

BUCSIS's Integrated Industry Experience Module:

What I have Learnt.

2401049

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Preface

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Introduction to the Module

The Integrated Industry Experience Module (IIEM). This module, designed to allow for undergraduate candidates to upskill and develop the necessities for an ever-changing workforce, to gain “practical experiences of the security and intelligence sector”¹ a sector that can be, by most accounts, both lucrative and yet very hard to enter. This module begins with the student selecting one of a few pathways, I personally selected to do 160+ hours of work experience alongside a final presentation and this project you are reading now. Alternative pathways include up to 5,000-word project alongside 80-160 hours of work placement and the final presentation, or an 8,000-word project combined with less than 80 hours of work experience and the final presentation.

Options for work experiences vary greatly depended on many factors, such as previous skills and experiences, personal likes and dislikes, and opportunities available at the time. As this university offers students the ability to complete their undergraduate education in 2 years (in comparison to the usual 3 year route for a Bachelor’s degree or the Scottish 4 year route for undergraduate MA/BSc) students in other programmes skip out on the ability to complete summer internships or work experiences, however BUCSIS’s Integrated Industry Experience Module gives this chance back to the students allowing them to not only complete their degrees 1 to 2 years early, but to complete their studies with the same accessibility to summer programmes keeping them on par with their peers at different institutes. So, let me discuss my experience, how I prepared, and what I hope to achieve henceforth.

¹ Dobson, M. (2024). Integrated Industry Experience Module Specification. [online] Buckingham.ac.uk. Available at: https://vle.buckingham.ac.uk/pluginfile.php/768592/mod_resource/content/1/Integrated%20Industry%20Experience.pdf [Accessed 17 Aug. 2025].

The Companion Module

While most of my project will discuss the IIEM, the other half of the term takes place in the form of the “Companion Module” which is a set of 8 guest lectures, paired with weekly quizzes and reflective logs. This companion module is not part of the 160hrs required for the IIEM. The purpose of the Companion module is to give the student the necessary information in preparation for careers within, and adjacent to, the field of intelligence. With guest lecturers such as Dr. Anjuli R. K. Shere, whose expertise lies in threats from Internet of Things (IoT) devices (such as Amazon’s Alexa Dots) as well as state surveillance and Freedom of the press, and Dr Bill Kappis, who’s lecture was related to International Organisations with special interest in the UN, the content discussed within the CIEM is highly valuable for undergrads and postgrads alike.

From asking “What have I learnt from this lecture?” to “How has this lecture made me think differently about intelligence/security?”, The Companion Module allows us to ask serious questions about our paths, forcing us to reflect on where we see ourselves being in the future. This is a great aspect of the IIEM as a 2021 report showed that 45% of students in universities felt underprepared “for getting a job or apprenticeship”² which is a worrying statistic, given the fact that many students go to university for the increase in job prospects.³

² Prospects (2021). Nearly half of university students unprepared for employment | Prospects.ac.uk. [online] [www.prospects.ac.uk](https://www.prospects.ac.uk/prospects-press-office/nearly-half-of-university-students-unprepared-for-employment). Available at: <https://www.prospects.ac.uk/prospects-press-office/nearly-half-of-university-students-unprepared-for-employment> [Accessed 4 Sep. 2025].

³ Universities UK (2023). 73% of UK graduates say going to university got them the job they wanted. [online] Universities UK. Available at: <https://www.universitiesuk.ac.uk/latest/news/73-uk-graduates-say-going-university-got> [Accessed 4 Sep. 2025].

Methodology

The IIEM allowed me to attempt many methods of work, from OSINT style research, Trial and Error, and traditional style education, to gain valuable insights into industry experience. The method I use most extensively was Trial and Error as it allowed me to feed my risk appetite while quickly adapting to constant changes in variables. This can be seen throughout my Phases 1-3 work (The SPARK Group) as it aligned most with my work style. However, like with all work styles, Trial and Error comes with many cons such as increased workload and loss of time efficiency. These risks were manageable as I am at the beginning of my career and Trial and Error is an unavoidable strategy. Furthermore, as quite a lot of my work was aligned with more technical skills that I did not possess, Trial and Error allowed me to learn how and why errors come about, which aided with debugging my programmes.

Trial and Error was not my only work style as I used research, particularly in Phase 0 (DAA & AIB planning) as it allowed me to practise, prepare and strategies for important assessments and interviews. This work style also carried over into Phase 2 when I utilised online platforms (Such as Rocket Software's Free Learn COBOL programmes) and the University of Buckingham's Faculty of Computing, Law, and Psychology's Database Design module. This more conventional approach allowed me to acquire skills in a more time efficient manner while having the ability to seek help, which is not always available with Trial and Error based strategies.

The preparation.

In preparation to the Integrated Industry Experience Module, we received two lectures (one in late February, and another in March) to explain the module, the expected outcomes and the process of completion. While 4 months is a long time, quite a few of the summer internships and direct work experience programmes had already closed their applications and as we were not made aware of the Integrated Industry Experience module earlier, we did not have the ability to apply. Another factor to consider is that many of these programmes are mainly aimed at Penultimate and Final-Year students⁴ and not First year students but since we are on an accelerated course, our penultimate year is our first year and our final year's summer is our dissertation period. This makes our cohort illegible for some highly sought-after and competitive programmes. However, that is not as to say that many programmes are not worth applying for, as Afterall "Shy bairns get nowt". And so, even though the pass-out rate was low, I took a leap of faith and applied to the Maritime Reserves.

Before coming to Buckingham, I had applied to join the Royal Navy however I had ultimately failed my Defence Aptitude Assessment (DAA), coming short by 7 Points. This module presented to me the opportunity to complete both university and naval training simultaneously via the Royal Naval Reserve's eight-week intensive Accelerated Officer Programme (AOP) taking Potential Officers and shaping them into Midshipmen 'from civvies to sailors' in record time. While this course is quite intensive, especially considering I

⁴ SIS (2025). Summer Intelligence Internship. [online] Secret Intelligence Service. Available at: <https://www.sis.gov.uk/careers/intelligence-officers/summer-intelligence-internship> [Accessed 21 Aug. 2025].

am already on an accelerated degree programme, I would apply to join the RNR and resit my DAA.

The Defence aptitude Assessment is a two-hour, 6-part exam, assessing everything from basic mathematical and written comprehension to three-dimensional spatial reasoning and your ability to break codes and recognise patterns under brutal time constraints. Fortunately, my prior FAIL gave me both the confidence and experience to score a PASS (with highest scores in numerical reasoning and mechanical comprehension, and lowest scores in Spatial Reasoning – where I had fallen short my first time round). The next stage in my journey was a series of Med-Fits and background checks. Without getting into too much detail, this included Disclosure and Barring Service (DBS) Check, a dozen different disclaimers (such as tattoos, swimming ability and criminal history), eyesight and sickle cell blood test, culminating with the National Security Vetting Service’s Security Check. While this took up most of the timescale, unfortunately there is not much to report back.

After completion of most of these checks and tests, I was invited to complete one of the greatest tests I have had the honour of failing, a century old tradition known as the Admiralty Interview Board (AIB). Formed in 1903 by Admiral Sir John Fisher, the AIB aims to measure a potential officers’ skills in the following categories: “Communication, Teamwork and Collaboration, Problem Solving and Decision Making, Confidence and Resilience, Effective Intelligence as well as their Motivation and Awareness”⁵ of joining His Majesty’s Naval Service prior to Britannia Royal Naval College (BRNC Dartmouth).

⁵ Royal Navy (2025). The Admiralty Interview Board | A Candidate’s Journey. [online] His Majesty’s Naval Service. Available at: <https://cd.royalnavy.mod.uk/-/media/rnweb/files/careers/joining-process/awcnnr38392aiba-candidates-journey->

In its 120-year history, the AIB has taken many faces. Its current form, as since the Coronavirus Pandemic, is online and takes part (from admission to results) over 23 days. The AIB consists of two main Phases, the Pre-Recorded Interview (PRI) phase and the Group Planning Exercise (GPE) phase. The PRI section involves the candidate answering Pre-recorded questions via 2-minute segments, while the GPE involves the candidate being placed into a team and solving a fictional scenario. The PRI aims to assess your personal strengths as any interview does, while the GPE aims to assess your inter-personal and teamwork skills. While there are many advice forums and resources for the PRI phase, the very nature of the GPE phase makes it so that there is limited help available.

Upon my failing of the AIB, I was 4 weeks away from the end of term and had no idea what to do for my IIEM. Clearly the phrase “Divvin’t place all your eggs in one basket” wasn’t quite in the front of my mind when I made the decision to focus solely on the RNR. The realisation set foot with 4 months gone and nowt to show for it - Thankfully I found my old notes from a project I started over 2 years ago, and in a flurry of panic and prayers I began to jot down “PLAN B”. The Strategic Pursuits in the Advancements of Research and Knowledge Group, or for short The SPARK Group, was founded in early 2023 as an effort (between myself and a few colleagues from multidisciplinary backgrounds) to combat the growing issues of misinformation and investigate growing political discontent as well as to document the rather strange geopolitical position the world is currently stuck in.

publicationv9.pdf?rev=ec588882546a43388b8ee534e5c00d35#:~:text=The%20Admiralty%20Interview%20Board%20(AIB,to%20be%20an%20effective%20officer. [Accessed 22 Aug. 2025].

While this project began over 2 years ago, it never took off, leaving myself facing 9 weeks of unprecedented unknowns with nothing more than notepad of jottings, and a quota to fill. Did I question my life-choices? Yeah! Did I give up? Nearly. Sitting here, needing to find a way to turn a half-baked idea into something function, no sane man would stand-fast against opposing tides. The real question is, Did I do well? Let's have a look.

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The Integrated Industry Experience Module

I have talked about this magical plan B, so what exactly is it? Well, the IIEEM is a way for students to develop skills in an area where they do not currently possess them. For me, that is Information Technologies. While I am canny with a radio, I couldn't tell you the difference between high and low-level languages, or why Java and JavaScript are so different. This gave me an idea, If I could build the backbone of The SPARK Group's digital presence, I would have a purpose and means to create it. I set out to complete SPARK Lab's first Projects: SenaCode, SparkNet and Clifford, a three-part challenge (which would most likely take more than half a decade to finish alone) that was already 10% complete (thanks to my previous notes). In the two weeks between the end of the last exam season and the start of term 25T3, I began drafting Project SenaCode from the ground up. By the first Monday of the term, I had made a realisation, If I wanted to have something I could physically demonstrate, I would have to skip Project SenaCode (The beefiest of all the projects) and deliver a slimmed down version of Project SparkNet.

Project SenaCode, the first SPARK Lab's project, is a hefty lump and would be completely unfinishable within the timeframe. It is my personal response to the stagnation and complexity of contemporary operating systems - many of which have strayed far from the foundational ideal of security through simplicity. Inspired by early computing systems, where every line of code could be read, understood, and secured by a single person, SenaCode aimed, and still does aim, to recreate that ethos in a modern development context. It includes a custom interface – The Graphically Assisted Text-Based User Interface (The GATBUI) - and a bespoke programming language, SenaLang, built to be clear, secure, and

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fully auditable. By stripping back unnecessary complexity and focusing on transparency, auditability, and low volume, the project was designed to serve both as a learning journey in systems development and a practical commentary on modern cybersecurity.

SenaLang, a bespoke General-Purpose programming language, is designed with simplicity, readability, and security in mind. While it is a dialect of COBOL SenaLang takes in aspects of BASIC, C and FORTRAN, aiming to provide enough power for users to develop SLEs (SenaLang Executable Files) while avoiding complex and obscure syntax - allowing for the motto of Security through Simplicity to shine through. The SenaLang Integrated Development Environment (SLIDE) allows users to run SLEs, ensuring every line of SenaLang code is auditable, within a controlled, sandbox-like environment.

The second project, SparkNet (from the portmanteau of SPARK and Internet) is a theoretical Intra-Net that would use mesh-net technology alongside TOR Tunnels to achieve semi-secure communication. SparkNet utilises many ‘nodes’ and ‘node classes’ to achieve an organisation and business orientated network that, when connected to other SPARK Group member organisation’s networks, form this modular scaled-up network. The ‘blueprints’, found at the end of this document outline how the SPARK Group imagined SparkNet to look. The idea of choosing to develop the SparkNet during the IIEM has not been completely without success. While, as you can guess, I had to move away from SparkNet later – I had in fact both gained valuable insights into how computer networking works but also have (alongside other members of the Spark Group) carved the future procedures and protocols into stone. Speaking about protocols, at the heart of SparkNet is lies the SNX Protocol

(SPARK Network Exchange Protocol), which allows for the sharing of data from multiple SNX Machines within the SparkNet.

While this is all good and dandy, SparkNet is irrelevant as an IEM project unless I could produce something physical, this is where the EXT Nodes come in. The EXT (External X Translation⁶) node acts as a gateway between the SparkNet and the MainNet, this is where it gets its nickname “The gateway node”. While the EXT node is strictly theoretical, I did at one point attempt to fabricate a PCB that could act as a beta version of an EXT node. This was all for nought. Although I do have experience in designing electronics, the process of designing a microcontroller that could scan information within a specific folder and formulate it into SNX packets and then use TOR tunnelling sub-systems to facilitate communication between Centrally Administered Systems within the SparkNet via the MainNet, was significantly harder than I imagined.

At this point, approximately two and a half weeks in with over 90 hours (including personal time) of constantly running into a brick wall repeatedly, I decided enough is enough. I hated PCB design and every second I spent on Ki Cad was a second, I will never get back. This brought me to a point where I needed to reflect on everything so far and analyse my path forward. Luckily, an opportunity opened perfectly on time.

I had not mentioned this yet, however at the end of the last exam series, Dr Melina Dobson had offered myself and the others within my class the opportunity to study within the

⁶ “Translation” is a slight misnomer as the node does not actually ‘Translate’ packets but rather conforms SNX packets within the more established IP/TCP protocol. If data is letters, using an EXT node is like placing an IP/TCP stamp onto a SNX envelope to allow the letter to pass through the MainNet.

faculty of Computing, Law and Psychology (CLP) as to increase our skills within a few subjects of our choice. I had chosen to study Database Design with Professor Du Hongbo. Professor Du's class provided an amazing insight into how computer systems work within database design. His classes, while a challenge for someone (like me) who lacks technical skills, were very digestible and were very intriguing. From learning Relational Algebra and SQL, to creating my own Indexed Sequential Access Method (ISAM). I used my pre-existing knowledge in the Common Business Orientated Language (COBOL) and Quick Beginners' All-purpose Symbolic Instruction Code (64) (QB64) languages, combined with the newfound knowledge within database design to make SPARK Lab's 4th and final project: Kielder.

Project Kielder is my final and most successful project within the IIEM. Project Kielder, named after the man-made reservoir Kielder Waters in Northumbria, acts as a programme to scan and index files from an external source, creating a 'reservoir' of reports and knowledge. As Project Kielder is written in COBOL (as I am not too familiar with more modern languages such as C and Java), it is quite portable and reliable. This programme, as demonstrated on the 5th September 2025 during the Presentation for the IIEM, allows users to batch index and manually index reports of the Wordgrinder (.wg), PDF (.pdf), and text (.txt) formats.

Conclusion

Upon finalising Project Kielder, one would think my journey was over – however, that is not the case. To finish this module, I had two key pieces of work to complete: this very project and the aforementioned presentation. The end of week 8 and the entirety of week 9 felt as if all my work were jigsaw pieces, painted and shaped, waiting to be placed together to form a picturesque symphony of pure chaos and madness. And yet, somehow, I believe all my work paid off. There were points at which I was not confident at all in the possibility of pulling this off but about 200 hours and 3,000 words later we are here.

From failing to join the Navy for the 2nd time, to somehow resurrecting a dead organisation, building the framework for a completely new networking system, designing and programming an ISAM and throwing in UI/UX design into the mix purely for the love of it all, not only did I learn skills I never even sought out after, I had fun doing it. That leaves me with only one thing, to answer the question I posed earlier, did I do well? Aye, I'd like to think so.

Thank you for your patience and your time,

- Joshua McManus

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Reference List.

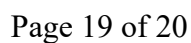
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4. SIS (2025). Summer Intelligence Internship. [online] Secret Intelligence Service. Available at: <https://www.sis.gov.uk/careers/intelligence-officers/summer-intelligence-internship> [Accessed 21 Aug. 2025]. Universities UK (2023). 73% of UK graduates say going to university got them the job they wanted. [online]
5. Universities UK. Available at: <https://www.universitiesuk.ac.uk/latest/news/73-uk-graduates-say-going-university-got> [Accessed 4 Sep. 2025].

Annex A

SenaCode: OS



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Annex D:

VS Code with Project Kielder

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1 IDENTIFICATION DIVISION.  
2 PROGRAM-ID, PROJECT-KIELDER.  
3 AUTHOR, George Mac.  
4  
5 ENVIRONMENT DIVISION.  
6 INPUT-OUTPUT SECTION.  
7 FILE-CONTROL.  
8 SELECT REPORT-FILE ASSIGN TO "reports.txt"  
9 ORGANIZATION IS INDEXED  
10 ACCESS MODE IS DYNAMIC  
11 RECORD KEY IS REPORT-ID  
12 FILE STATUS IS WS-FILE-STATUS.  
13 SELECT INDEX-FILE ASSIGN TO "reports_index.txt"  
14 ORGANIZATION IS LINE SEQUENTIAL  
15 FILE STATUS IS WS-INDEX-STATUS.  
16  
17 DATA DIVISION.  
18 FILE SECTION.  
19 FD REPORT-FILE.  
20 REPORT-RECORD.  
21 05 REPORT-ID.  
22 05 REPORT-TITLE.  
23 05 REPORT-CONTENT.  
24 05 REPORT-DATE.  
25 05 AUTHOR-NAME.  
26 05 REPORT-STATUS.  
27  
28 FD INDEX-FILE.  
29 INDEX-RECORD.  
30  
31  
32 WORKING-STORAGE SECTION.  
33 01 WS-FILE-STATUS.  
34 01 WS-INDEX-STATUS.  
35 01 WS-INPUT-CHOICE.  
36 01 WS-SEARCH-ID.  
37 01 WS-SEARCH-TITLE.  
38 01 WS-COUNTER.  
39 01 WS-TALLY-COUNT.  
40 01 WS-CONTINUE.  
41 01 WS-ORDER-66.  
42 01 WS-BATCH-RESULT.  
43 01 WS-INDEX-FILE-PATH.  
44 01 WS-REPORT-ID.  
45 01 WS-REPORT-TITLE.  
46 01 WS-REPORT-DATE.  
47 01 WS-AUTHOR-NAME.  
48 01 WS-RELATIVE-PATH.  
49 01 WS-REPORT-DESC.  
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51 01 WS-PARSING-WARS.  
52 05 WS-START-POS.  
53 05 WS-DELIM-POS.  
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