to keep safe (Whittaker 2018). Improper cybersecurity brings with it the potential for widespread damage, the impact ranging from the average person having their identity stolen, to banks being unable to do business online, to malware being spread far and wide by a single bad actor. The technology behind cybersecurity, namely encryption, is essential to keeping this from being the case.

Discounting policies that may undermine all security online, the future is looking pretty good for cybersecurity. Companies are continually improving their routines all the time, and new technologies are incorporating better standards for security, such as in new developments like Wi-Fi 6 (802.11ax-2019) which incorporates WPA3 encryption, making networks that use Wi-Fi 6 harder to break into than legacy networks which use earlier forms of encryption, such as WPA2, WPA and WEP, or for open networks, no encryption at all (Hoffman 2018b).

And how does this affect me?
Cybersecurity is not meant to change anything; instead it is primarily designed to keep things from changing. If my wifi password is 10000% harder to snoop, and I am 6000% more resistant to Man-In-The-Middle attacks, I am not going to notice a difference in my overall cybersecurity unless I go out of my way to figure out how resistant I am to these things. Improvements will keep me much safer while online, and as someone decently educated about the presence of cybersecurity, I can appreciate the amount of time and effort that goes into keeping my bank account under my control, and keeping my money from going to Seth McSleezy down the street; yet I am also aware of how underappreciated cybersecurity is. Most of my friends and family will never notice the presence of the security protocols that people have painstakingly attempted to make more and more convenient for the end user; as the average person generally doesn't give too much thought to their cybersecurity, and subsequently tend to see putting more effort into it as pointless. People reuse passwords for this reason, because in their mind, "I have nothing to worry about, nobody will ever find my account, and why would they want to break into it?". I myself was of that mindset, until a massive security scare just on the date of me typing this paragraph, that could have resulted in my accounts being compromised because of my chronic password reuse, forced me into taking action and increasing my own security. Many people live not realising that cybersecurity is two-part, and that they need to actively work to keep themselves safe from bad actors attempting to gain access to their accounts, as not doing so puts them at risk of cybersecurity problems like impersonation, fraud and theft. Ultimately though, I am just repeating what so many cybersecurity experts have said, and the common ideal of "convenience over all else" will continue to hold true.

As an ending note, please for the love of all that is good, do yourself a favour if you have not already, get a password manager and randomise your passwords. It is one of the most effective ways to keep your data safe. Make sure your password manager uses a master password that is long and strong. A tip for secure and easy-to-remember passwords is to make them a sentence.

Machine Learning

Michael Plenert

What does Machine Learning do? What is the state of the art of this new technology?

Machine Learning is a subset of Artificial Intelligence (which is a subset of computer science that attempts to simulate intelligent behavior in computers (Samuel 1959)) and has roots in classical statistics, manipulating data that has been gathered and sorted. Where classical statistics used much smaller data sets, machine learning can analyze vast quantities of data. Today statisticians use machine learning in statistical learning (James, et al. 2013).

Machine learning refers to the use of a specific set of algorithms by a computer system to make predictions based on patterns and not explicit instructions. The term was first used in 1959, by Arthur Samuel at IBM (Samuel 1959). Machine learning has developed considerably since its conception in the late fifties, and its development has accelerated in recent years - in fact, in 2018, almost a quarter of all enterprises in North America had machine learning embedded in at least one company function (Columbus 2019).

As an example of how machine learning operates, in order to try and have machines identify seagulls based on their wingspan, you would start with a base set of data with various wingspans of seagulls measured, and a set of data with wingspans of various birds including seagulls to test against. Run over and over analyzing each iteration, the machine will change the base model as it incorporates more data, modifying parameters to refine the outcome (Sullivan 2015). Over time the model will become even more accurate.

What can be done now with this technology?

Machine learning is used across almost every industry. Facial recognition and object detection in security camera footage uses machine learning. When your plane ticket suddenly goes up in price, or an email is relegated to spam by a spam filter, this is a result of machine learning. Machine learning is at work when online video streaming, online stores or social media deliver (sometimes very poor) recommendations to their users. Banks and government agencies use machine learning for fraud detection (Sas 2019) and recently the technology has been used to create "deep fakes" (Horowitz 2019). Two areas where machine learning is experiencing rapid growth are marketing and sales (Columbus 2019), and supply-chain management and manufacturing, where machine learning has the potential to reduce costs on hardware and software and optimize manufacturing machines (Joshi 2018). Machine learning is even harnessed by wearable technology and IoT devices, which are used in the healthcare industry to diagnose medical conditions such as diabetes and high blood pressure, and in our personal lives, where machine learning is used to perform tasks as simple as choosing which smartphone notifications to show (Pickell 2019). Every day more applications for machine learning are being introduced, and the ones currently in use are getting even better.

What will this technology be capable of in the future?
Many are predicting that machine learning will accelerate in the coming years due to quantum computing. Industry leaders predict large problems in machine learning will be solved in a fraction of the time it currently takes (Pickell 2019, Garbade 2018). Machine learning is expected to become even more integrated into our lives in the coming years. A 2018 Google I/O presentation gave a peek into the near future of machine learning, demonstrating the machine learning capabilities of Google's new "Google Duplex", a feature of the Google Assistant AI, which was able to make a call to a hairdresser and book an appointment without assistance from the user, and without the hairdresser knowing she was speaking to a machine (Welch 2018). Google is also working to integrate machine learning into their search engine, such that our past searches will be used to tailor our future web search results (Sullivan 2015, Pickell 2019). Self-driving cars are another example of emerging machine learning technology, as the technology continues to improve the safety and reliability of driverless cars through decision trees and object detection (Hawkings 2018).

Over the past few years, machine learning has been moving towards "unsupervised learning" for example as used in "generative adversarial networks", which are algorithms that don't usually require human intervention. Generative adversarial networks learn to generate new data with the same characteristics as the training data (i.e. produce a picture with the characteristics of a seagull from pictures of seagulls). Unlike the previously mentioned deep learning, unsupervised learning can understand patterns from within data (Oman 2017) and can make predictions from datasets even without all required information (Garbade 2018). This brings down the cost of machine learning, as gathering data is expensive and time consuming. This efficiency will lead to new growth in areas such as cognitive services, where developers will be able to make their apps intelligent by giving them the ability to speak, hear and see (Garbade 2018).

This future direction for machine learning also entails a change in the way computers process information. In the beginning, CPUs were shouldering the workload in machine learning, whereas today GPUs are capable of this processing, and research into the use of advanced technologies such as Field-Programmable Gate Arrays (FPGAs) and Tensor Processing Units will see greater efficiencies in machine learning and other AI technologies (Johnsen 2018, Ray 2018). This will see the continued expansion of machine learning into almost every industry.

What is the likely impact?
Machine learning brings many benefits to businesses and consumers. For businesses, machine learning brings the potential for between 12 and 22% return on investment across all sectors from potential efficiencies, with the biggest gains to be seen in labor automation due to the high cost of staff. Consumers will continue to benefit greatly from machine learning, for example with marketing personalisation, which has led to an improved customer experience (Columbus 2019). IBM's Watson computational engine gave an excellent example of the future prospect of machine learning; this machine was able to reliably diagnose cancer better than oncologists (Galeon 2016), outlining an area where computers have been as good at recognising patterns as humans, but where their increased ability to

recall large amounts of data on demand has resulted in technological advances. There are many more potential short- and long-term benefits to machine learning. Machine learning will play a big role in helping humans deal with climate change by building better electricity systems and monitoring emissions and deforestation, helping to design better dwellings by creating low-carbon materials, and predicting extreme weather (Vincent 2019).

With enhances in machine learning and the potential for this technology to replace human workers, there has been speculation that as many as two billion jobs will be made redundant by 2020 (Frey 2012). To combat a future with mass layoffs, some countries like Canada have trialed universal basic income, where people earning below a certain amount have been given a supplemental income (Province of Ontario 2019). Social media has also had problems with the echo chamber effect (Hsiang 2016) where machines have learned someone's misguided search history to deliver more bad content which might lead to reinforcing thoughts like the world is flat, Australia doesn't exist (STARINSIDER 2018) and vaccines cause autism. Other negative impacts to machine learning can be seen in countries that have more oppressive governments. China for example, uses facial recognition and big data to collect information on its own population in order to assign a social credit score, which can punish citizens who 'step out of line', even with non-criminal behavior like speeding tickets, consorting with people who have low social credit or being late on taxes (Mosher 2019).

How will this affect me?

I imagine talking to my devices quite a bit more. Amazon Alexa can deliver the news and weather, and plays music by voice command, but soon we'll be able to manage our daily activities, complete online purchases, and have Alexa control more objects throughout our life, with continued expansion of machine learning. It's easy to see smart objects being useful especially now that wireless is being built in to so many IoT devices. Right now, we can turn on or off our lights remotely or on a schedule but with machine learning, lights could be automatically controlled based on various conditions such as outside light, if someone is in the room, if we are on holidays or just out for the evening.

My Android phone already utilizes machine learning in a noticeable fashion. It has started modifying my alerts, planning the routes I drive to take the shortest distance, traffic and weather into account, and more recently Google has been recommending restaurants though my phone based on those I have visited previously. The Google Assistant is continually improving, and will now go through my emails, identify flight itineraries and bookings, and let me know when I have to check-in for a flight or when it's been delayed. Soon I will start using Google maps exclusively when I drive, even when going shorter distances as machine learning has helped me to find new routes even on paths I know well. I expect that as Google gathers more data on me, it will affect how I spend money. Soon Google will let me know when I should buy my plane ticket based on my past flights. Whilst I see benefits from this technology, the computer revolution has left many of my family and friends behind, and I believe that machine learning can benefit non technically minded people in our society the most. Installing Windows, for example, is so much easier now that you can talk to Cortana, and no-code environments are already in the works and will only be more widespread in the future (Pickell 2019).

Raspberry Pis, Arduinos, and other small devices

Jessica Munit

What does it do?

Raspberry Pi's, Arduinos and Makey Makeys are a series of small single board computers, which come with their own retrospective circuit board, IDE's and connectors. These components can be sold individually or as bundles based on the hardware requirements of a project. They provide a cheap alternative to their large scale commercial competitors, allowing their users to customise the device through parts that are relevant to the user's projects. For example, a person can build their own automated home with components which they can configure themselves. This is an alternative to paying for a service or commercial solution that may cost significantly more.

These small circuit boards and related hardware components do a plethora of different things. In an online article penned *What is a Raspberry Pi* (Red Hat Inc 2019), these hardware components are touted as able to help users learn to code, and for those who know how to code already, to code electronics for physical projects.

What is the state of the art of this new technology?

The state of the art in small computing devices is primarily seen via the implementation of better WiFi connectivity in these small devices. In an article penned, "*Introducing Two New Boards from Arduino*" (Arduino 2018), Arduino introduced the MKR WiFi 1010 and the MKR NB 1500, the two latest boards in their product catalogue. The improvement to WiFi technology has been appealing to gamers, which has allowed Arduino to diversify their customer base. This is one example of how constant technical evolution has improved the capabilities of small computing devices. This constant evolution has also seen these devices continue to decrease in size whilst increasing their capabilities. For example, the Arduino Nano is considered to operate in a similar fashion to its larger counterpart, the Arduino Uno, but with at a fraction of the size (Aqeel 2018). Similarly, Raspberry Pi Zero has been introduced as half the size of the Model A+ device, with twice the utility (Raspberry Pi Foundation 2019). The Pi 4 is the state of the art for Raspberry Pi lineup, with its increased processor speed and larger memory capacity making it a powerful single-board computer (Pecina 2019).

What can be done now?

As discussed above, small computing devices have become more compact and even cheaper. With the introduction of more streamlined WiFi connectivity, users of small computing devices can create "media centres, file servers, retro games consoles, routers, and network-level ad-blockers" (Arduino 2019). Additionally, there are an abundance of code libraries users can utilise for their at home projects with small computing devices. For example: Google's TensorFlow software can be installed on the Raspberry Pi for machine learning projects (Heath 2018). This ability to run different software allows small computing devices to perform more complex tasks for the user, and increases their overall utility. The growth of online communities and technical forums relating to the likes of Arduino and

Raspberry Pi is allowing further advances in the utility of these devices. For example, Arduino has its own official Stack Exchange forum (arduino.stackexchange.com). Forums such as these allow people to discuss their projects and add to coding libraries, expanding the project capabilities for a user. This means, there is more that can be done with these devices - it all depends on the resources available online.

What is the future of this technology?

These devices have a massive future ahead of them. In the past few years, the growth of these technologies has disrupted the commercial technical space by introducing hardware that is cheaper and more compact, directly to end users. As these technologies continue to evolve, so will their capabilities. This growth has been considered noteworthy by many in the IT industry, with IT PRO calling the new Raspberry Pi 4 "a new PC" (Shepherd 2019). The expansion of these devices has been largely attributed to the rise of nano-technology, which has allowed hardware that is a fraction of the size of regular counterparts to become more readily available. In addition, small computing devices have a future in early education, where products such as Makey Makey's have been introduced to school children (Makey Makey 2019).

What is the likely impact of this technology?

It is still relatively early days in the world of small computing devices, however since its launch, it has had a largely positive impact on its users. For example, the implementation of products like Makey Makeys in school programs has helped to build an understanding of technology at an early age. In a TED Talk by Massimo Banzi, the Arduino open-source movement is discussed as influencing a "DIY-community, that believes in open-source, in collaboration, and collaborates online" (Banzi 2019) demonstrating a shift in society's interaction with computing. This shows that people have been positively impacted by these smaller computing devices. Through its innovative and DIY nature, this technology has allowed users to create solutions for their own problems. In his video, Banzi provides an example of an assistive device, that can understand sign language and transforms gestures into sounds (Banzi 2019). This is one example of how this technology can positively impact people and communities.

It is still unknown how small computing devices will impact the workplace. Arduinos and other small devices have been implemented in the workplace in some sectors, for example as discussed in Arduino's community forum *"Professional Engineers' Perspective?"* (Arduino 2019b) individuals have started to use Arduino in their micro-processing tasks, and in automating assembly at work. Whilst it is too early to assume that these technologies will make any current jobs redundant, this is a potential future issue, as automation (and potential for redundancy) goes hand in hand with small computing devices. In spite of this, Arduinos, Raspberry Pi's and other small devices are likely to have a positive impact on the workplace. This technology can be used, for example, by smaller companies for penetration testing of information security (Paulownia n.d.), and has been considered as providing a low-cost development platform for software developers and network engineers. Whilst these are niche examples, this shows that under the status quo, these devices have improved the way people do tasks in the workplace.

How will this affect me?

As it is too early to understand the clear impact of small computing devices in the workplace, one can only think that these devices are relatively positive and helpful. Personally, I enjoy creating tiny projects. My first introduction to small computing devices was in high school where we had to build a small mechanical ladybug and race it. In my spare time, I research different automation projects to work on, and small computing devices have provided me with an inexpensive means by which to build my own projects.

Small computing devices will not have a large impact on my daily life at the moment, but I suspect they will in the future. I don't think they will affect me now because I don't currently need any automated tools or applications. I think as these components become more mainstream, there will be more competition in the commercial market and automated tools and appliances will become cheaper because of brands like Raspberry Pi and Arduino. This might apply to my friends and family as well.

Clouds, Services, Servers

Won Kim

What does it do?

The cloud, which is an operational technology comprised of many interconnected servers, computers and other internet-connected devices, allows users worldwide to store, create, manage and manipulate information and data remotely and quickly via the internet (Microsoft Corporation 2019). The companies providing the servers and 'cloud based technology' generate revenue from the provision of Software as a Service (Saas), Platforms as a Service (PaaS) and Infrastructure as a Service (IaaS), which will be discussed later.

Cloud Storage

Cloud storage allows users, and especially businesses, to store all matter of data at a comparatively lower cost, and with higher piece of mind, when compared on-site hosting and the associated cost of purchasing and maintaining equipment (Microsoft Corporation 2019). The global reach of cloud technology allows users to access their stored data anywhere with an internet connection. For businesses and large scale organisations this technology is especially useful as it allows them to have office locations all over the world which can all access the same information in real time. On a smaller more personal scale, individuals and families can also utilise these systems to store and share videos, photos, school work and other personal files efficiently and safely around the world using services such as Google Drive, OneDrive, Flickr, Photobucket and many more. Cloud storage, in relation to other IT services and products, is relatively new, and does not come without its disadvantages (O'Neal 2018). One major downfall is that if the system were to fail, many, including large businesses, would not be able to access their stored data, causing major disruptions and issues for businesses that rely heavily on this technology to create profit (Zimmerman n.d).

Cloud Services

The cloud is used to provide many services that can be accessed on demand. For example, schools and Universities are more commonly starting to use cloud based platforms such as

Canvas and Blackboard to deliver and discuss relevant content, to allow students from all locations and backgrounds to complete a university degree (Dickson 2017). As a university student myself who is studying online whilst working full time, a cloud based learning platform allows me to complete my degree online and in my own time, allowing me to manage my time and work more effectively and flexibly. In addition, the education provider also benefits from this set-up as scheduled class times are all but eliminated, potentially allowing the teacher to also manage and delegate their time and resources in a more efficient way.

These cloud-based services are broken down into categories based on what is provided to the end user - Software as a Service, Platforms as a Service, and Infrastructure as a Service (Watts & Raza 2019). Businesses and end users can use cloud services from any one of these categories. IaaS provides users with server infrastructure remotely over the cloud, and is generally recommended for businesses that prefer to manage their own data, but don't have the space, resources or financial ability to host their data infrastructure physically on site (Watts & Raza 2019). Paying for infrastructure as a service rather than owning outright can be a cost effective approach for many businesses. Building on Infrastructure as a Service, PaaS is useful for businesses that would like to develop and run their own software, but lack the facilities to do this on-site (Hurwitz, et al. 2019). A cloud service provider provides the infrastructure and software platform on which to achieve this, and the business can access these resources over the internet. Perhaps the most commonly used cloud based service is SaaS (Cook 2016), and involves the provision of remotely hosted software applications to end users over the internet. SaaS offers quick set-up and deployment, as the end user often requires no specialised hardware to use the software (as they would if they installed it locally) (Sylos 2013).

What is the likely impact?
As discussed previously, many companies around the world are utilising cloud systems to better enhance the way in which the company achieves its goals. In addition to education and multi-location businesses, technologically advanced companies such as Google are using cloud services for Artificial Intelligence (AI) applications (Loucks 2018). Google is one of the largest cloud facilities in the world with at least 16 different global locations, collectively hosting millions of servers (Google 2019). Google is researching the use of AI within their data centres to help their customers to find what they are looking for faster. Large retail sites such as Amazon are also using AI-enhanced machine learning to understand their customers' interactions with their websites, and then suggest items for their customers to buy, whilst also tailoring advertisements to the user, for example those displayed within social media platforms such as Instagram and Facebook (Loucks 2018)

Furthermore, Tesla has also been recently utilising cloud services to create their own autopilot application for self-driving cars. Tesla collects data during manual driving, such as the vehicles' speed, turning angles, and proximity sensor data, and combines this with the location of the car through GPS tracking services. This is stored within a cloud system that allows engineers and IT professionals to later analyse and develop this data into an autonomous driving application (Tesla 2018, Marr n.d.). The autonomous driver would then continually upload new data, for example data gathered when driving roads in different

conditions and at different times, which would in turn be analysed and used to improve the autonomous driver system (Tesla 2018, Marr n.d.).

Cloud storage is undoubtedly becoming an important storage method for businesses and consumers. To the older generation and those resistant to change, cloud systems can seem unprivate and a worrying concept as personal data and information is stored remotely and out of direct reach. However, cloud storage has many advantages over older, on-premises, physical mediums of storage, including protection from data loss due to fire or natural disaster, and redundant storage that keeps multiple copies in separate locations (Microsoft Corporation 2019). As businesses and consumers shift to cloud services for storage of data, physical, on-site storage requirements are becoming less, and the ability to work remotely by accessing files anywhere, at any time, is increasing.

How will this affect you?
On a personal level, the use of cloud storage has impacted me greatly in terms of the study options available to me. I have been interested in undertaking an IT course to accompany my Bachelor of Building, however was unable to attend physical classes due to full time work. Cloud based storage and education systems such as Canvas, which delivers my course content, and Google Drive, on which this assignment is being produced, has allowed me to study from home in my own time around my full-time work commitments.

In addition to allowing me to study independently from home, cloud systems have made a significant impact to a colleague of mine who works within the manufacturing industry. This is an example of a business that has multiple locations, comprising of a head office with multiple sub locations. Training on certain products, services and processes are developed and then presented at the head office, meaning employees were having to travel at least 65km one way to receive the training every month. The cloud has allowed my colleague's company to provide real-time training to all of its locations, reducing the time and finances wasted due to staff travel.

Group Project: Automating the Clinical Coding System

Foreword
This group project is building on the initial project idea developed by Brendan and available for viewing here: https://brendan6780.github.io/ProjectIdea.html. Further adaptations by 'The Thing Doers', such as incorporation of additional functionalities and production of a UI wireframe, are discussed in the section 'Further Considerations for Development by The Thing Doers'.

Background
Public hospitals in Queensland and other Australian states receive funding from Medicare and other government bodies on a per-patient-per-procedure basis (QLD Health 2018). For funding to be allocated correctly to each hospital, the procedures undertaken on a per-patient basis must be recorded and remitted to Medicare or the relevant funding body in

a timely fashion. The current procedure for recording and remitting this information, called clinical coding, is extremely manual and time-consuming. This task involves an administrative worker reviewing patient charts and practitioner/nurse notes to determine what the medical condition was, which procedures were performed, and what materials were used in the process. Each condition and procedure is then assigned a code based on the Australian clinical coding standard ICD-10-AM; for example, P59.9 Jaundice in newborn (IHPA 2019). At times critical information such as the condition or procedure can be up to interpretation, due to complexity or inability to decipher clinician handwriting.

Where small hospitals may be able to keep up with procedures using this manual method, large hospitals require a clinical coding team to process the many procedures performed daily. This project proposes an automated system for clinical coding, whereby clinicians enter procedure details directly into a patient's electronic chart (where in practice by the hospital) or into a stand-alone application, either of which will automatically code said procedure and produce a summary of codes ready for remittal to Medicare. This system will reduce time spent reviewing patient charts and prevent miscoding due misinterpreted practitioner notes.

The Initial Project Idea
As many hospitals still utilise paper-based patient charts, this project will focus on the implementation of a stand-alone application designed to run on a tablet computer, supplementary to the paper charts. To achieve this, an iOS or Android application (app) will be developed for use on whichever mobile devices are employed by each Hospital and Health District (HHD), which will query clinicians for the following information, at minimum, as required by relevant data collection standards (QLD Health 2019):

- Treating physician (and unique identifier such as password)
- Minimum Patient Information (UR/Medicare number, DOB, First and Last Name)
- Date and time of event/diagnosis/procedure
- Diagnosis 1 (2, 3, 4 as required)
- Procedure 1 (2, 3, 4 as required)
- Additional materials used
- Patient status (committed (and expected/actual duration), discharged, deceased)
- Additional notes for clinical coding team

This app will be lightweight with a minimalistic User Interface (UI) to allow fast identification of data required, and practitioners will be queried for data in a stepwise fashion, as per the example in appendix C.

The practitioner will be required to submit the data, after which point data entry will close and the system will return to the initial 'treating physician identification' query. The app will organise this data per field, initially identifying the patient from hospital records and assigning patient details, practitioner name, and date/time to a temporary working file on the device. Key words and phrases from the diagnosis, procedure and additional materials fields will then be compared to a built-in table of ICD-10-AM codes. Where matching codes are found, these will be added to the working file. The file will be summarised with the patient

status. Additional notes will be transcribed directly to the end of the file, alongside a direct copy of the practitioner notes for the diagnosis, procedure and materials fields, which will be included for verification and audit purposes, with any unresolved words or phrases highlighted for review by the clinical coding team.

A possible example of the data generated can be found in appendix D. This data will then be remitted to an internally hosted clinical coding database via the hospital's wireless LAN, for review by the clinical coding team.

Pre-implementation configuration
The query fields will be configurable by each hospital's Information Technology department based on the requirements of their HHD. The location of a locally-hosted storage database will also be assigned during initial configuration.

Equipment, Technology and Skills Required for Implementation
This project will require app development software and skills in application programming and mobile app development. There are many app development tools available, such as the free and open-source MIT App Inventor, or paid cloud-based applications such as Shoutem and GoodBarber. Further research is required into the features and limitations of each tool to discern which is most appropriate for this project. For example, MIT App Inventor is yet to release support for iOS apps (Patton 2019), and at this stage confirmation of the mobile platform in use by each HHD has not been obtained. As most app development tools include mobile device emulators, physical hardware is not required for this project. Beta testing would require an Android or iOS device, however as this app would not require specialised hardware, sourcing mobile devices for beta testing is not anticipated to be difficult.

While the above app development tools boast no requirement for related skills, a basic understanding of databases, app development and mobile app programming would be beneficial in production of the app, and aid debugging. These basic skills can be acquired through a multitude of online tutorials and reference materials, and verbosely through RMIT's Bachelor of Information Technology, with courses such as Database Applications, Mobile Application Development and iPhone Software Engineering.

Further Considerations for Development by The Thing Doers
To conceptualise the original 'data collection' function of the app, UI wireframes were produced that outline the end user experience, stepwise from login through to data entry. A copy of these can be found in appendix B and on the group's website, here: https://bit.ly/2YM9Gl1

Further consideration regarding ways in which to streamline the use of the app were then considered by group:
- The addition of 'Touch ID' fingerprint recognition instead of standard username and password authentication to log in to the app. This will require further research regarding acceptability of this approach considering relevant hospital data protection policies and procedures. For example, fingerprint recognition may not be acceptable by some HHDs.

- Ability to identify patients using their patient identification barcode. There is a barcode on many paper patient charts that is used to identify the patient during manual data entry. An additional option has been added to the app's 'Patient Details' screen that allows users to scan the patient barcode using the device's camera. This will then be used to search for and display patient information, for confirmation by the user.

In addition to providing a data entry interface for clinical coding purposes, additional ways in which this app can be used to further aid clinicians in providing treatment to their patients have been identified. Subject to relevant privacy policies and procedures, patient data entered through the app could be combined with a patient's health record and further analysed to identify trends and provide insight into the patients' treatment. On an all-patients level, trends in the healthcare setting can also be identified, for example by examining similarities between patients, geographical locations and symptoms. Examples of further ways in which the app can be developed outside of pure data entry include:
- Individual Patient Care:
  - Identifying trends in patient data such as symptoms, age of patient, gender, current medications and comorbidities, and relating this to individual patients to help diagnose, prevent misdiagnosis and prevent further hospitalisation. In addition to the "clinical coding" data entry pages in the app, additional pages can be made available for use at Point of Care (POC), which summarise a patient's medical history and draw upon this data, in combination with the newly coded patient information, to highlight items for consideration by the practitioner, such as:
    - Allergies
    - Current medications
    - Comorbidities and any relevant treatment information
    - Likely adverse reactions to medications prescribed
  - Having easy access to this information at POC will aid the practitioner in providing the correct treatment regime to the patient.

- Public Health Analysis:
  - Whilst not directly related to the app itself, behind-the-scenes, data collected from the app can be augmented with other available healthcare information, for example public health data from relevant states and territories, to identify trends in morbidities between regions. Whereas this data may be manually analysed at present, machine learning could be implemented to quickly and efficiently identify trends, and may also provide a means by which to ensure confidentiality of data processed.

Further research required
- **Adherence to privacy policies** - The app must adhere to relevant hospital, state and federal privacy policies, which will require further investigation. At a minimum, this app will not require internet access and will transmit data only via the hospital's intranet to a locally hosted database.

- **Storage databases** - Databases currently in use for storing manually coded data must also be investigated to ensure this app produces compatible data and is able to write to these databases.
- **Data protection policies** - Further research into the suitability of Touch ID is required, considering each hospital's data protection policies and standard practices regarding user authentication.
- **Access to data** - In addition to privacy restrictions, any other restrictions that may impact the ability to access patient and public health data required for the additional app functions discussed above, must be considered.

Obstacles to implementation

As with all new products and procedures, beta testing of an initial prototype will be required prior to development of the final model to identify any obstacles to implementation. For example, personal experience has identified a general distaste towards technology in many practicing physicians. With the implementation of the above additional considerations by The Thing Doers, lack of use by physicians would not render the app useless, as nursing staff, whilst not able to code data, will be able to use the POC portion of the app to support their care of the patient in the same fashion as is intended with physician use. The clinical coding portion of the app could then be used by clinical coders to transcribe practitioner notes directly into the program, which will assign relevant codes. This will increase the efficiency of the traditional clinical coding system, as clinical coders would not be required to remember or look up ICD-10-AM codes unless they cannot be resolved by the program.

Conclusion

If successfully integrated into a hospital environment, this project will increase the efficiency of clinical coding by reducing time spent reviewing patient charts and preventing miscoding. This may result in timelier remittal of funding and a reduction in staffing requirements for larger hospitals. The additional app functionalities discussed by The Thing Doers will see efficiencies introduced outside of the clinical coding environment as well, with physicians receiving timely access to relevant data at point of care. Improved access to data such as concomitant medications and allergies through the app may result in a higher standard of patient care than with paper charts alone. Although ideally implemented at point-of-care for use by practitioners, the app can also aid nursing staff in providing care to patients, and increase efficiency with traditional clinical coding if used by clinical coding teams.

Group Reflection

Communication was a strongpoint of the group throughout this assignment. Overall, group members kept in good communication with each other using Slack, and Wednesday and Sunday night whole group meetings were an excellent means to discuss goals for the coming days and reflect on achievements from the previous days. Meeting minutes were recorded for each of these group meetings (available on the group's repo for reference) and were of great utility in keeping track of goals that were set in the meetings.

Tasks were assigned to individuals at the beginning of the assignment based on their skills and abilities. The group leveraged skills and resources from members well to work towards the completion of the assignment. For example, Callum's CSS skills were put to use in the website design, whilst Joe's connections with IT professionals were leveraged to organise the IT Professional Interview. Mike produced a tool to aid all group members in referencing, Jess directed team meetings and Brendan helped to proofread everyone's work.

Things to improve on as a group

While the group performed well in meeting its goals and working towards the end result, some areas for improvement have been identified:

- Deadlines

Every group member fell behind on deadlines at some point during this assignment. For most members this was only by one day, but regardless this has an impact on future planning. Moving forwards, we must review the goals we set for each deadline to determine whether we were being overly optimistic when setting tasks, or whether improvements in prioritising and scheduling are required.

- Task commencement

The group had been formed for a number of days before there was any solid communication or commencement of work. It wasn't until a group chat was set up that this occurred. In the future, this will be the first point of call so as to facilitate communication and 'kick-start' the task.

- Planning

The group would have benefited from production of an overarching plan at the beginning of the assignment that set out basics such as fonts and themes, and how and where data was to be organised. These details were considered ad-hoc for this assignment.

- Use of tools

The group as a whole had many more tools at our disposal that were not utilised, or underutilised during this assignment. For example, Microsoft Teams was not considered for use, and Trello was largely underutilised. A group Discord was considered at the start of the project and then the idea abandoned, and the communication features of the Canvas group were largely unused. In future work consideration as to the utility of these tools should be given during initial planning.

Brendan's Reflection

This is certainly not the first course I've done that loves its group work, and won't be the last either. In saying that, this was one of the better group experiences I've had; the group showed great cohesion and worked well towards the completion of the assignment. Communication between most members of the group was excellent, and the fact that we were able to identify and work towards goals at every team meeting really helped to keep things running smoothly. To improve things moving forwards it would be great if the team could gather an idea of each team member's availability so we are aware of times when members are unable to contribute. Our group started this initially however it fell by the wayside before all members contributed their availability. The thing I found surprising about

this group was the difference in time of day that we each got things done - some of us were productive late at night when I was fast asleep, whilst I was most productive early in the morning when everyone else was fast asleep! This is the first group project I've completed where this is the case (maybe it's an IT thing?), and so I've learned that each group member's most productive time must be considered when planning future group work.

Callum's Reflection

Overall, I think this was quite a good first experience for me, as this is my first time doing anything like this having just come out of high school last year. Making the website went well, the framework was done pretty quickly, and I learned a fair bit about Git, including how to remove sensitive information from commit history. I probably could have done my work quicker, as I have a habit of procrastinating, but other than that, the group as a whole seems to be pretty good and not much in need of improvement. I was surprised at how easily we decided on our team name, normally that sort of stuff is the topic of much discussion and back-and-forth, but then again, we do the thing, for we are the thing doers, and for that short amount of time, the thing was agreeing on what our name was. Also, moving from HTML to XHTML1.1 on the website was easier than expected, just had to close some tags to get things to indent properly. Made readability of the website a whole lot better. To cap it all off, I shall say something that I believe reflects how I felt this team adequately: "Given a good team, even the most seemingly daunting of tasks can feel easy."

Michael's Reflection

There was a good feeling to this group. We never lost sight of our goal and I was impressed with how much cohesion our team had. I felt like everyone's interests aligned to meet the assignment to the point where I don't think anyone was stuck with a role they didn't want. While I can nitpick that individuals in our group didn't give much notice when they'd be late with work or when they wouldn't be able to attend a meeting, an update would always come eventually, and all of the work was done with time to spare. I've learned that working with younger people can be easier at times as everyone in our team seemed eager to please and there was no attitude. Also, I don't believe I had ever done a psych evaluation before, but I think it was a perfect way to reflect on your strengths and weaknesses as well as to get to know your teammates before having to work together. My final thoughts about my team was that there was a real effort put forward by everyone. No matter how busy, I never felt alone, and I never felt anyone moving without, or waiting on group input.

Joe's Reflection

Having been my first university group task, I feel very fortunate to have been a part of a group that worked so cohesively and well together. All members contributed, were courteous of one another, and respected that some group members had outside of study commitments and could not always be available. One thing that I found surprising (and lucky) was how diverse our group was. This was made apparent after review of each group members personality test results and ideal jobs, as well as observing how each individual fitted a role naturally within the group. I believe it was this diversity that allowed our group to work so well. By leveraging each other's strengths, we were able to overcome challenges we may have struggled with individually. Group diversity being key to a successful group is the learning that I am taking away from this group assignment.

Won's Reflection

I cannot ask for a better team than what I'm with now. The teamwork of the group has been absolutely extraordinary and each member respected each other, showing courtesy and leniency towards one another. Given that this assignment started at the end of the financial year, I had no opportunity to coordinate with the team members in its early stages, and I feel that I can definitely improve how I got started with the team, and the way in which I coordinated activities. My late start had a domino effect as I was lagging behind everyone and had trouble catching up. However, I was shocked at how everyone was considerate and understanding of me and my situation. One thing I learned about the group is that our team members are very understanding of each other but that is something that I cannot take advantage of, so I will avoid and leaving everything to the last minute or passing responsibility onto someone else in the future.

Jess's Reflection

This has been a delightful assignment to work on. My team has been really supportive of one another, and I've had a really good experience. The team has been honest about meeting deadlines and has made a solid effort to stick to its weekly meetings. There was a great sense of cohesion within the team, people chose their roles and stuck to them. This hasn't always been the case in other assignments I have worked on. Further, when someone fell behind or needed help, there was always someone available to help or chip in. As such, we really didn't fall behind on our tasks. There was no conflict either, even when we started reviewing one another's tasks. I had become jaded from other group assessments however this group was dedicated and supportive of one another. The only thing I would change would be to set up a zoom/video conference meeting once a week with the team instead of having two online meetings. I think if we had this option, we would be able to finish tasks faster but this is a moot point. For me personally, I have to try and be more organised so that I could chip in more technically.

Appendix

IT Work - Interview an IT Professional - Transcript

Interviewer:	The Thing Doers (RMIT University Group)
Interviewee:	Michael Ranson-Smith
Role:	Data Specialist
Interview Held:	Thursday 4 July 2019, 8:00pm

The Thing Doers:
Can you tell us about your role and what you do?

Michael:
I started in IT as a second career. I started in software engineering and systems maintenance 16 years ago. Now most of my work is really dealing with data movement, data engineering, data analysis and working with businesses to collect data more effectively so the business has to do less work. My current work is all federal government whereas prior to that it was intelligence and security, a different domain altogether.

The Thing Doers:
Where did you start your IT career?

Michael:
In Canberra at the defence signals directory, which was about high capacity collection and intelligence gathering.

The Thing Doers:
So I guess your career has always been focused on data and data collection?

Michael:
Yeah, not all of it though. I guess all of it has been more broadly information related, but most of IT is. Some of the stuff that I have done has been around deploying and supporting very large scale records management systems, managing those, developing those, troubleshooting those; and corporate supported case management systems. So it's been pretty broad.

The Thing Doers:
Other than the technical aspects of your role, what other types of work do you do in your job?

Michael:
Well, most of it really, and I believe this is the common misconception, is that unless you are doing a straight DBA role or hardware support, or various software development which isn't really as prolific as it used to be, most things have already been built. Most of what you do in IT now is about configuring appropriate technology, integrating technology and doing change management in organisations to accommodate it. So most of the work you do now is more business and user

centric, rather than necessarily being highly technical. It's about ensuring technology is suitable for its intended purpose and is fit for purpose for a set of requirements in an organisation, both for whether it's an immediate functional requirement or whether or not it's supportable in an organisation based on the technology and whether they actually have the resources to support it through its life, whether or not they have the resources to use it effectively, or whether or not they've got the money to support it long term. It's as much about non-functional requirements as it is functional, within an organisational context.

The Thing Doers:
On a day to day basis I imagine you would be interacting with a lot of different people. Could you tell us about these interactions?

Michael:
Well, for me in federal government as a fairly senior practitioner, most of my interactions are with fairly senior executives. So branch managers and above senior executive servants. I also work with the user base, which aren't necessarily as senior. A lot of my work is around architecture and design, so it's understanding and getting senior executives to articulate a strategy for where they want to be, then looking at their technology choices and what their change management costs look like. Then doing all the planning; procurement, purchasing and managing the complexities of deployment, maintenance, configuration and user training. So it's quite a broad range of stakeholders, everything from senior executives to junior users for me in essentially an architecture and design role.

The Thing Doers:
Looking at job ads online it's easy to notice the common theme of the communication skills necessary in IT, especially the ability to communicate with different types of audiences, technical and non-technical folk.

Michael:
Yeah I think one of the biggest challenges in the industry that I work in with public servants and senior executives is trying to figure how far you can dumb down very complex issues to provide them with some understanding of the decision making that they need to do. Because if you speak over-technically, or you spend your time down in the weeds, most don't have an IT background, so you have to often explain highly technical concepts and consequences at a level that will elicit a realistic decision making process.

The Thing Doers:
What aspect of your role takes up most of your time?

Michael:
Communication. Communications in large organisations is the biggest overhead.

The Thing Doers:
How much of your day would be taken up by communication?

Michael:

The current phase of the project I am working on is about 80% communications including document preparation, meetings and mentoring. During the project there will be a month or two where I'll be involved in deployment and configuration that will be more systems centric.

The Thing Doers:
Over the years in your career has the amount of your time spent on communication changed much?

Michael:
Well It's a bit skewed, because where I started in Defence Signals was a completely technology driven organisation, so signals intelligence is all about technology and lots of computing and fun things. So technology is their business and that was one of the exceptions where there was a very clear motive for why we were doing things, because it was about providing competitive advantage through intelligence for our country or contributing to our effective war fighting capability, so that less people get killed. So that was the nearest I've had to a real mission, and something that was quite visible and immediate for a lot of the work that we did.

And for how it has changed, in the broader sense for the general run of the mill agencies, the big difference now twelve years on is that most of them are buried under the weight of legacy IT systems. So the cost to them to simply 'keep the lights' on for a whole bunch of legacy systems, means they don't have the budget or resource capacity to envisage or build a better world, to update their capabilities to far more cost effective solutions that are available now. So that's a big sticking point and I've seen that in more than a few organisations. And I guess I've seen more of it because I've worked quite extensively in information management and enterprise architecture and that's when you've got to start dealing with those things. So my last ten years has been far removed from what I started doing initially, which was requirements analysis, software development, testing and development.

The Thing Doers:
What aspect of your work do you find most challenging?

Michael:
I think it's corralling enough people towards a common goal to get a coherent set of decisions to do things and getting enough momentum to actually implement something. Getting a large group to come to a consensus.

The Thing Doers:
Why did you get in to IT? What interested you?

Michael:
I liked and still do like the problem solving aspect of it, even though most of the problems I face now are cultural problems, or rather cultural challenges, rather than technical ones. It's still an exercise of trying to get to the root of what a set of requirements are and how you can accommodate or enact that change within an organisation so that they are more cost effective, more efficient, more competitive, delivering better value for money, or simply wasting less. A lot of those problem solving skills I brought with me from having been a tradesman. They weren't necessarily something that I learnt through studying IT. And actually as a repeating theme I have seen a lot of guys my age that actually transition from trades where they had to solve 10 different

problems every day in order to make a quid and they've retrained in IT where they've basically applied the same skills without having to get dirty.

Appendix B

Group Project: Automating the Clinical Coding System - UI Wireframes (Ipad - IOS)

User Sign In (using username and password). This provides a familiar sign in experience that is similar to how hospital staff normally access other systems.

User Sign In (using 'Touch ID' fingerprint recognition). This sign in option was considered as a faster alternative to username and password, however further research is required regarding acceptability of this approach considering relevant hospital data protection policies and procedures.
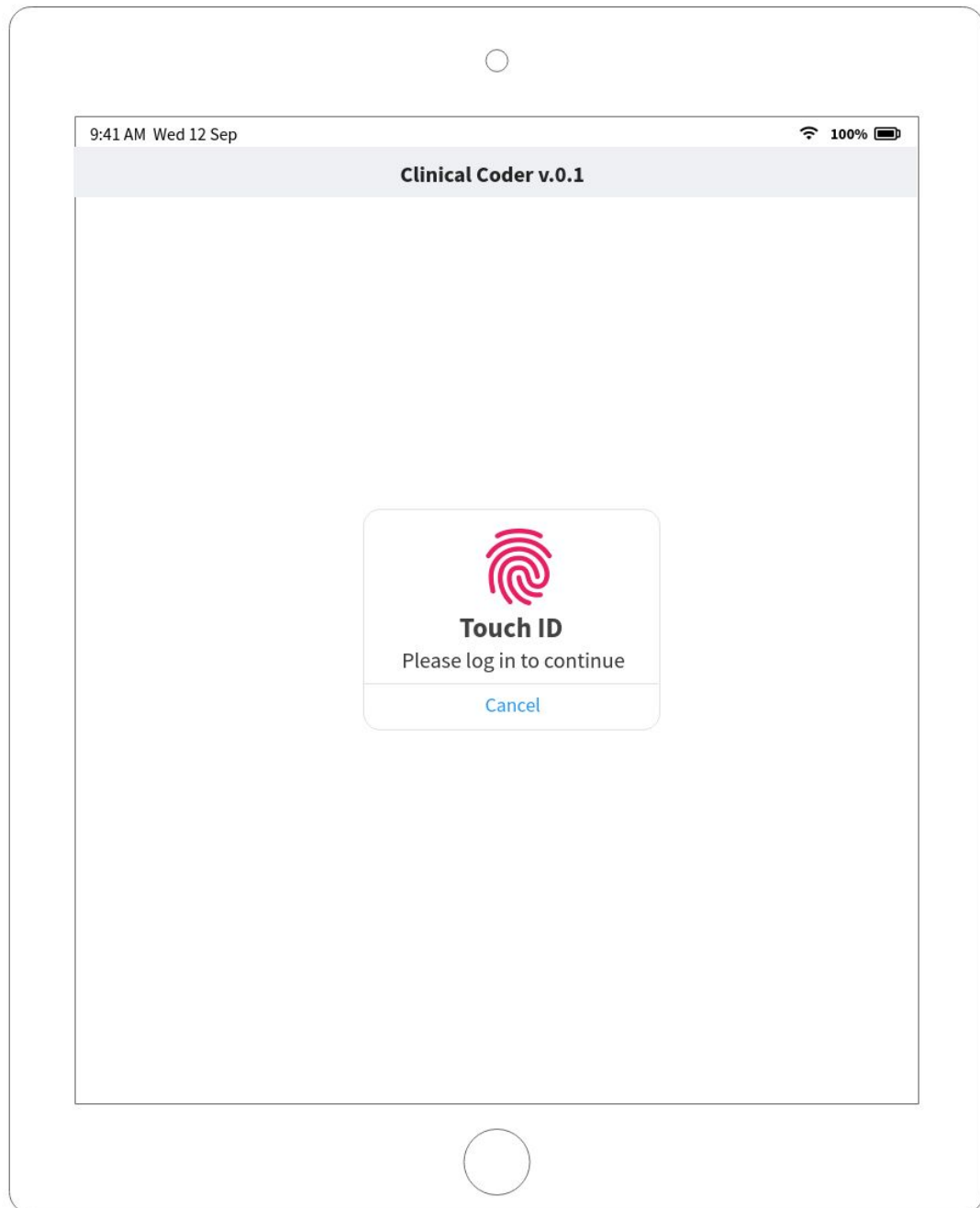
Post-login, Entering Patient Details. At this screen, the physician must enter the minimum patient data (full name, date of birth and one unique identifier) required for the app to search the patient database and return the patient details. The physician must then confirm these details are correct before proceeding.

9:41 AM Wed 12 Sep   📶 100% 🔋

‹ Home   **Please Enter Patient Details**   🔍 +

Patient Full Name   Jane Doe

Patient Date of Birth: 05 Apr 1984   📅

Patient Unique ID: 123 45 67 890   Please enter patient UR number, medicare number or
                                              other unique identifier.

Please confirm patient identified below is correct before proceeding.

Jane Doe (No Middle Initial)
UR: 123 45 67 890
Date of Birth: 05 April 1984
Address: 123 Sample Street, Sample
Town QLD 4567

If a paper chart is available, you may scan the patient's UR barcode here:

Scan Patient Barcode

Patient Confirmed, Entering Details for Coding. This is the data entry portion of the app as described in the report. Physicians are required to fill in all fields relating to the initial diagnosis and treatment, adding further diagnoses and treatments using the "plus" button at the top right of the screen.

Appendix C

Group Project: Automating the Clinical Coding System - UI Flowchart

Treating Physician Identification
- Using ID/Password or similar authentication

Patient UR Number?
- Will then autofill patient details for physician to confirm

Date & Time of event/ diagnosis/ procedure?

Diagnosis?
- 1
- 2
- 3, etc

Procedure?
- 1
- 2
- 3, etc

Any additional materials used?

Patient status?

Additional notes for clinical coding team
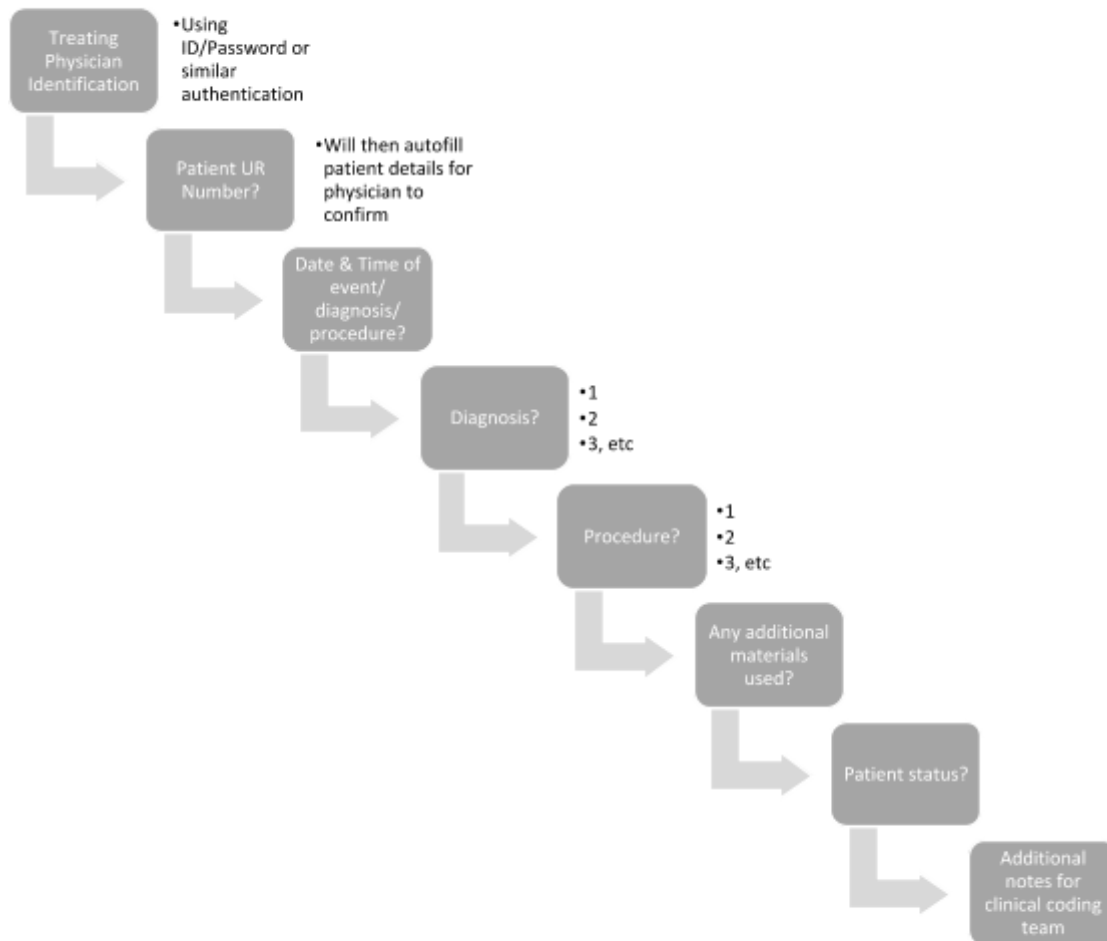
Appendix D

Group Project: Automating the Clinical Coding System - Data Form Example

Example data from practitioner review of patient John Citizen, unresolved phrases highlighted in yellow for review by clinical coding team.

UR 123 45 67 890 / John Citizen / DOB 06 AUG 1976				
Dr Anthony Citizen MBBS FACS FRACS				
Date of Procedure 01 JUL 2019			Time of Procedure: 1537	
Diagnosis	Procedure	Additional Materials	Patient Status	Additional Notes
Code A	*Code 1, 2, 3*	*Code 22*		
Code B	*Code 1, 5, 6*	-		
Code C	*Code 2, 3, 4*	*Code 76*		
Physician Data: Lorem ipsum dolor sit amet, consectetur adipiscing elit.	**Physician Data:** Vestibulum rutrum tincidunt malesuada. Aenean eros ex, euismod non nibh ut, lobortis lacinia lorem.	**Physician Data:** Vestibulum erat ex, cursus ac tincidunt vel, lacinia nec ante. Nulla facilisi. Sed congue sed elit non pretium.	Discharged	isolated resection caudate lobe

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