ATILIM UNIVERSITY
FACULTY OF ENGINEERING

DEPARTMENT OF SOFTWARE ENGINEERING

SE 499 SUMMER PRACTICE II REPORT

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1. INTRODUCTION

Summer internships give university students the chance to experience their dream careers and get firsthand exposure to the work environment. At Atılım University, there are two required summer internships. The first is short-term, lasting 20 working days, and the second is a longer one, lasting 30 days. I am a software engineering student, and I completed my second, long-term internship from July 8, 2024, to August 20, 2024. This was my second internship in the software industry. I felt more confident during this internship and was more aware of the processes involved.

I arranged my internship at AYDIN YAZILIM ve ELEKTRONİK SANAYİ A.Ş. (AYESAŞ) through the cooperative education program at our university. AYESAŞ is a company in the defense industry. Since I started studying software engineering, I have always wanted to work in this sector. This internship allowed me to gain experience in this field.

In my report, I will first give some information about AYESAŞ. Then, I will describe my daily tasks, the project I worked on, and the experiences I gained. I will also discuss the challenges and errors I encountered during this time. Finally, I will explain how this internship contributed to my skills and knowledge.

2. COMPANY OVERVIEW

2.1. A Brief History of AYESAŞ

Figure 1: Company Logo[1]

AYESAŞ was founded in 1990 as a joint venture between the American company L3 Communications and the Turkish company METIS. In Figure 1, the AYESAŞ logo is displayed. The company provides a wide range of products and services in the defense, aerospace, and security sectors. These include command and control solutions, avionics systems, and the production of electronic and electromechanical systems, covering the entire process from design and development to manufacturing.

In 2004, a portion of AYESAŞ shares was sold to Zorlu Holding as part of an agreement. Together with LENTATEK, AYESAŞ continues to serve both domestic and international clients under the Vestel Defense Group.

2.2. AYESAŞ Today

AYDIN YAZILIM ve ELEKTRONİK SANAYİ A.Ş. (AYESAŞ) competes internationally by offering engineering and production services. The company continues to provide solutions in air defense systems, electronic equipment for naval and aerial platforms, and safety-critical avionics and embedded software. Currently, the General Manager of AYESAŞ is Öner Tekin. Under his leadership, the company is growing and establishing its reputation in the industry, supported by skilled employees.

[1] Figure 1: Company Logo, Source : AYESAŞ, www.ayesas.com/tr/kurumsal .

2.3. AYESAŞ Locations and Physical Capacities

AYESAŞ's headquarters are located in the Sincan Organized Industrial Zone (OSB) in Ankara. The company has a factory in Sincan OSB, which is used for production and maintenance, and an Engineering/Development Office in the METU Technopolis campus in Ankara.

The factory has a NATO Secret Facility Security Clearance and spans 15,000 square meters, while the engineering offices at METU Technopolis cover 2,500 square meters of indoor space.

2.4. AYESAŞ Workforce and Employee Qualifications

AYESAŞ employs over 300 people across its factory in Sincan and its office in METU Technopolis. Of these employees, 180 are engineers with undergraduate and graduate degrees. The average tenure of employees is 7.13 years. While the factory houses staff in critical engineering and technical roles directly related to production, the Technopolis office primarily employs computer, software, and electrical-electronics engineers. As depicted in Figure 2, the pie chart illustrates the education distribution of employees.

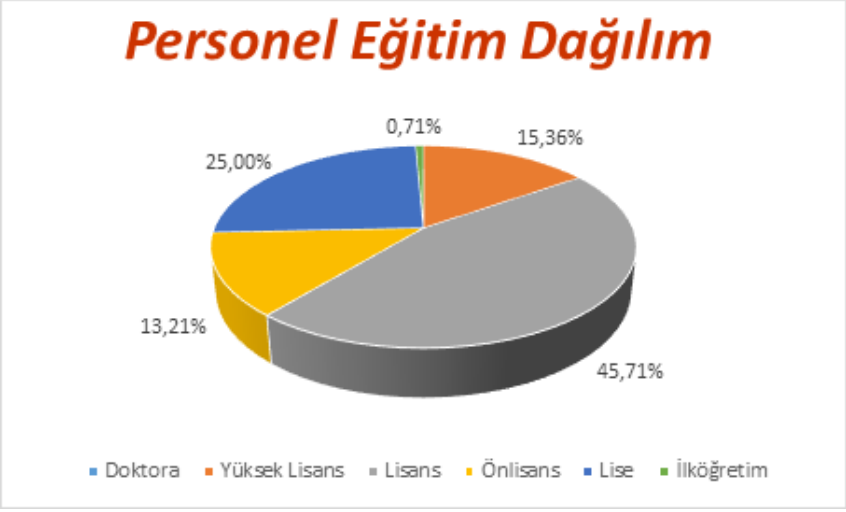

Figure 2: Employee Education Distribution Pie Chart

2.5. Departments and Units at AYESAŞ

AYESAŞ operates from two main locations: the factory in Sincan and the office in METU Technopolis. The departments in the Teknokent office where I completed my internship consist of the Software Department, Quality Control Department, IT Department, Administrative Affairs Department, Human Resources Department, Engineering Services Department, Production Operations Department and Systems Engineering Department. The distribution of employee positions is shown in Figure 3.

Figure 3: Employee Position Distribution

2.6. AYESAŞ Organizational Structure

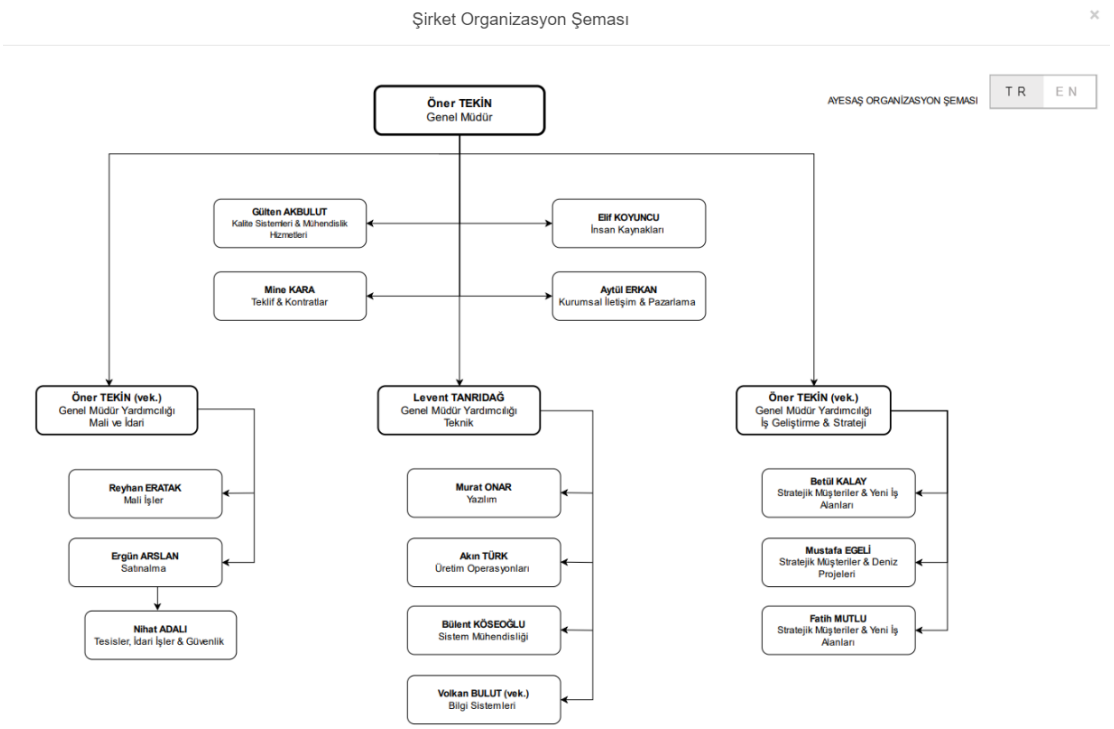

Figure 4: Organizational Structure

Organizational structure defines the hierarchy and division of labor within an organization. Figure 4 illustrates the company's organizational structure. This structure is crucial for understanding the relationships and communication pathways between different departments.

2.7. AYESAŞ Products and Services

AYESAŞ provides a wide range of products and services, from design and development to production, system engineering, integration, and safety-critical embedded software development. The company focuses on meeting and exceeding customer expectations with highly educated, experienced, and innovative employees.

Embedded Avionic Military Computer: AYESAŞ's embedded avionic/military computer is designed for civil and military air platforms that require high durability, safety, and environmental resilience. It features a DO-254 and DO-178B compliant design and a flexible architecture that can be used as an embedded avionic Line Replaceable Unit (LRU) [2].

HTAWS Helicopter Terrain Awareness and Warning System: HTAWS is designed to reduce the risk of Controlled Flight Into Terrain (CFIT) accidents for rotary-wing aircraft. It enhances situational awareness by providing visual and audible warnings based on inputs such as position, flight data, and terrain and obstacle information. The system is ARINC 653 compliant and can be integrated with flight computers and display systems [3].

LINK-11B Data Link Processor: AYESAŞ's Link-11B DLP is a cost-effective solution for integrating Link-11B capability into both Command and Control (C2) and non-C2 systems. It offers up to 8 simultaneous connections with customizable settings for each link, supporting analysis and reporting with embedded recording features. A human-machine interface (HMI) allows easy configuration and visualization of link activities [4].

LINK-16 Data Link Processor for Non-C2 Systems: The Link-16 DLP from AYESAŞ is a solution certified to RTCA DO-178B Level-B standards. It offers highly configurable software interfaces (API) for seamless integration [5].

Remote Sensor Control System (RSCS): RSCS allows full control of radar heads through a user-friendly graphical interface [6].

AYESAŞ SOA-Based Tactical Data Server (ATDS): The ATDS facilitates tactical data exchange between legacy Command and Control Centers and systems requiring tactical data using Service-Oriented Architecture (SOA) technologies, compliant with NATO standards [7].

Radar Message Conversion Computer (RMCC): RMCC manages different radar message protocols, converting messages between formats like Super Set Message (SSM) and AWCIES. It supports direct communication with ACCS and KIM/KIP systems [8].

Track Management System: This system provides comprehensive maritime tactical images by fusing data from sensor networks, assisting authorities in monitoring small objects in vast maritime areas, thereby supporting efforts to combat smuggling, illegal immigration, and terrorism [9].

TRUVA Software Testing Tool: TRUVA is a software testing tool qualified under RTCA DO-178. It facilitates automated white-box testing, unit and component testing, black-box testing, and integration testing for C/C++ programs [10].

Multi-Sensor Data Fusion and Automatic Target Tracking: AYESAŞ's system fuses data from radar and IFF systems to create a comprehensive, coherent air and surface picture. It uses advanced algorithms to detect and track targets with reduced false detection rates [11].

Digital Moving Map: The Digital Moving Map software increases situational awareness for air platforms by offering digital display technology, providing pilots with enhanced safety and awareness not possible with standard cockpit equipment [12].

Military Type Rugged Cabinets: These cabinets are designed to protect Commercial Off-The-Shelf (COTS) equipment from environmental conditions such as shock, vibration, and EMI, meeting MIL-SPEC standards for naval and underwater platforms [13].

Multi-Functıon Operator Consoles: AYESAŞ's rugged multi-purpose consoles provide platforms for executing command and control functions, system control, HMI, and emergency control. They can be customized with various components like monitors, programmable keyboards, and video processing units, depending on requirements [14].

Military Touchscreen Computer: This rugged computer is designed for harsh land and naval environments. It complies with MIL-STD-810G and MIL-STD-461F standards and can be easily customized to meet specific customer needs [15].

3. WORK COMPLETED DURING THE INTERNSHIP

3.1. Assigned Unit

During my internship at AYESAŞ's ODTÜ Teknokent campus, I was assigned to a unit responsible for the development and testing of sensitive defense systems. This unit handles end-to-end development of critical defense projects, including documentation, design, development, and testing. Post-delivery, the unit also provides maintenance and warranty services.

The team I worked with was dedicated and respectful. From the moment I started, I felt comfortable in the work environment. I did not encounter any significant difficulties or issues during my adjustment period, largely due to the company's supportive culture and the friendly, solution-oriented attitude of its employees. My internship experience was both enjoyable and beneficial, contributing to my professional growth.

3.2. Tasks Performed

At AYESAŞ, the workday starts at 7:30 AM and ends at 5:00 PM. Transportation to and from the workplace is provided by a company shuttle, which made commuting convenient for me. The lunch break is from 12:00 PM to 1:00 PM, during which we could choose from various nearby restaurants. This comfortable and efficient work environment contributed to increased productivity.

As a corporate entity, AYESAŞ organized several security meetings during the first week. I attended Occupational Health and Safety (OHS) training, which included detailed information on emergency responses to fire, earthquake, and workplace accidents. The training concluded with a short test to assess our knowledge. Given AYESAŞ’s focus on the defense industry, security is a priority, and the training covered essential topics. Additionally, we were introduced to the company’s network systems and the applications used in project management, such as Jira, Intranet, SVN, and Git. While waiting for my computer and necessary software setups, I had the opportunity to meet other interns and learn about their projects and experiences.

Once the setups were complete, I was assigned a task by our project manager to add a search module to a simulation project used for testing certain systems developed in our unit. Since the application was written in Java Swing and I needed to add a new module to an existing project, I used the Java language [1]. I utilized the Eclipse IDE, which I had previously used in the System Software Validation and Testing (SE 344) course lab by our department head, Ali Yazıcı. I became more familiar with Eclipse during this project and grew to appreciate its features. Given my previous experience with C# and C++ and understanding object-oriented programming concepts, I quickly became proficient with Java by researching its core features and methods. To better understand and integrate the module into the project, I created several separate projects. Using different workspaces allowed me to isolate projects and settings, organize them efficiently, and create customized working environments according to project requirements. This approach also provided advanced project management and independence, which are particularly beneficial for large and complex projects.

My first project was a simple search engine. Despite its simplicity, it allowed me to explore various Java Swing libraries and improve my understanding of the language.

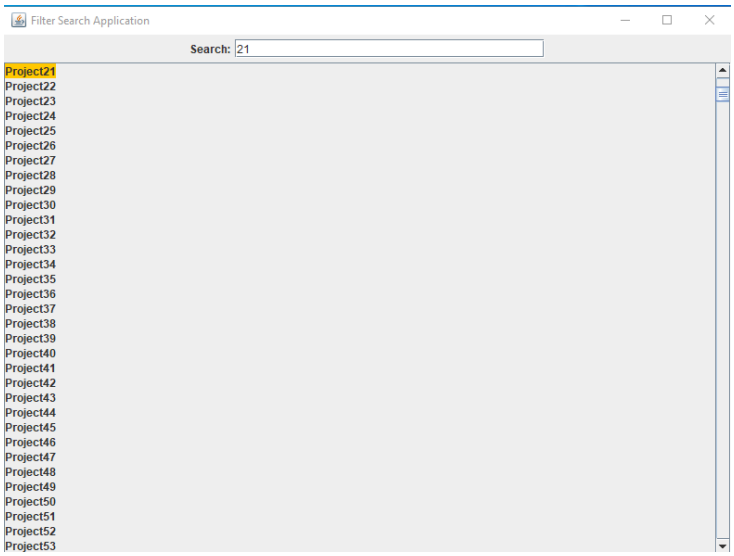

Figure 5: First Simple Java Project

Figure 5 shows the image of the first simple Java project I completed. This project provided me with my first experience in creating and compiling an application using Java. I gained hands-on experience with some basic Java Swing libraries and laid the foundation for the search engine module to be added to the main project.

Integrating the simple search engine module into the project proved more challenging than expected. The source code of the simulation application was the largest and most complex project I had worked on so far. However, I did not need to review every package and class; instead, I identified the necessary packages and classes within the project. I used console output to locate the required variables, identified the labels where the necessary items were found, and ensured the scrollbar moved automatically to these labels. I learned about the operation of these labels by changing their background colors. I made modifications to the initial project and integrated it into the main project. I encountered several errors, but I resolved them using the debugger. Throughout this development process, I received feedback from my supervisor and team, which helped me correct mistakes and continue the development.

In the first stage, the goal was to find the desired text and highlight it at the top of the panel, which I successfully achieved. I faced several challenges, one of which was ensuring the scrollbar moved correctly to the label's position. Working with nested collapsible panes was confusing and the panel size changes according to the search keyword added complexity. As this was my first experience with collapsible panes, resolving this issue took some time. I gained a better understanding of collapsible pane usage and getParent method. I also learned the use of casting, which I had some knowledge of from data types but had not used with components before.

In the first phase, I added a module that searches for text and parameter names in the simulation application. Subsequently, I was asked to enhance this search feature to include searches by ID and Source numbers. I decided to create an XML file to map Source and ID values to parameter names in the simulation application. The challenge was to match Source and ID values from Excel with parameter names in the application, as they did not align. I completed this mapping by reviewing and analyzing the necessary documents. I added functions to support

searches by ID and Source numbers in addition to text. This required creating XML files for each of the two other variants of the simulation application, which had different variables and configuration files. I developed an application to read XML files and generate them in the required format. The main project also required reading the XML file and matching parameter names with ID and Source numbers.

```
public static void main(String[] args) {try {
    File inputFile = new File("input.xml");
    DocumentBuilderFactory dbFactory = DocumentBuilderFactory.newInstance();
    DocumentBuilder dBuilder = dbFactory.newDocumentBuilder();
    Document doc=dBuilder.parse(inputFile);
    doc.getDocumentElement().normalize();
    NodeList nodeList = doc.getElementsByTagName("key");
    for (int i = 0; i < nodeList.getLength(); i++) {
        Node node = nodeList.item(i);
        if(node.getNodeType() == Node.ELEMENT_NODE) {
            Element element = (Element) node;
            String common = element.getAttribute("common");
            String name = element.getAttribute("name");
            NamedNodeMap attributes = element.getAttributes();
            while(attributes.getLength() > 0) {
                attributes.removeNamedItem(attributes.item(0).getNodeName());
            }
            element.setAttribute("common", common);
            element.setAttribute("name", name);
            element.setAttribute("source", "");
            element.setAttribute("id", "");

        }
        File outFile = new File("output.xml");
        TransformerFactory transformerFactory = TransformerFactory.newInstance();
        Transformer transformer = transformerFactory.newTransformer();
        transformer.setOutputProperty(OutputKeys.INDENT, "yes");
        transformer.setOutputProperty("{http://xml.apache.org/xslt}index-amount", "4");
        DOMSource source = new DOMSource(doc);
        StreamResult result = new StreamResult(outFile);
        transformer.transform(source, result);
        System.out.println("xml oluşturuldu");
```

Figure 6: XML Reading and Editing Application

In the code provided above, I read an XML file, added necessary features, and generated a new XML file by modifying the existing features, as illustrated in Figure 6. This task allowed me to work with XML files and practice reading and writing XML in Java. I applied the XML reading method I learned to my project. Additionally, I created a user guide for the application, detailing the project's description, requirements, dependencies, configuration process, technical details, methods, and including a flowchart. Through this process, I gained insight into how to add a new module to a large project and the complexity and dependencies involved. I learned that, in real-world scenarios, working with large projects often involves module sharing within

the team. If documentation is lacking, this can complicate the project significantly, making it more challenging than starting from scratch.

This experience highlighted the importance of flowcharts in managing complex algorithms. I observed that flowcharts provide a clearer and more understandable representation of algorithms, which helps in making changes more efficiently and with fewer errors.

During the development process, my supervisor and other engineers provided valuable guidance and tips on development environments and Java programming. This mentorship helped me learn many useful programming practices and standards used in defense industry projects.

3.2.1. Description of the Module Developed

The simulation application is designed for engineers to modify parameters based on specific fault codes and retest the system to determine the underlying causes of these faults. This project, part of AYESAŞ, cannot be detailed due to confidentiality; however, its description is available in AYESAŞ's database. Therefore, I am unable to discuss the user interface or other project specifics, but I can elaborate on the newly added search engine feature.

The addition of the search engine feature to the simulation application facilitated the easy identification of potential faults. Previously, locating a fault name from the Excel file within the simulation application was problematic, as fault names were not directly utilized; instead, they were represented with abbreviations or alternative terms. This complexity forced engineers to adopt a trial-and-error approach, consulting outdated documents to identify necessary parameters, which was time-consuming.

To address this issue, we utilized company documents to map abbreviations and terms corresponding to parameters and created an XML file for this purpose. This XML file linked

fault names from Excel to their respective parameter names within the simulation application, significantly reducing the time and effort previously required for this task.

With the search module, engineers can now easily search for and locate parameter names within the application. The search results display the frequency of occurrences of the searched parameter, and the navigation button allows users to move through the identified parameters, clearly indicating their positions. Matching parameters are highlighted in orange, while selected parameters are prominently displayed at the top of the application with a blue border for enhanced visibility. Additionally, the XML files in the configuration folder enable matching of ID and Source values from Excel with parameters in the simulation application. This functionality allows for searching by both ID and Source numbers, simplifying the identification of specific parameters. When both ID and Source numbers are entered, users can efficiently locate unique parameters.

3.2.2. Flow Chart

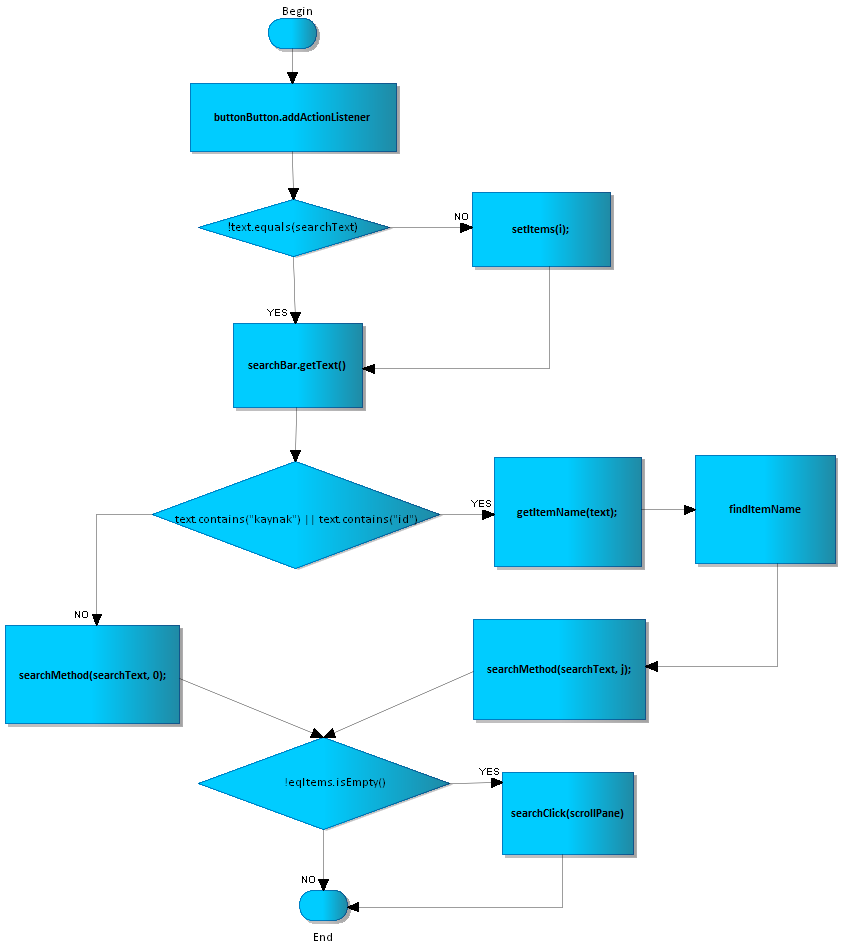

Figure 7: Flow Chart

A flowchart is a tool that graphically represents the steps and decision points in a process. This diagram defines the methods and techniques used to reach specific decision points. In particular, the 'if' structure checks whether a certain condition is true and directs the flow of the process based on this condition. In this context, Figure 7 presents the flowchart of my project, detailing the decision-making processes and flow of the application.

3.3. Problems Encountered and Solutions

AYESAŞ, being a defense company with strict military standards, operates in a closed network environment. Consequently, our internet access was limited to specific websites during our joint training, which posed some challenges for my project. However, the constructive approach and support from the engineers and my supervisor helped me overcome these challenges.

Due to security procedures, the installation of software and Java libraries was managed by the IT department, which sometimes took several days depending on their workload. Despite this, our requests and installations were handled promptly and positively by both our supervisor and the IT team.

4. RECOMMENDATIONS

My extended internship at AYESAŞ profoundly impacted me, especially regarding the technologies used in the defense industry, the working environment, and the scale of the projects. Unlike typical software companies, working on large-scale projects in this sector, which is truly a team effort, was highly intriguing. I am excited about the prospect of working in a defense industry company and contributing to significant projects in the future. If you enjoy teamwork and prefer working on diverse and impactful projects rather than routine tasks, and if you believe that such projects benefit our country and nation, I highly recommend interning in the defense industry to experience this sector.

5. CONCLUSION AND SUGGESTIONS

During my internship at AYESAŞ, I experienced how a defense industry company handles and develops projects within a specialized department. The tasks assigned to me allowed me to develop a project using Java programming and various libraries, enhancing my skills in project development and documentation. I gained experience in adding new modules to large projects, preparing me to be a more prepared engineer in the industry. The module I developed made it easier to find parameters in the application, saving time and improving efficiency. Beyond technical knowledge, I learned valuable life lessons from colleagues and project managers. I expanded my network and gained insights into the industry. I would like to express my gratitude to our project manager, Serdar Torun, and all the staff for their guidance and friendliness during my 40-day internship.

6. REFERENCES

[1] https://docs.oracle.com/javase/tutorial/uiswing/start/index.html

[2] https://www.ayesas.com/en/products/embedded-avionics-military-computer

[3] https://www.ayesas.com/en/products/htaws-helicopter-terrain-awareness-and-warning-system

[5] https://www.ayesas.com/en/products/link-16-data-link-processor-non-c2-applications

[6] https://www.ayesas.com/en/products/remote-sensor-control-system

[7] https://www.ayesas.com/en/products/ayesas-soa-based-tactical-data-server-atds

[8] https://www.ayesas.com/en/products/radar-message-converter-computer

[9] https://www.ayesas.com/en/products/track-management-system

[10] https://www.ayesas.com/en/products/truva-software-test-tool

[11] https://www.ayesas.com/en/products/multisensor-data-fusion-and-automated-target-tracking

[12] https://www.ayesas.com/en/products/digital-moving-map

[13] https://www.ayesas.com/en/products/military-type-rugged-cabinets

[14] https://www.ayesas.com/en/products/multi-function-operator-consoles

[15] https://www.ayesas.com/en/products/military-touchscreen-computer