
# WOLKITE UNIVERSITY

## COLLEGE OF COMPUTING AND INFORMATICS

## DEPARTMENT OF SOFTWARE ENGINEERING

Report on the practical attachment in Software Engineering

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*Organization supervisor: Mr. Habtamu Firew*

*Report submitted to: Software Engineering Department*

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**Wolkite University**

**Wolkite, Ethiopia**

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# DECLARATION

I therefore certify that all materials and data in this Practical attachment document are obtained and presented in compliance with guidelines of Software Engineering Department. I also declare that; this work is entirely original and has never been presented or used by any other departments

Student Name_____

Signature _____

Date _____

As an authorized Advisor, I have approved the submission of this Practical Attachment document.

Advisor Name_____

Signature _____

Date _____

# ACKNOWLEDGEMENT

Above all, I offer my heartfelt gratitude to GOD for His presence in every facet of my life. His boundless love and unwavering mercy have remained steadfast, accompanying me through the peaks and valleys, even in moments when I feel undeserving of such blessings.

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Also, I want to acknowledge Mr. Joseph Wondwosen, our advisor, for his insightful intellectual guidance concerning our job responsibilities. A profound sense of gratitude is extended to our advisor, Mr. Habtamu, for his valuable advice and consistent support that have been indispensable throughout our journey.

Lastly, I wish to express my deep appreciation to my families for their unwavering support, which has played a pivotal role in helping me successfully fulfil the mission set forth by Wolkite University.

# LIST OF ABBREVIATION

| | |
|---|---|
| **API** | Application Programming Interface |
| **DB** | Database |
| **FDRE** | Federal Democratic Republic of Ethiopian |
| **INSA** | Information Network Security Administration |
| **JSON** | JavaScript Object Notation |
| **JWT** | JSON Web token |
| **MUI** | Material UI |
| **UI** | User Interface |

# ABSTRACT

This report document outlines the development of Omni-Stock, a Multi-Store Inventory Management System designed for INSA. The Omni-Stock system serves as an expansive database solution tailored for overseeing the day-to-day operational activities of stores.

The project's primary objective revolves around resolving challenges related to stores and products. By embracing a computerized approach, this system aims to efficiently manage store services and empower users in handling various product aspects within the store environment. Through this initiative, users can engage in a highly effective and streamlined process. The system's core functionality centres on swift and efficient data processing and comprehensive record management.

The architecture of the system is founded upon Node.js, utilizing the Express.js framework for development. MongoDB serves as the robust backend database, while the user interface is crafted using React, coupled with the Material UI library for a polished and intuitive design.

Overall, the project's ultimate aim is to enhance operational efficiency by minimizing data-processing time, reducing errors, elevating input accuracy, and alleviating the workload on employees.

**TABLE OF CONTENTS**

# CHAPTER ONE

## 1. Introduction

Commerce lies at the core of economic growth, and an effective commerce system forms the very bedrock of a nation's progress. In today's digital age, advanced technology opens doors to remarkable possibilities for simplifying and optimizing online commerce procedures, thereby promoting collaboration among customers, merchants, and the commerce workforce.

Introducing a Multi-Store Inventory Management System, shortened as "Omni-Stock," designed to be a comprehensive management software that ensures the smooth operation of daily activities at a reasonable cost. This project is dedicated to creating a web-based Product (Inventory) Management System specifically tailored for INSA's needs. Omni-Stock serves as a substantial database system, serving the purpose of efficiently overseeing the day-to-day operations of stores. It acts as a pivotal tool, fostering continuous communication between administrators, store managers, and customers, facilitating a cohesive and streamlined management process.

### 1.1. Background of the hosting organization

The Information Network Security Administration was established for the first time in 1999 under the Council of Ministers Regulation No. 130/1999 with the aim of protecting the national interests of our country's information and information infrastructures. The Information Network Security Administration was founded by Dr Abiy Ahmed (who later would become the Prime Minister of Ethiopia) during the FDRE's period in power. However, the Agency's Council Regulation No. 250/2003 and recently Proclamation No. 808/2006 need to be restructured to address the increasingly complex cybercrime and protect national interests. Yet, in 2021, based on the Definition of Powers and Duties of the Executive Organs of the Federal Democratic Republic of Ethiopia Proclamation No. 1263/2014, INSA was renamed as Information Network Security Administration.

### 1.2. Mission, vision and Core Values of the hosting organization

**Vision**

INSA's vision is to realize a globally competent National Cyber capability which plays a key role in protecting the national interests of Ethiopia.

**Mission**

- ✓ To build National Cyber Power capable of protecting the national interest.
- ✓ To provide technical intelligence pertaining to national interest so as to support decisions and actions of the government.
- ✓ To build data and computing capacity so as to ensure the transformation of the national high-tech and security industry.

**Core Values**

The legal basis of creating INSA in 2006 was the Council of Ministers Regulation No.130/2006, with goals including defence of Ethiopian information infrastructure. Among the initial activities of INSA was spying on dissidents among the Ethiopian diaspora using "sophisticated intrusion and surveillance software", and to lay legal charges against journalists and opposition activists and politicians of "treason" and "terrorism".

## 1.3. Organizational Chart

## 1.4. Statement of the problem

INSA's customer faces several problems according to the side of the product, stores, transferring product between stores and promoting their product because of the manual system. These problems are:

- ✓ **Managing stores would take even longer.** With a manual system, there is no way to automate tasks such as tracking inventory, tracking transfer of inventory. This would make it very difficult to manage multiple stores efficiently.
- ✓ **The store owner would have even less guarantee for his customer and product.** With a manual system, there is no way to track customer need or product quality in real time. This would make it difficult for the store owner to ensure that customers are getting the products they need and that the products are of the quality they expect.
- ✓ **Product transfer between stores would take even longer.** With a manual system, there is no way to automate the process of requesting and checking if a product transfer is needed. This would make it very difficult to move products between stores quickly and efficiently.

- ✓ **Auditing store revenue and cost would be even more tedious and time consuming.** With a manual system, there is no way to automate the process of auditing store revenue and cost. This would make it very difficult to track the financial performance of the stores.
- ✓ **Loss of data would be even more likely.** With a manual system, there is no way to back up data regularly. This would make it very likely that data would be lost or corrupted.
- ✓ **Promoting products for clients would be even more difficult.** With a manual system, there is no way to track customer preferences or target marketing campaigns. This would make it very difficult to promote products to clients effectively.
- ✓ **Generating reports would be even more time-consuming and inefficient.** With a manual system, there is no way to automate the process of generating reports. This would make it very difficult to get the information needed to make decisions about the business.
- ✓ **Data security would be even weaker.** With a manual system, there is no way to protect data from unauthorized access. This would make it very easy for data to be lost
- ✓ **The system is not integrated.** The existing system is not integrated, which means that data is not shared between different parts of the system. This can lead to errors and inefficiencies.
- ✓ **The system is not scalable.** The existing system is not scalable, which means that it cannot be easily expanded to accommodate more stores or more products. This can limit the growth of the business.
- ✓ **The system is not user-friendly.** The existing system is not user-friendly, which means that it is difficult for employees to use. This can lead to errors and inefficiencies.
- ✓ **The system is not secure.** The existing system is not secure, which means that data is at risk of being accessed by unauthorized users. This can lead to data breaches or other security incidents.

## 1.5. Task Assigned

Sidebar Navigation Development:

- ✓ Successfully designing and implementing a sidebar navigation component for the application.
- ✓ The sidebar navigation provides intuitive and convenient access to various sections and features of the product store management system.
- ✓ Users can easily navigate between product management, and other relevant sections.
- ✓ Design and develop the dashboard, providing users with an overview of sales, inventory, and
- ✓ Implement data visualization tools to present sales and inventory data in a visually appealing way.

Product Management with JSON Server:

- ✓ Developing product management functionalities using a JSON server as a mock backend.
- ✓ Implementing features for adding, editing, and deleting products.
- ✓ Implement product category management, allowing users to categorize products for easier navigation.
- ✓ Incorporating product listing, sorting, and filtering options to enhance usability.
- ✓ Ensuring data accuracy and consistency by integrating form validation during product addition and modification.

Authentication Integration:

- ✓ Connecting the application with a backend server to enable user authentication and authorization.
- ✓ Implementing secure user authentication mechanisms, such as password hashing and token-based authentication.
- ✓ Users can now securely log in, and their access to the system is controlled based on their roles and permissions.
- ✓ Implementing session management and user authentication state persistence.

Configuring database instead of JSON server for product management:

- ✓ Developing product management functionalities using a mongoDB server.
- ✓ Implementing backend API for adding, editing, and deleting products.
- ✓ Integrate API endpoints for managing product categories.

- ✓ Incorporating product listing, sorting, and filtering options to enhance usability in the form of table using backend API.

Another task

- ✓ Design and develop the landing page using MUI and Tailwind.css.
- ✓ Integrate Cloudinary for efficient storage and retrieval of product images.
- ✓ Integrate context for state management to ensure efficient data flow throughout the application.
- ✓ Implement frontend components and forms for creating and managing product categories.
- ✓ Design and develop the order management functionality, allowing users to manage and track orders.
- ✓ Integrate API endpoints for order creation, order status updates, and order history retrieval.
- ✓ Implement the notification system, sending automated confirmations for updates.
- ✓ Integrate third-party email service providers for seamless email delivery for admin and store manager.

### 1.5.1. Task Completed

- ✓ Sidebar and Navbar are implemented successfully on dashboard navigation
- ✓ Login page successfully implemented and allows users to authenticate and access the system securely.
- ✓ Integrated form validation to ensure the accuracy and validity of user credentials.
- ✓ An authorization developed to control access to the application's features and resources.
- ✓ Authorization system implemented using secure mechanisms, such as password hashing and token-based authentication.
- ✓ Authenticated users ensured that only have permission to perform actions within the application.
- ✓ Product management is successfully implemented
- ✓ Cloudinary integrated for efficient storage and retrieval of product images.
- ✓ Nodemailer email service providers Integrated for seamless email delivery for admin and store manager.
- ✓ The notification system implemented by using polling mechanism, sending automated confirmations for updates.

### 1.5.2. Task Not Completed

- ✓ Further refinement required for seamless product management. Completion of product listing, sorting, and filtering options to enhance usability. Additional validation checks needed to ensure data accuracy and consistency during product addition and modification.
- ✓ Further testing and refinement required to ensure robust security and seamless user experiences.
- ✓ Additional validation checks needed to ensure password strength during new use added
- ✓ Additional work needed to ensure complete and error-free functionality for product management and the user interface. Further development required to provide a fully optimized user experience.
- ✓ Order management functionality, allowing users to manage and track orders also to manage history of orders is required to enhance the system.

## 1.6. Objective / aim of the task

### 1.6.1. General objective

The primary goal of the Omni-Stock project is to design and implement an Inventory Management System for INSA's requirements. This system will streamline inventory management processes, improving efficiency and effectiveness.

### 1.6.2. Specific objectives

- ✓ Admin and Store Manager Accounts: We aim to develop a system that allows for the efficient management of admin and store manager accounts.
- ✓ Inventory Value Management: The system will enable store managers to handle inventory values related to sales and purchases.
- ✓ Revenue Tracking: Admins will have the capability to track revenue, transfer products, and generate reports.
- ✓ Customer Product Viewing: Customers will be able to easily view the products available in the store.

# CHAPTER TWO

## 2. Methodology for business process analyses or case study

### 2.1. Method of data collection

The Omni-Stock project is based on utilizing pre-collected data obtained from our hosting company. As such, our data collection methodology differs from traditional data acquisition processes. Rather than actively gathering data, we are leveraging an existing dataset provided by our hosting company for the purposes of this project.

The company's data collection methodology is centred on an iterative process that involves continuous feedback and input from users, facilitating the constant improvement of their processes and services.

To gather foundational data for their project, they employ the following methods:

**1. Interviews with Customers**: The company conducts interviews with customers, including store owners and managers, to gain insight into the current system and its challenges.

**2. Observation at Stores**: They visit stores during operational hours, closely observing the current system and the interactions between customers and store staff throughout the product purchasing and inventory management processes.

**3. Document Analysis**: As part of their research, they review existing materials related to the project's development. Special attention is given to documents that may suggest additional features or improvements.

This comprehensive approach ensures that the company remains responsive to user needs and can continuously enhance their project effectively.

### 2.2. Method of problem analysis

The company employs a diverse approach to problem analysis, integrating a range of methods to gain a deep understanding of challenges and develop effective solutions. These methods consist of:

**1. Prototyping**: The company utilizes prototyping to create visual models that allow them to visualize and experiment with potential solutions. This aids in identifying design issues and user experience challenges.

**2. Brainstorming**: The company fosters collaborative brainstorming sessions where a variety of ideas are generated to address identified problems. This approach encourages creative thinking and promotes innovation.

**3. Requirements** Analysis: The company conducts a comprehensive analysis of requirements, covering both the functional and non-functional aspects of the issues under consideration. This process forms the foundation for effective problem-solving.

## 2.3. Difficulty in internship

Internships offer valuable learning opportunities but can be challenging. Interns often struggle with heavy workloads, learning new skills, effective communication, and networking. In this discussion, we'll explore these common challenges and ways to tackle them. Certainly, here's a more detailed explanation of the selected difficulties faced during internships:

**1. Workload**: Interns often have to juggle our internship responsibilities alongside academic coursework or other commitments. The workload can be unexpectedly heavy, leading to time management challenges and stress.

**2. Skill Gaps**: Interns may encounter tasks or tools that are unfamiliar to them, necessitating a steep learning curve to adapt. Additionally, collaborating with students from other universities may require bridging skill gaps and adapting to different work styles.

**3. Communication Challenges**: Effective communication with supervisors can be challenging for interns, particularly when seeking clarification or feedback on our tasks. Clear and open communication is crucial for a successful internship experience.

**4. Feedback and Evaluation**: Some interns may find it difficult to receive constructive feedback on our performance. This lack of feedback can hinder our personal and professional growth during the internship.

**5. Networking**: Building professional relationships is a key aspect of an internship, but it can be intimidating for introverted individuals or those who are new to the industry. Networking may require stepping out of one's comfort zone.

These challenges are common during our internships time but can also provide valuable learning experiences and opportunities for personal and professional development.

## 2.4. Strength and weakness of the hosting organization

### Strength of the hosting organization

**Workspace**: The company boasts a spacious and well-equipped working environment that fosters productivity and ensures a comfortable setting for its employees.

**Transportation Service**: As a testament to its commitment to employee convenience, the company provides transportation services, making commuting to and from work hassle-free and efficient.

**Full Projects**: Employees are entrusted with complete projects to work on, allowing them to take ownership and demonstrate their expertise in project development from start to finish.

**Job Opportunities**: One notable advantage of the company is its practice of offering job opportunities, often accompanied by recommendations, providing interns and employees a clear and promising career path.

### Weakness of the hosting organization

**Workload**: Interns often contend with heavy workloads, which can be overwhelming when trying to balance internship responsibilities with academic coursework. This can lead to stress and time management challenges.

**Lack of Mentorship**: Organization not offer structured mentorship programs, they leaving us without experienced guides to navigate our roles. This can hinder our professional growth and development.

**Limited Opportunities**: Organization assign tasks that lack substantive content, limiting the enriching experiences we had hoped for. This may affect our overall satisfaction and skill development.

**Inadequate Feedback**: Insufficient or infrequent feedback from our supervisors can hinder us to understanding of our strengths and areas for improvement, impacting our professional development and adaptation to our roles.

# CHAPTER THREE

# 3. Result and Discussion

## 3.1. Result

During my internship, I had the opportunity to work on a diverse set of tasks and projects related to the development of the Omni-Stock system. These tasks encompassed various aspects of software development, ranging from user interface design to database management, security, and user access control. Here, I provide a concise summary of the results from these accomplishments.

**Sidebar and Navbar Implementation**: The successful implementation of the sidebar and navbar components has led to the creation of an impressive dashboard with a variety of dynamic charts and visuals. This visually appealing dashboard is designed to captivate users and provide an engaging and informative experience.

**Login Page Implementation**: The implementation of the login page has resulted in the creation of an efficient and secure login form that is seamlessly connected with the backend. Users can input their credentials, which are then securely processed by the backend for authentication.

**Configuring Database for Product Management**: I developed product management functionalities using a MongoDB server as the backend. This included backend API development for product operations and incorporating product listing, sorting, and filtering options in the form of a table using the backend API.

**Authorization Development**: The implementation of authorization using JSON Web Tokens (JWT) ensures that unauthorized users are denied access to the system. Passwords are securely hashed before being stored in the database, enhancing security and protecting user credentials.

**Role-Based Access:** The implementation of role-based access control ensures that even authorized users are granted access only to pages and functionalities appropriate to their assigned roles. For instance, a store manager cannot access the admin page or dashboard unless their role permits it. This role-based access enhances security and data integrity within the application.

**The implementation of inventory management** functionalities, where store managers can effectively manage inventory related to sales and purchases, along with admin managing inventory transfers between stores, has been accomplished successfully. This ensures efficient inventory control and tracking within the system, optimizing the management of products.

Overall, my internship experience has equipped me with valuable skills and insights into software development, particularly in the context of a product store management system. The accomplishments outlined above highlight the importance of usability, security, and data management in building effective software solutions. These experiences have deepened my understanding of software development best practices and the significance of user-centric design, security measures, and efficient data handling. Overall, this internship has been a valuable learning experience that has prepared me for future challenges in the field of software development.

## 3.2. Discussion

The internship experience has been a pivotal journey in my professional development, offering a wealth of knowledge and hands-on experience in the realm of software development. Each accomplishment during this internship represents a significant milestone, contributing to my growth and understanding of key aspects in this field.

**User-Centric Design**:

The implementation of the sidebar, navbar, and dynamic dashboard underscores the importance of user-centric design. This approach prioritizes the user experience, making navigation intuitive and visually appealing. The captivating dashboard not only enhances usability but also ensures that users engage with the application in an informative and engaging manner.

**Security Measures**:

The development of a secure login page, integration of JSON Web Tokens (JWT), and password hashing highlight the critical role of security in software development. These measures protect user data and credentials, ensuring that unauthorized access is effectively denied. This emphasis on security aligns with industry best practices and is essential in today's digital landscape.

**Efficient Data Management**:

Configuring the MongoDB backend for product management and implementing backend APIs for product operations demonstrate the significance of efficient data management. The ability to list, sort, and filter products seamlessly optimizes data handling within the application. Efficient data management not only enhances user experience but also streamlines core functionalities.

**Role-Based Access Control**:

Role-based access control plays a pivotal role in maintaining data integrity and access management. Restricting user access based on roles ensures that only authorized users can perform specific actions. This granular control enhances security and ensures that users can interact with the system in a manner appropriate to their roles.

**Data Management in Practice**:

The successful implementation of inventory management functionalities, including sales, purchases, and transfers between stores, brings the theoretical concepts of software development into practical use. This accomplishment showcases the real-world impact of effective software solutions in streamlining business processes.

In a broader context, this internship has deepened my understanding of software development best practices and the holistic approach required to create effective software solutions. It has equipped me with a diverse set of skills, from user-centric design and security implementation to efficient data management and practical application of software concepts. As I move forward in my career, these experiences and insights will undoubtedly serve as valuable assets, preparing me to tackle future challenges in the dynamic and ever-evolving field of software development.

## 3.3. Recommendation

**For the hosting organization**

Recommendations for the hosting organization, some of them are based on the mentioned weaknesses:

**1. Workload**: The organization should consider implementing workload management strategies, such as clearly defined tasks and timelines, to help interns balance their responsibilities effectively. Encouraging open communication with interns about their academic commitments can also aid in workload planning.

**2. Mentorship**: To address the lack of structured mentorship programs, the organization could establish a mentorship framework that pairs experienced employees with interns. This mentorship can provide guidance, support, and a platform for interns to seek advice and learn from seasoned professionals.

**3. Opportunities**: The organization should strive to offer interns tasks that provide substantial learning experiences and contribute meaningfully to the organization's goals. Regularly evaluating and enhancing internship project assignments can ensure that interns are exposed to a wider range of skills and experiences.

**4. Feedback**: To enhance feedback, supervisors should establish regular feedback sessions with interns. Providing constructive feedback on strengths and areas for improvement can facilitate interns' professional development and help them adapt more effectively to their roles. A structured feedback process benefits both interns and the organization.

**5. Recommendation Letters**: The organization should be proactive in offering recommendation letters to interns who have completed their assignments successfully. These letters can be invaluable for interns' future career prospects. Customize recommendation letters to highlight the project-based skills interns have acquired and developed during their time with the organization. This personalization can significantly enhance the value of the letters.

**6. Skill-Based Project Assignments**: Before interns begin their assignments, proactively engage with them to identify and understand the specific skills they are keen to develop during their internship. Collaboratively assign projects and tasks that align with these skill development objectives. This approach not only enhances interns' preparedness but also ensures that their internship experience is customized to their skill-building needs.

**For Wolkite University college computing and informatics, Department of Software Engineering**

Wolkite University, College of Computing and Informatics, Department of Software Engineering, should take proactive steps to strengthen its university-industry linkage by following up on the intern program and creating job opportunities for its students, including remote job opportunities both during and after graduation. Additionally, the department should regularly compare its curriculum with that of other universities and assess its alignment with the skills needed by companies in the software industry.

**1. Follow-Up Internship Programs**: The department should establish a structured follow-up mechanism for its intern program. This includes actively seeking feedback from both students and host organizations to evaluate the effectiveness of the internships. Regular follow-up ensures that the internships are providing valuable experiences and addressing any challenges faced by students.

**2. Job Opportunities for Students**: The department should actively collaborate with industry partners to create job opportunities for its students, both during their academic journey and after graduation. This includes exploring remote job options to expand students' access to a wider job market and enhance their employability.

**3. Curriculum Alignment Assessment**: On a periodic basis, the department should conduct a comprehensive review of its curriculum. This review should involve comparing the department's curriculum with that of other universities and assessing its alignment with the skill sets demanded by software companies. Adjustments should be made to ensure that the curriculum remains up-to-date and in sync with industry requirements.

**4. Establish a Robust Internship Program Schedule**: Develop a clear and well-structured internship program schedule that outlines the timelines, objectives, and expectations for both students and host organizations. A robust schedule ensures that internships are integrated seamlessly into the academic calendar and provide consistent learning opportunities for students.

By implementing these recommendations, Wolkite University's Department of Software Engineering can enhance its students' internship experiences, job prospects, and the relevance of its curriculum to the dynamic software industry, ultimately equipping graduates with the skills needed for successful careers.

# Conclusion

In conclusion, the Omni-Stock project has been a significant milestone in my software development journey, providing valuable insights and hands-on experience. The successful implementation of user-centric design elements, stringent security measures, efficient data management, and role-based access control has underscored the importance of best practices in software development. Furthermore, the practical application of data management functionalities has demonstrated the real-world impact of effective software solutions. While facing challenges such as workload management, skill gaps, and communication, I have grown both professionally and personally. As I move forward, these experiences will serve as valuable assets, preparing me for future endeavours in the ever-evolving field of software development. Additionally, recommendations for the hosting organization and the academic department aim to further enhance the internship experience and bridge the gap between academia and industry.

# Reference

https://www.insa.gov.et/web/en