SUMMARY OF REFLECTIVE JOURNAL

EAT20008 – Professional Experiences in Engineering

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Host organization

In conducting the engineering professional experience, I had an opportunity to work part time at Saigon Electric Company Limited for 6 months as a student intern. The company, located in Ho Chi Minh city Vietnam, specialises in the manufacturing, installation, and maintenance of electrical systems for industrial and commercial applications. They aim to provide quality engineering products to clients through their strict adherence to international standards as well as constant pursuit of perfection in digitalization and technological advancements. As a student intern, I worked in the Energy Management System - Internet of Things (EMS-IoT) project, which focused on building a system through which users can monitor and optimize the energy consumption of multiple power plants remotely. Here, I was tasked to develop a complete Graphical User Interface (GUI) for such a system, including features such as: utilising Modbus RTU over TCP/IP communication protocol for remote multimeters connection; display the data read as charts and graphs; create and export reports from aggregated data; as well as provide warnings and suggestions based on data thresholds. I was required to report my progress weekly, with monthly meetings to test and assess the application using set up hardware.

Completed tasks/trainings

Week #	Date	Stage	Completed tasks/trainings
1	07/10/2024 – 12/10/2024	1. User Interface Design and Data Acquisition.	• Researched the WPF framework and the Model-View-ViewModel (MVVM) design pattern. • Started implementing the basic GUI structure for the EMS software.
2	14/10/2024 – 19/10/2024	1. User Interface Design and Data Acquisition.	• Researched the Modbus RTU communication protocol. • Analysed the project's network topology involving TCP/IP encapsulation. • Determined the use of function code 0x03 (Read Holding Register) and parameter address assignments.
3	21/10/2024 – 26/19/2024	1. User Interface Design and Data Acquisition.	• Investigated Modbus slaves' simulation options. • Implemented and modified the code to take in users' input via a textbox for slave ID.
4	28/10/2024 – 02/11/2024	2. Data Visualization.	• Fix bugs. • Researched the visual representation for each parameter. • Implemented the charts.
5	04/11/2024 – 09/11/2024	1. User Interface Design and Data Acquisition. 2. Data Visualization.	• Continued to implement the charts. • Implemented the Singleton design pattern. • Remotely connected to a Modbus device.
6	11/11/2024 – 16/11/2024	1. User Interface Design and Data Acquisition. 2. Data Visualization.	• Researched manuals for power monitoring devices.

			• Conducted connection testing with remote multimeters. • Implemented a status text block for connection attempts.
7	18/11/2024 – 23/11/2024	2. Data Visualization.	• Modified the code to read from specific registers and save data as a dictionary. • Used scroll view on front end. • Analysed power parameter relationships, deeming some chart types unsuitable.
8	25/11/2024 – 30/11/2024	2. Data Visualization.	• Implemented a "running window" property for charts. • Explored solutions to optimize chart updates. • Implemented and found flaws in the “refresh timer" approach.
9	02/12/2024 – 07/12/2024	2. Data Visualization.	• Implemented and found flaws in "re-population on view switch” approach. • Implemented and found flaws in “unbinding chart values” approach. • Implemented the front end of a new visual representation with buttons to control chart plotting and type.
10	09/12/2024 – 14/12/2024	2. Data Visualization. 3. Data Analytics and Logging.	• Implemented the back end of the new visual representation. • Researched database integration and chose PostgreSQL. • Installed and configured PostgreSQL created a table, and tested queries. • Added the class to store the energy reading parameters.
11	16/12/2024 – 21/12/2024	3. Data Analytics and Logging.	• Added the repository interfaces/classes with asynchronous database operations • Developed the service class for continuous database saving. • Faced exceptions while integrating the service into the View Model classes.
12	23/12/2024 – 28/12/2024	3. Data Analytics and Logging.	• Attempted to solve the exceptions by relocating some logics without success. • Successfully integrated PostgreSQL using the Npgsql library for instant data saving. • Developed the layout for the report creation feature.
13	30/12/2024 – 04/01/2025	2. Data Visualization. 3. Data Analytics and Logging.	• Included a DataGrid element for displaying reports. • Implemented the method to handle report generation, including date validation and parsing. • Retrieved aggregated data with a specified frequency. • Received supervisor feedback.

14	06/01/2025 – 11/01/2025	2. Data Visualization. 3. Data Analytics and Logging.	• Added a Maximized App Button and reordered elements for better full screen usability. • Continued implementing the Report button. • Tested with dummy data. • Modified the code to display specific parameters in the DataGrid.
15	13/01/2025 – 18/01/2025	3. Data Analytics and Logging.	• Re-implemented the data structure with Start Timestamp and End Timestamp. • Improved DataGrid presentation with scrolling and styling. • Adjusted gauge chart limits and updated simulated data.
16	20/01/2025 – 25/01/2025	3. Data Analytics and Logging.	• Modified the Report feature to fully align with MVVM. • Implemented an Async Relay Command for the Report button. • Extended the Report feature to all parameters and changed the Full Data type.
17	27/01/2025 – 01/02/2025	3. Data Analytics and Logging.	• Developed a method to export DataGrid to CSV. • Implemented this in relevant View Model classes and added ToolTips to buttons. • Styled the DatePicker and ScrollBar elements and set the default date.
18	03/02/2025 – 08/02/2025	4. System Optimization.	• Researched and planned the implementation of the Warning feature. • Implemented the basic Warning system in Model classes. • Implemented the event in View Model classes and started displaying warnings in Main View.
19	10/02/2025 – 15/02/2025	4. System Optimization.	• Addressed cross-threading issues in the Warning feature implementation. • Developed the Warning Model class and modified the Warning Triggered event. • Implemented dynamic styling of the Warning ListBox based on category.
20	17/02/2025 – 22/02/2025	4. System Optimization.	• Enhanced gauge chart colour coordination with the warning list. • Developed the Acknowledgement sub-system for warnings. • Expanded the Warning system to other parameters.
21	24/02/2025 – 01/03/2025	4. System Optimization.	• Implemented a Setting page for users to change thresholds, including saving and applying settings • Added other parameter thresholds to the Setting page and improved its layout.

22	03/03/2025 – 08/03/2025	4. System Optimization.	• Developed the Acknowledge All function. • Allowed the gauge chart limits in Settings Model to be set by users. • Added threshold validation.
23	10/03/2025 – 15/03/2025	5. Presentation	• Finalized and cleaned up the code base. • Tabulated all implemented and unimplemented features.
24	17/03/2025 – 22/03/2025	5. Presentation	• Prepared the scopes achieved and future consideration. • Presented to the supervisors the finalized application. • Received feedback and prepared documentation.
25	24/03/2025 – 29/03/2025	6. Documentation	• Create a GitHub repository. • Initiated the README file detailing how to run the app and what features available. • Started writing the Summary of Reflective Journal document.
26	31/03/2025 – 05/04/2025	6. Documentation	• Continued writing the Summary of Reflective Journal document. • Identified the engineering competencies and influence on future career direction. • Upload the program onto GitHub for sharing.

Swinburne engineering competencies

K5 Practice Context: Discerns and appreciates the contextual factors affecting professional engineering practice.

Developing the EMS software required a lot of experience in utilising programming languages and object-oriented design patterns to design a functional and aesthetic desktop application that is able to interface with remote devices via Modbus RTU over TCP/IP communication protocol. I acquired the foundation for these skills when studying various units during my engineering courses. In particular, Introduction to Programming and Object-Oriented Programming taught me the basics programming skills with different languages, along with the object-oriented programming structure. Engineering Technology Innovation Project and Engineering Technology Inquiry Project, on the other hand, equipped me with the knowledge of how microcontrollers, sensors, or actuators receive and process data in an IoT system, how different library and API interacts with this hardware, as well as the data structure and communication protocol of these systems. Furthermore, various industry project units also prepared me with the basic project management skills, such as objectives definition, scope identification, time management, report writing, and presentation. These skills are absolutely essential for the project I was conducting, providing me with invaluable knowledge in researching, implementing, and presenting the application I developed even in a field that I have limited technical background.

K6 Professional Practice: Appreciates the principles of professional engineering practice in a sustainable context.

The opportunity that I have with Saigon Electric exposed me to various industrial standards, some of which help established a strict guideline to how the software should be developed. One such standard is embedded within the user manual for the multimeter PAC3102, in which the ways the parameters can be read, stored and transmitted are defined to be very specific and standardized. The device utilizing Modbus RTU protocol to store the data measured into small registers, which can be read, verified and interpreted by other Modbus devices. The protocol is then encapsulated in a TCP/IP packet and sent via the internet, the process of which is protected by using VPN to ensure data privacy and cybersecurity. These guidelines, built upon many decades of testing and deploying, are documented and maintained regularly to ensure any attempts at utilising or integrating the device into a system are adhered to industrial practice, which ultimately result in better interoperability and robustness. Learning to use this protocol, along with learning to establish a private VPN session when conducting connections testing with remote devices, helped me to realize the importance of industry standards adherence, as any non-compliances will result in severe data breaches, fractured implementation, as well as obtaining unsatisfactory outcomes. Furthermore, deploying the AGILE project management model, which required each team member to establish and finish a set of works in a specific period, also helped me to learn these new concepts more effectively. By dissecting the overarching goal of the project into smaller stages, which can then be further divided into smaller tasks for each week, help me tackle the project in a more modular manner. This provides me amber times to learn new concepts relevant to the project, as well as aids me in balancing between my course workload and that of the internship, which is a very crucial aspect of project management.

Another important aspect of an industrial project that I learned during my internship is the appreciation of sustainability in its objectives. The goal of the project is to monitor, and in turn optimize, the consumption of electrical energy in power plant. The data visualization, report generation, and warning system implemented all serve this purpose, which aims to minimize the energy needs for these power plants and thus reduced their reliance on unsustainable energy sources such as fossil fuels.

A1 Ethics: Values the need for, and demonstrates, ethical conduct and professional accountability.

Developing a software for a remote monitoring system means managing and transmitting a large quantity of data, those of which potentially contain important information on the power plants' energy consumption patterns. The leakage of these data, done by the hands of malice parties, would undoubtedly result in severe consequences. Therefore, I need to be extremely cautious when test my application against internationally placed devices, with establishing a VPN session, where all data transmitted are protected within a virtual tunnel, is one of the precaution protocols I needed to comply. Through this process, I learned that ensuring a proper data privacy methodology is crucial when working in industrial projects, as it strengthens the ethical responsibility of the company when dealing with sensitive clients' information.

A2 Communication: Demonstrates effective communication to professional and wider audiences.

In an industrial project such as the one I conducted during my internship, ensuring effective communication between stakeholders and relating parties are essential in synchronizing workload and flow of information. Acknowledging this, I agreed to submit a weekly progress report to the company, where every change I made, every research I did, or every challenge I faced during the

implementation of the program were documented on a daily basis. These documents also served as the weekly reflective journal that I was required to write to summarize my responsibility during the professional experience, which also help bugs fixing and backtracking become easier and more effortless.

Another form of communication between me and my supervisors is our online meeting conducted at the end of each phase. Here, the supervisors demonstrated their hardware installations, which was set up to test my implementation in real life scenarios. The purpose of these meetings is to make sure that the program work as intended when remotely connected to a Modbus device. This process, despite not having any data related to the energy parameters required transmitted, serves as an important performance verification as well as information communication gateway between me and my supervisor, ultimately help the project being conducted effectively. Through these methods of communication, I learned the importance of this aspect in industrial setting, where multiple parties have their own responsibilities and workload. Defining and adhering to specific form of frequent communication helps each individual workload integrate together more seamlessly, while also ensuring that the entire team is working towards a singular purpose. It can also encourage others to meet their deadlines, which in turn enhances the project's progression as well as facilitates engagement between relating parties.

A5 Professional Self: Demonstrates professionalism.

The division I was working in at Saigon Electric has a focused on working flexibility, hence I was allowed to conduct my work remotely without having to turn up onsite. However, ensuring regular update on work progression, as well as be on time during our meeting at the end of each phase is very important, as it demonstrated my professionalism and seriousness in completing the tasks assigned. Because of this, I always making sure that development of the program was conducted and documented regularly, with detailed description of the work undertaken and proper planning and prediction of what should be done in the coming week. This ensures that the tasks were completed in a timely manner, ready to be reviewed and assessed by the supervisors. Appropriate preparations were also needed before any online meeting with the supervisors, which help all features implemented during that phase were properly introduced and demonstrated. I also making sure that any feedback I received during the online meeting were addressed and expanded upon, meaning that my works will be a better and more completed version of itself in the next meeting.

In addition, while the company doesn't have strict dress code for online meetings, ensuring that the outfit I wore was professional while still seem casual and approachable was also essential during my presentation. The company required me to turn on my camera when conducting online meetings, which simulate the scenario where I physically present my works. A proper and presentable appearance help me gain self-confidence, which not only makes my works seems more credible, but also prepare me for my future career, where I might be required to communicate with more people in a more variable environment.

A6 Management of Self: Demonstrates self-management processes.

During my time as a student intern, I learned the importance of self-management, as the workload from both my course and the internship project can easily overwhelm me if I don't have an effective time and work management plan. Studying full time in the course of Mechatronics and Robotics Engineering while conducting research, implementing program, and documenting my work on an EMS project can be extremely exhausting and time consuming. In order to tackle all of these workloads, I devised a self-management plan in which I aim to ensure the tasks have their time strategically distributed. This include determining the importance of each task based on their

respective deadlines; clearly identifying what needed to be done and the ways in which they can be done; as well as constructing a contingency plan in cases when these tasks cannot be completed. The contingency plan is especially important, as sometimes the workload from both of these sources, as well as other surprise factors that can happen in my personal life, can make me miss deadlines. In these scenarios, I learned that honesty and the ability to admit incompetency are often crucial in ensuring an effective workflow. Even though dedicating finish the tasks assigned in the time promised is the priority, I will accept my inability to meet the deadlines and try to compensate for my mistakes. In sincerely explaining the issue with my supervisors, as well as agreed upon a new deadline, I managed to build upon my shortcomings and aim for the better. These are parts of my self-management strategy, those of which I learned through practical experience during my internship.

A7 Teamwork: Demonstrates effective team membership and team leadership.

The EMS-IoT project involves the development and cooperation of many moving parts. While the tasks that were assigned to me focused on the software implementation of the project, the testing and performance verifying processes are still done in collaboration with the hardware team, who are responsible for setting up the devices of interest, as well as establishing a VPN session for secure connection. There was also a senior programmer, who maintained and reviewed my code; as well as the project manager, who supervised and oversaw the project progression. These roles were assigned in a Google chat group chat and through a Gmail thread, where progress report and meeting schedule were also communicated. The most important aspect of team working in an industrial context that I learned was that the tasks were divided based on each individual capabilities and specialities. This makes the workload to be distributed effectively, bringing out the best of everyone to contribute to a singular purpose. Thus, I believed that team working skills are very crucial when working in the industry.

Influence on the future direction of your career

The internship opportunity at Saigon Electric Company Limited gave me the chance to work in an industrial project involving communication between IoT devices, standardized data transmission, desktop application GUI development, data visualization, report generation, and warning system implementation for energy optimization. The experience required me to learn many software development concepts, including back-end and front-end development, library utilization, database management, and remote connection handling. These skills, built upon many hours of self-learning, testing and research, will undoubtedly contribute greatly to my future career as a robotics and mechatronics engineer, especially in the fields of embedded system development, IoT programming, or control system design. Furthermore, the opportunity also taught me important project management skills such as time management, industrial standards adherence, goals identification, presentation, and report writing, all of which are crucial when contributing to any engineering project. This, along with the sense of pride after finishing developing a working application, will equip me with the necessary experience when joining the workforce in the future.

In addition, the opportunity also helps me confirm my career direction. Specifically, it shows me the responsibilities of a mechatronics engineer and subsequently brings me happiness and satisfaction when fulfilling them. I found interest in the field of industrial digitalization and automation, where devices like sensors and actuators can communicate with one another to achieve greater purposes. The control and monitoring process of easily fluctuated parameters such as power, current, and voltage can be done remotely, securely, and even automatically without the help of human resources. This form of augmented capability can be extended to other fields not limited to energy management and thus have limitless potential to be explored. Such a concept fascinates me, urges me to refine my passion, and

subsequently shapes my future career to realize such passion, all the while helping to build better technologies in the future.