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Year in Industry

Final Reflective Report

1. Placement Overview

1.1

I carried out my year in industry placement at Microsoft, working within the Bing (Search Technology Centre, Europe (STCE)) team. Microsoft is a Products and Services company with the mission of empowering its user to be their most productive in mobile-first, cloud-first world. Bing technology powers many different services such as, bing.com, Cortana and Apple Spotlight. Bing's main aim is to create intelligent systems that can assist users in the most appropriate way.

Microsoft's key business objective is to increase market share and revenue in Gaming (Xbox), Productivity software (Office), Mobile and Desktop OS (Windows), web search (bing.com) and Storage and Compute (Azure). The specific business objectives of Bing are to reach 20% market share in the US and reach profitability by the second quarter. Both of these targets were met in my final month at Microsoft and I left two weeks before the Bing town hall meeting, where I believe the new targets and objectives were going to be set out. Microsoft's biggest products are the Windows Operating System and the Office productivity suite. Microsoft is moving into creating revenue from selling 'Products as a service'; an example of which is the Office 365 subscription. Microsoft has more aggressively entered the hardware market by buying Nokia and producing first party tablets (Surface), fitness trackers (Band) and next generation Computers (Hololens, Surface Hub), alongside the existing Xbox hardware. Bing's main service is bing.com. However, Bing also provides the Natural Language Processing (NLP) for Cortana, search for other companies (such as Yahoo! Search and Apple Spotlight search on both iOS and OS X) and searching on first party services like Xbox Live and MSN. Other product and service areas that Microsoft operates in include: Gaming (Xbox), Mobile OS (Windows Phone, Storage and Compute (Azure), enterprise and consumer services (Outlook, Yammer, OneDrive, Skype).

Bing's main competitor in the search space is Google. The Bing customer base is predominantly in the US, but we have users all over the world (with South Korea having the highest Bing market share). Microsoft competitors include: Google, in Search, Mobile OS, Enterprise applications (productivity, email, storage and compute, video conferencing); Amazon, in Storage and Compute; Apple, in desktop OS, tablet and phone hardware; Sony and Nintendo, in gaming. As Microsoft has many competitors across multiple business areas there are some unusual crossovers where these competitors are actually partners in other areas. For example, Apple is a competitor in the OS market, but we work with them to power Siri using Bing's technology.

As a technology company, Microsoft creates the Information Systems and Information Technology that support the functioning of the business (and many other businesses). C# and the .NET framework are developed by Microsoft and enable them to achieve most of the work that is carried out here. The .NET framework includes database interaction (MS SQL Server), interactive web design (ASP.NET), OO programming (C#), functional programming (F#) and huge Common Language Runtime (CLR) libraries. Microsoft uses the Exchange email server and Lync (soon to be 'Skype for Business') to support organizational communication. Microsoft also creates bespoke software technology for internal-only usage, such as COSMOS (large scale distributed storage solution), SCOPE (programming

language used with COSMOS to enable large scale data processing), Source Depot (Version Control software with support for automated testing and rollback functionality). SCOPE and COSMOS are key technologies that allow Bing to operate.

Bing is structured so that each team (no matter its size or seniority) is led by software engineers, who are supported by program managers. This means that the goals and objects of the whole of Bing are very technology focused, as well as including financial and market share aims. The structure is designed to be as flat as possible. This allows communication and ideas to be shared easily so that they can be reacted to quickly.

Within my team, Bing has an agile structure where projects are reassessed every month to ensure that they are progressing effectively and are still relevant to our long term goals (which are evaluated every 6 months). Being agile allows Individual Contributors to affect the direction of the projects carried out, as we are encouraged to submit project proposals that will be considered for next month's sprint. I found this effective as projects could be ramped up and down quickly if circumstances changed.

1.2

I was assigned to the Infrastructure team within the Universal Search Box (USB) department. The USB department had ownership of any area where a user could directly interact with search. This included bing.com, the Cortana search box in Windows10 start menu, search in the App Store, search on MSN and other services. The USB department was part of the Bing STCE (which includes the London office and the Munich office), and the Bing group is made up of several Search Technology Centres (India, Redmond, Silicon Valley, Europe). Part way through the year the team structure changed to 'One Team' which allowed people to volunteer for any project regardless of which team it contributed to. In theory this allowed greater fluidity of individual contribution. In practice I mainly continued to contribute to the Infrastructure team, but I did get an insight into the Tools team, which create and maintain the tools used within Bing.
My team (the infrastructure team) is responsible for making Bing as low latency as possible. The team has biannual latency reduction targets that we need to achieve. The team is also responsible for developing and maintaining APIs that allow internal and external customers to use the Bing technology for their own products.

The infrastructure team was important in achieving the business objectives because reducing the latency of the service makes bing.com a better product and therefore increases user retention and growth. Increased user base leads to increased revenue. Across the bigger organization (outside Bing) the Bing technology enables services like Cortana to exist. Cortana is seen as a key differentiator for Windows Phone and Windows 10, so this work helps towards making the Windows OS competitive.

1.3

As a Software Development Engineer in the Infrastructure team within Bing, my role consisted of designing, developing and testing software that supported new features for Bing.
My main responsibilities from month 5 onwards included:

- Developing and extending the Answers Triggers Pipeline to support new features and to run more efficiently. The Answer Triggers Pipeline is a big data processor that determines and memorizes new search queries that can support special answers.
- Developing the Multi-Scraper platform, a tool that allowed others to easily extend a framework that handles multi threaded, fail-safe test scrapers.
- Anomaly reporting for the USB Hub, enabling the backend of the USB Hub (an internal site that provides visualisation of system health data) to detect and report unusual system health stats as soon as they are available.
- Creating ramp up material, such as PowerPoints and OneNotes and planning a training schedule for the 2015/16 interns.

On top of these responsibilities, I had to ensure that any work that I had carried out over the year had been thoroughly documented so that the Full Time Employees (FTEs) and new interns could pick up and improve any code that I had created. As most of the documentation had been carried out in parallel with programming there was not a great deal of this to be done. However, it was very important to make sure that nothing was left undocumented as this leads to 'tribal knowledge' and could effectively make the work I had completed unaccounted for and useless.

2. Development of Professional IT Skills

2.1 Progress Against Work Objectives

From months 5-12 my work objectives included:

- Designing, implementing and testing the USB Hub.
- Extending the capabilities of the Answers Triggers Pipeline to include multi-market support, full automation and data validation reporting (and smaller feature and robustness fixes).
- Implementing and testing the Multi-Scraper, a framework that supports testing queries against the bing.com live site.
- Creating content to help the following year's interns start their placement, including documentation of my projects and presentations on general Bing software and tools.

Working on the Answers Triggers Pipeline (referred to as the Pipeline) consisted of several projects with multiple work objectives. The Pipeline is a data pipeline that processes the most recently available user search logs to determine which queries the service is capable of providing an Answer Scenario for. An Answer Scenario is when a specialised value is returned to the user. For example, if you search 'Weather in London' on bing.com an icon depicting the current weather in London will be returned (this is the Weather Answer). After the triggers are determined they are stored in COSMOS where they can be quickly accessed so that future queries have the answer served up. This process allows bing.com grow its database of Query – Answer tuples and to serve them to the user in an efficient manner.

One of my Work Objectives for the Pipeline was to implement Multi-Market support. When I initially took ownership of the Pipeline it only processed US data. My objective was to add support for five key European markets (English language UK, France, Italy, Germany and Spain).

While planning this project I decided that it was logical to implement the program to support a configurable list of markets, so that it could be easily altered in the future. When implementing this I had to ensure that my alterations kept the existing functionality of the program but also introduce the new features in an efficient and maintainable way. For example, the program was designed to be used to process one market at a time, but when I added multi-market support I had to introduce the ability to process multiple markets **concurrently**. This resulted in much more **efficient software** and a relatively short run time, which made it possible to generate data faster than previously possible.

This approach displayed my **technical ability**, one of my strengths which I greatly improved throughout this year. By having a good understanding of the SCOPE programming language, alongside a strong technical knowledge, I was able to design a program with a **low order of complexity**, and to deliver on those designs. This is a particularly useful skill when dealing with **big data pipelines** as *n* can be huge (in the millions). My manager's feedback indicated that my **coding ability** was one of my strengths and because of this I was capable of creating **high quality**, **robust** and **efficient software** that contributed to **important business areas** (Manager Feedback: "*Nathan had a great year at Microsoft. It was evident that we gained from his time here as he worked on some key areas from tools, to pipelines, frontline code and implementing tests*").

One of my work objectives for the USB Hub was to implement error reporting. This feature would use the latest available data to alert people to issues, such as high latency or very low traffic to the data centres, which usually indicated a problem that required further investigation. To achieve this, I created a program which analysed the data received on that day and compared it to historical data to check for anomalies.
While carrying out this project I was able to identify one of my biggest weaknesses, which is accurately estimating the work hours required to complete a project. I found that I would try to assess the project as one task but a much better approach would have been to break the work objective down into **atomic tasks** and **assess them all separately**. By taking this approach it would have been much easier to **communicate** which areas of a project were causing a delay (which is sometimes unavoidable) and it would have lead to more **accurate initial estimations**. I also learnt that it is very important to identify and **eliminate unknowns** in the code base or tool set required for a project during the planning and design stage, as it is impossible to accurately estimate how these will affect the project. By the end of my placement I was keeping a record of my initial time estimates and the final time it actually took to complete a task. This allowed me to **track** how accurate my estimates were, and allowed me to **reflect** on what was causing a disparity between the two. I found that in most cases my inaccurate estimates were due to me making assumptions about unknown areas of the project, which then turned out to be inaccurate when I arrived at that stage of the process. Reflecting like this allowed me to improve my ability to **plan and organise projects**.
This project also allowed me to identify one of my strengths: the ability to **solve difficult projects**. In Form M2, my manager said that one of my main strengths was "*Perseverance and ability to work through a problem*". Also in Form M3, he graded my Attitude and Enthusiasm as **level 5** (Excellent). In this project I kept encountering issues with the logic behind determining when to trigger alerts. After creating the program, I would test it against historical data to see which days it triggered an alert on. This testing highlighted a lot of unexpected behaviour with my code, but after reassessing the problem several times I came to a working solution.

One of the last work objectives that I completed was creating the learning resources for the upcoming interns. This project required me to create presentations and documentation for a wide range of Bing software and technologies and general information. Topics included an overview of the Bing software stack, how to use tools such as Source Depot and Code Flow (the internal peer reviewing tool), and internal programing languages (such as SCOPE).
This project allowed me to display my strength of **Technical Knowledge**. My manager rated me **level 4** (Very Good) at Technical Knowledge and Ability. Creating the learning material for upcoming interns required me to display the things that I had learnt this year in great detail. I also **communicated** with the current interns to get their insight on how best to explain the Bing technology. By the end of my internship I was actively reaching out for help from others rather than trying to tackle problems completely on my own, as this was an area in which I knew I **could improve**. By asking for help I was able to **learn more thoroughly** and to **complete tasks more quickly**. This is an area that I will continue working on in my last year of university and into my professional life.
During my year, I was also able to **develop my confidence**. Communicating with senior managers and actively contributing in meetings gave me the opportunity to build

confidence whilst creating presentations really allowed me to display how my confidence had improved.

2.2 Progress Against Professional IT Skill

The three IT Professional Skills that I have been focussing on this year are **Programming/ Software Development** (PROG), **Data Analysis** (DTAN) and **Solution Architecture** (ARCH).

In my previous report I stated that I had reached level 2 in Programming/Software Development. I now believe that I can be classified as **level 4** in this area because of the work I carried out for the Answer Triggers Pipeline (explained in more detail earlier in §2.1), Full Automation project.
The Pipeline initially required roughly 1 day to run and 0.5 days of developer time to monitor and evaluate the outcome of the process. This meant that the pipeline was run once a week. For this project my goal was to reduce the end-to-end run time of the process and the developer time required to evaluate the output. I achieved this, resulting in the Pipeline being run once a day and only requiring developer time committed to it when issues arose.
This required me to **design**, **develop** and **test** the existing **large** and **complex program** (the Answer Triggers Pipeline) and create a **new** one (the Quality Gate, which was responsible for automated data validation).
For the modification of the Pipeline, I had to have a good **understanding** of the SCOPE **standards** and **tools** to achieve the goal of reducing the run time dramatically from 1 day to < 0.5 days. I achieved this by understanding how jobs are queued and combining processes so that they ran without being held up waiting for unrelated data generation.
It was very important that the Quality Gate carries out its task (data validation) **correctly** and **predictably**, and notifies the right group of people who can handle any issues that arise. Accurately issuing notifications is important, because over notifying can lead to real issues being ignored and under notifying will lead to issues going unreported. To ensure that the validation had the correct sensitivity, it was important to **test** the Quality Gate thoroughly with existing data that I already knew the quality of. By doing this I was able to ensure that the program that I had **designed** and **developed** was inline with the same **standards of quality** that the previous (human overseen) method had set.
Throughout this project I was able to **share my code changes** with other members of the team. This allowed me to get a second opinion of my work which really helped me to **learn** from more **experienced programmers** and consider the problem I was faced with from different perspectives. This also resulted in a **robust**, **error-free** and **high quality code** (in terms of both **readability** and **logic**). After this project was complete I took part in **reviewing other team members' code** that integrated with this code as I was now seen as the owner, or expert, of this code. I was also able to **offer my experience** working with SCOPE to other interns who had to use the language in future projects.

For Data Analysis I now see myself as **level 3**, which is an increase from level 2 in my previous report. I think that the work I carried out for the USB Hub Project, in which I was scraping raw data from SLAPI (Structured Language API) logs to create **useful business insights**, allowed me to achieve this.

This project required me to determine the real life **business meaning** from the SLAPI data, which consisted of raw data regarding how users interact with bing.com and what information the service returns. I had to **analyse different data sets** to create a full picture of what users' intentions are when they make a query, and whether they achieve their goal in that session. From this information I **assigned metrics** to attributes, such as Answer Recall (if an answer is already stored in the system) and Coherence (if a query is presenting the user with an appropriate answer).
The information that I had created from the raw data is then displayed on the USB Hub as graphs and tables. This information was presented once a week to the wider team to give everyone an insight into how the service is running. I required a **good understanding of business procedures** to be able to create and present the information that was of use to the team.
The information that I created from combining the raw data had to be **stored logically** and in a **maintainable** way. I stored this information across tables in COSMOS which referenced each other using foreign and primary keys to maintain data relations. My target was for all tables to have a **normalisation level of at least 3**.
As I was presenting this data to other members of the team it was important that it was **accurate** and of a **high quality**. I could achieve this by **testing** the high traffic queries on the live site. This process ensured that the most important queries were correct.
From my experience working on the databases for the USB Hub I was able to **offer assistance** to some of the other interns that required database support.

In my previous report I mentioned that I would like to develop my professional skills in Solutions Architecture, however I had not assessed myself against the skill criteria. I now believe that I am **level 5** in this area because of the work I did creating the Multi Scraper. Before the Multi Scraper existed, the teams who wanted to test sets of queries against the live site had to create their own programs to carry out the interaction with the live site and put measures in place to determine whether the query had been successful. The Multi Scraper framework provided a multi-threaded program that handled querying the live site, recorded if queries were successful or not (and retried to query if necessary) and generated a result report. People using the framework only needed to provide the input queries and override the method that processed the results.
As this is a **complex program** that needs to meet many different **business scenarios** it was important to carefully **plan** and **share this design** with others in the team. This ensured that no design features were missed out or overseen, and it helped to **bring attention** to a tool that many members of the team found useful.
To design this tool, I used **UML diagrams** to clearly explain which classes hold what functionality. Using a UML diagram was also a good way to **communicate** which **virtual methods** need to be overridden to allow people to use the framework for their own projects. The framework is designed to use the **Factory design pattern** to generate the appropriate class.
The **specification and requirements** for the project were clearly laid out so that it was easy to identify if the project design met the **goals for the project**. This ensured that the tool that I was designing would have **business impact** and **add value** to the team.
As this project was a framework, it would require other team members to regularly extend it and implement their own methods. This made it very important to clearly and accurately provide **designs for implementation** to make this process as simple as possible**.** In this

documentation I also provided advice on the **technical aspects** of interacting with the live site, such as dealing with HTTP errors and common troubleshooting issues.

2.3 Future Development

The achievements and professions skills that I have developed this year will greatly benefit me in my final year of University and into the start of my professional life.
This year I have become a much **better programmer**. The programming skills that I have developed have given me a much bigger **pool of knowledge** to use for my final year projects and to **build upon** in the future when learning new, **more complex technical skills**. I now feel well-equipped to **approach** and **plan** university projects that I will have to complete next year.
I have developed a more **critical** way of approaching problems, breaking them into **logical sections** and working through the solution. This skill will really help when tackling university projects as **critical thinking** results in more **efficient outcomes** from difficult problems. My experience of **documenting** tasks and **effectively communicating** them to others will also be a boon for my final year of university, as the ability to explain how I have achieved the work that I have completed will be a large part of the marking criteria for my final year work.
Building my **self-confidence** has prepared me for carrying out presentations and working in groups in my final year. I will now **contribute** more when working in groups and feel more confident when **giving presentations** and **explaining** and **justifying** my design approach to a problem.

All of the above examples of achievements and skills that I have learnt will also benefit my ongoing professional life. Having the experience of working in a **multi national** software organisation has shown me what to expect from my professional life and has made me **more confident** about **starting my career**. I now have an idea of how huge organisations **manage** and **track progress towards goals**, and how I would fit into that process.
I have also learnt the importance of (and gained some experience in) being able to **quickly ramp up** on **new tools** and **code bases**. Being able to **read new code fluently** is a vital skill (that I will continue to practice this year) as it is something that is required continuously in the workplace and it will enable to me start to contribute to new projects quickly.

3. Development of Personal and Employability Skills

3.1 Progress against Personal and Employability Skills

3.1.1 Teamwork Skills

Teamwork is a vital skill for any computer scientist as it is impossible to build large scale software systems alone. Every project that I worked on required team work, but one area where it was particularly important was when **peer reviewing** other team members' designs and code. Before starting a project, it was important to create a project proposal which covered what the project aimed to achieve, how this would be carried out and potential hurdles that could affect the progress of the project. Sharing this with the team allowed me to get an insight of how other, more experience programmers, would tackle the problem and it could also raise insights that I had overlooked. Furthermore, it had the important role of raising awareness of the project, which was important if the project was a new tool that other team members could use in their work (such as the USB Hub).
I also supported other team members by reviewing their code for them. This was doubly beneficial as, whilst I ensured the code was of a good quality, I was also able to learn by seeing how other peoples' code was written. Equally, when I wrote code that I knew would be reviewed by others I had to ensure that the code was not just functionally sound, but also readable and well-structured.

I believe that these examples display that I am now much more effective when helping others in a team as, by reflecting on my skills, I know which areas I can contribute to. At the same time, I have maximised my opportunities to benefit from a team as well by ensuring I made my code available and readable for their feedback.

3.1.2 Communication Skills

At the end of my internship I had to give a 30-minute **reflective presentation** on the work I had carried out across the year and what I had learned from it. It was important for my presentation to cover all the key aspects of my year, but to also be **engaging** and **interesting** for everyone there.
I learnt that it was important to **tailor my presentation style** to the **situation** and the **audience.** I used PowerPoint as a tool to **support** what I was saying by **emphasising** some of my points but ensured that it did not detract from my oral presentation as I believe speaking to the audience is more engaging than a slide show. Being thoroughly **prepared** and by using this mixture of mediums, I was able to deliver my presentation with **confidence**, which in turn helped me to maintain **audience engagement** throughout**.**

3.1.3 Influence and Leadership

My year at Microsoft included a week long Hackathon with the theme Productivity. I took the opportunity to pitch an idea and **proposed** a tool that would integrate with Outlook to identify acronyms and then provide the user with an on-hover explanation of the acronym.

My proposal gained interest and a group of 4 other interns signed up to the project. A team was formed and as the project was my idea I naturally took the position of **team leader**.
In this position I learnt that it was important to break down the project into **logical tasks** that could be divided amongst the team. It was also important for me to assign the tasks to the team members who were **most suited** to them. For example, I had a team member who worked on the UX team in Bing, so I assigned her to the front end coding for the Outlook plugin.
One of the most important things that I learnt as a team leader was to **listen to the feedback** from the team and **adjust the direction** of the project accordingly.
Communication is very important to get a **good working team** and if everyone is allowed to **contribute** fully then then end result will **benefit**.

3.1.4 Problem Solving Skills

While working on the Answer Triggers Pipeline, I encountered a bug whereby French language queries relating to weather were being over aggressively filtered out. This meant that weather queries being issued by users on bing.fr were not returning a Weather Answer.
I solved this problem by identifying and recoding a poorly implemented blacklist query removal method. The method used String.Contains() to remove queries that contained any value from the blacklisted string list. This caused words which contained blacklisted words to be removed. For example, the French word for weather ('météo') contained a blacklisted word ('été') so was being removed.
From this experience, I learnt that it is important to **identify key areas** of the program that could cause the issue and tackle them in a **systematic**, **methodical** way. It can be necessary to **re-approach** the problem to ensure that all possible causes are being considered. During this bug fix I learnt a lot about how to effectively use the **debugging tools** available in Visual Studio. Visual Studio provides powerful tools that require time to learn, but it is definitely time well spent as they provide a huge advantage when programming and debugging.

3.1.5 Task Management

Occasionally I had to split my time between 2 projects during a single sprint. In these cases, it was important to manage my tasks **effectively** and **communicate my progress** and **time commitments** clearly to the two project leaders.
I found it much more practical to divide my time into week-long stretches, rather than trying to complete work concurrently, because I found that **context switching** between different projects caused a fairly big **time overhead** and was an **ineffective use of my time**.
It was vital to **track** how my time was planned and how it eventually ended up being used. To do this I used a tool called Team Foundation Server (TFS). Tracking my **task management** allowed me to **identify** what kinds of project I had difficulty managing in an effective way. From **reflecting** on the tasks that I could see had been badly managed I was able to **identify** that I would often underestimate the level of design and planning required before starting a project. From this I learnt to assign more time to spend on creating my designs and discussing them with other members of the team. This was also in line with feedback that I received from my manager stating that this is an area that I could really build up my skills in and that I would benefit from.

By managing my tasks effectively, I was able to stay on top of my **work load**, **communicate** my progress **effectively** to senior members of the team and **learn about myself** and **adjust my work style** to become **more productive**.

3.1.6 Self Confidence & Self Awareness

At the end of each project I was required to present a short conclusion to some senior members of staff. This presentation would include what had been achieved by the project as well as the highlights and lowlights. As this was a very specific type of presentation it was important to be **self-aware** and present myself in the **correct manner**. These presentations required me to cover the key points in a **concise** but **insightful** way, and had to be carried out in a **professional** manner as I was presenting to the senior staff.
I think that these regular presentations really helped to develop my **self-confidence** over the year. My manger's feedback also supports this. He said that it is '*evident that Nathan gained through his time here as his **confidence** and ability increased over the year*'.

3.1.7 Appreciation of Legal, Ethical and Professional Issues

Working at Bing meant that I had access to the user search log. If handled unethically it would have been possible to build up a detailed understanding of a single user's online activity. I had to sign a document agreeing that I would handle the data responsibly and in accordance with the law. Signing this document really highlighted how important it was to appreciate **legal** and **ethical issues** in the workplace and made me regard access to that data in a **professional manner**.
I know that my appreciation of these issues developed over the year because in the Answer Triggers Pipeline project I had to build user anonymity into the project. I did this by converting the user ID into a Unique session ID. This allowed me to design a program that could understand a user session, but then treated each session as an atomic instance so that it could not be used to build up a picture of the user over time. Having to actively consider these ethical issues in my own project really made me appreciate how important it is for a large organisation to operate **responsibly**.

3.1.8 Awareness of links between Academic and Practical Skills

My year in industry has allowed me to develop many different skills including coding ability, critical thinking, software planning and design, confidence and time management. All of these practical skills will be incredibly useful in helping me perform to a high standard in my final year of university and I hope that my grades reflect that. According to my manager's feedback, my strengths lie in coding ability and persevering when solving a problem. Understanding and reflecting upon my strengths will be beneficial in my final academic year when making choices about my courses and projects. It is also useful to have a good **understanding of my capabilities** when finding my role in a team so that I can put myself forward for the position that I am **most suited for**.

There are two areas that I feel I have particularly learnt the importance of. Firstly, I understand the significance of **regularly reflecting** on the work I have carried out in order to **assess** how I could **change my working style** to **improve** my overall professional skills. For

example, by **setting work goals** or by **gathering feedback** from my peers. Secondly, I now know the value of having a good repertoire of **design patterns** at my disposal, enabling me to be more equipped to face difficult problems and devise **elegant** and **high quality** solutions for them.

3.2 Future Development

The Personal and Employability skills that I have developed this year will make a huge difference to my final year of university and my ongoing professional life.

The development of my **communication** skills will be particularly useful during my final year of university as being able to **deliver a clear explanation** about the work I have carried out can be as important as being capable of completing the technical aspect of that work. For example, 50% of the work marked for the computer science course is based on my **reflective analysis** and **understanding** of the work that I have completed. Therefore, the ability to **effectively analyse** and **explain** my projects to the marker will be very important. In addiction, the ability to **adapt** my communication style to accommodate different situations is a necessary and useful skill as it will allow me to **effectively share** my ideas in modes such as **succinct reports**, **in-depth analyses** and **presentations**.

Although I do not have any group work projects in my final year, **teamwork** is still an invaluable skill. It will be very important to collaborate with people when it comes to learning the content of my final year modules. Learning from others is a great way to get a different insight into a topic. Also, helping others learn is a useful way to make sure that I truly understand a topic myself.
This skill will become even more important in my professional life, as it is impossible to carry out work in an **organisation** without **effective** teamwork. My **experience collaborating** on huge codebases will help me to **integrate myself** into a professional team much more quickly than I would have been able to otherwise.

Problem solving is a vital skill for a computer scientist. This is because computer science requires the **critical assessment** of problems and **creation of solutions** that will continue to function, even in unusual cases. These solutions often need to be **creative** and **versatile**. Being a better problem solver will help me complete my university degree, but I think it will be far more important in my professional life. I think this because in a work-place scenario I will be required to **solve real-world business problems** that have a correspondingly real world **impact**.

Task management will be a skill that I utilise in both academic and professional life. At university, I will have to deal with completing multiple workloads **concurrently** so it will be important to finish all my work to a high standard. It can be easy to complete one piece of work to a good standard but allow others to slip due to poor task management. It is important to **share my time appropriately** between the tasks. To determine how to do this I have learnt to **evaluate** all my tasks and **understand the requirements** for each one, before **assigning** my time to them. **Continual reflection** is also required so that I can **adjust** my task management as my work progresses.

Task management is also a valuable skill to have in professional life as delays caused by poor organisation and time keeping can affect a whole team of people and in turn, their schedules. This can cause a negative business impact, which I would be responsible for and have to face the repercussions of.

Self-confidence is a trait which I can use in all aspects of my life. It will be important in my final year for the poster presenting session when I will have to discuss my year in industry with prospective second year applicants. Being confident will really help me to **display the value** of taking an industrial placement.
Having self-confidence will also be very important when I am **attending interviews** and **assessment centres** for graduate jobs, as I will be better at **expressing** my technical ability using different methods of communications, even in daunting environments.

Thank you for taking the time to read my report. My year in industry has been of huge importance to me and I am confident that it will play an important role in determining my future success.