# JAVA DESKTOP ASSIGNMENT

# BUILDING A SOFTWARE MANAGING GOODS RECEIPT AND GOODS DELIVERY OF A GROCERY STORE'S STORAGE

**Class:** SE1401

**Subject:** PRJ311 – Desktop Java Applications

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# ACKNOWLEDGEMENTS

Thanks to the instructions of Mr. Luong Hoang Huong, our group has made a project "Building a software managing goods receipt and goods delivery of a grocery's store storage". To finish this project, our group wants to say thanks to Mr. Luong Hoang Huong for supporting and orientating us.

Although we have tried our best to do the project, it cannot be denied that we may lack of knowledge about coding and programming, and the lack of experience to do the project. That is the reason why this project may contain errors and problems. We hope that we can get feedbacks from teachers to improve the project, hence, to get more experience for the later one.

We sincerely thanks!

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# ABSTRACT

Currently, information technology in our country is changing and developing rapidly, increasingly becoming a leading important field of our country, and weaving throughout our society.

Especially in business, the apply of information of technology has become more and more popular. In the past, all the works had to be done manually which requires lots of paperwork.

Due to the increase of customers' need, Xuan Mai Grocery Store (specializes in wholesaling and retailing grocery and essential goods) in Binh Thuy District, Can Tho City, is in need to build a database to manage the receipt and issue of goods in the warehouse. This project will help that store to build a software (Using Java programming language for coding and Java Swing for designing GUI) in order to avoid wasting of time in managing all the paperwork and enhance the efficiency when managing and making statistics about the product.

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# TERMINOLOGIES AND ACRONYMS

| Terminologies / Acronyms | Definition |
| --- | --- |
| IDE | Integrated Development Environment |
| SQL | Structured Query Language |
| OOP | Object-oriented Programming |
| WORA | Write once, run anywhere |
| JVM | Java Virtual Machine |

*Table 1: List of terminologies and acronyms*

# I.   INTRODUCTION TO THE PROJECT

1. Problem definition

   - There are many fields that are applying information technology into management such as health care, education, banking and retail. The accuracy, quickness and diversity of management functions of management software products help reduce effort and improve work efficiency and gained a lot of achievement. In addition, applying IT in business field is getting more and more popular, especially with all people who are making business. They want to find a method in order to manage all the products easier instead of managing them by paperwork

   - In the past, all these business's transactions are done manually which requires lots of paperwork. This leads to the difficulty of maintenance and increases the possibility of the discrepancies in data. Even data retrieving also becomes hectic with this system. In order to avoid the waste of time and enhance the efficiency when working, a software that can be managed all the products in a store and can have many useful functions such as making statistics about product or managing the status and the availability of the product is really necessary.

2. The history of solving the problem

   - In recent years, the application of using information technology in business is getting more and more popular. There are lots of application that are written in various of programming language and can be used in any platforms such as desktop application, Android application, and web application.
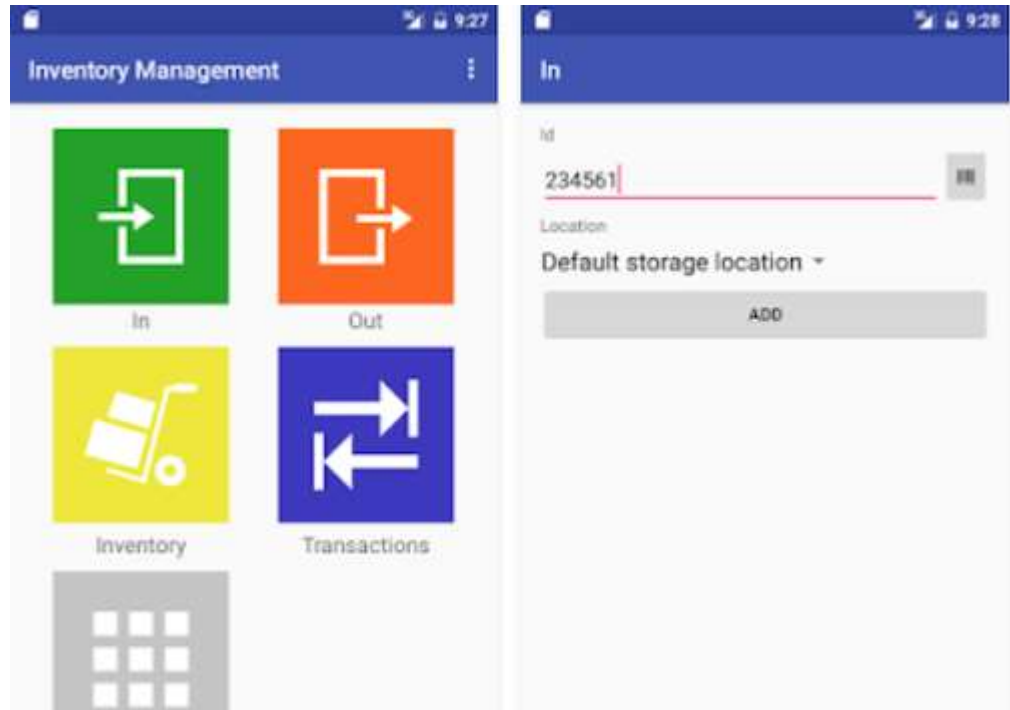
*Picture 1: Application for managing inventory*

*management in mobile platform*

- In reality, there are many applications that have been created for managing storage. However, because of users needs, every application will have their own advantages and disadvantages for each user. That is the reason why this project mainly creates for the business that we have discussed above.

3. The goal of the project

- The goal of the subject is to create a software that containing database and other necessary functions for product's management. By using Java programming language (with NetBeans IDE) as the main coding language for this software and using Microsoft SQL Server software as the program for containing the database (using SQL - Structured Query Language).

- The program allows users to add information of goods, suppliers, information and staff sessions, inventory details and receipt-issue details. Those information can be modified easily by staffs and admin. The project's product is the database named QLKHO. This is the database to manage the warehouse.

- The role of admin is to manage his / her staffs who are currently working in the storage. Moreover, he / she will manage and modify the information of the products and suppliers for the storage. Finally, the admin can make statistics about the availability of the products that are stored in the storage, the information of the staffs who are working in the storage.

- The role of user is to manage the status of the products that are store in the storage. Moreover, they have to check and manage the process of receipt and delivery products in their current working time slot.

- Moreover, from the information that have been stored into the database and import to the Java application, we can export those statistics such as the products' availability and information which are stored in the storage, or the information of the staffs who are currently working in a storage, into Excel file.

4. Objects for researching and the scope of the project
   - The objects for this document are anyone whose are interesting and having passion of using Java Programming Language by NetBeans IDE, using Microsoft SQL Server for management.

   - Using Apache POI library to export the information that have been stored into JTable into Excel file.

- The scope of the project is the base knowledge about how to program desktop application and how to do object-oriented programming (OOP) using Java Programming Language by NetBeans IDE and how to manage database using Microsoft SQL Server. Moreover, the database about the products have been retrieved from the storage of Xuan Mai's Grocery Store.

5. Contents for research
   - The main contents for researching this project:
      - Object - oriented programming with Java

      - Designing GUI with Java Swing

      - Connecting database with Microsoft SQL Server

      - Export information getting from a Java application into Excel files

6. The main contributions of the project
   - About the theory
      - Knowledge of programming with Java programming language

      - Knowledge of object - oriented programming

      - Knowledge of manipulating data on Microsoft SQL Server

      - Knowledge of uploading data from Microsoft SQL Server into the design of GUI (Using Java Swing)

      - Knowledge of exporting information getting from a Java application into Excel files (Using Apache POI library)

   - About the software
      - The software has been installed and tested. It meets practical needs.

7. The layout of the document
    - The document consists of three main parts:
        - Part 1: Introduction to the project
            - Giving problem definition

            - The history of solving problem

            - The goal of the project

            - Objects for researching and the scope of the project

            - Contents for research

            - The main contributions of the project

            - The layout of the document

        - Part 2: Content of the project
            - Giving the problem description

            - Project plan

            - Designing the software based on requirement specification

            - Task sheet

            - Testing and evaluating the software

        - Part 3: Conclusion to the project
            - Giving what it has been done

            - The limitation of the project

            - The later development of the project.

> ➢ Final check list

    o Finally, the layout includes the references

# II.   CONTENT OF THE PROJECT

1. Problem description

    a) Introduction

        o The goal of this section is to provide general information to the reader about the system is based on the functional description of the product so that readers understand the function of each component in the product and to show the relationship between the components in the product

    b) Java Programming Language

        o Java is a general-purpose programming language that is class-based, object-oriented, and designed to have as few implementation dependencies as possible. It is intended to let application developers write once, run anywhere (WORA), meaning that compiled Java code can run on all platforms that support Java without the need for recompilation. Java applications are typically compiled to bytecode that can run on any Java virtual machine (JVM) regardless of the underlying computer architecture. The syntax of Java is similar to C and C++, but it has fewer low-level facilities than either of them. As of 2019, Java was one of the most popular programming languages in use according to GitHub, particularly for client-server web applications, with a reported 9 million developers.
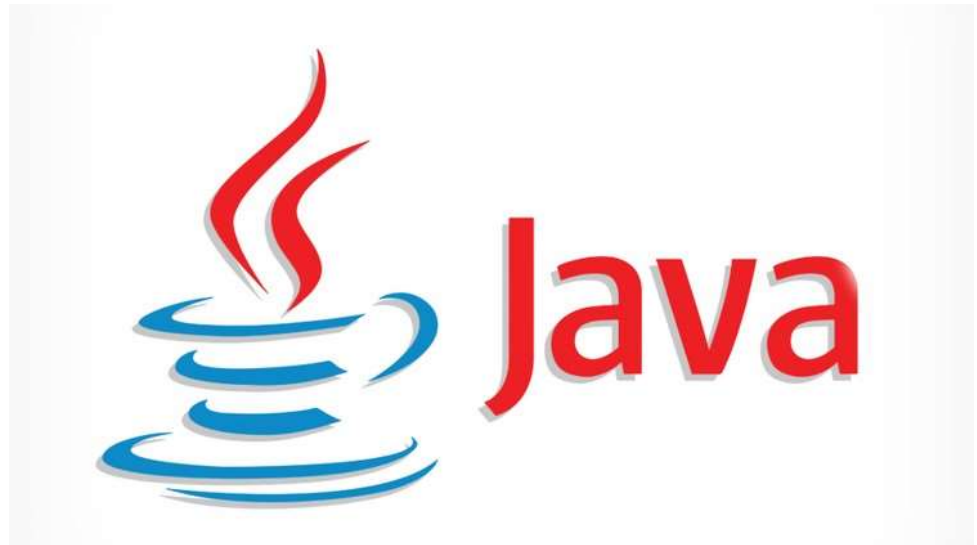
*Picture 2: The logo of Java Programming Language*

c) Microsoft SQL Server

- o Microsoft SQL Server is a relational database management system developed by Microsoft. As a database server, it is a software product with the primary function of storing and retrieving data as requested by other software applications—which may run either on the same computer or on another computer across a network (including the Internet).

- o Microsoft markets at least a dozen different editions of Microsoft SQL Server, aimed at different audiences and for workloads ranging from small single-machine applications to large Internet-facing applications with many concurrent users.

*Picture 3: The logo of Microsoft SQL Server*

d) Apache POI Library

    o The Apache POI Project's mission is to create and maintain Java APIs for manipulating various file formats based upon the Office Open XML standards (OOXML) and Microsoft's OLE 2 Compound Document format (OLE2). In short, you can read and write MS Excel files using Java. In addition, you can read and write MS Word and MS PowerPoint files using Java. Apache POI is your Java Excel solution (for Excel 97-2008). We have a complete API for porting other OOXML and OLE2 formats and welcome others to participate.



*Picture 4: The Apache logo*

e) Context to choose the project

- o Currently in Can Tho, there are many grocery stores, cafes and supermarkets that have used management software, so management software is a potential and attractive topic for students and the IT

- o Due to the increasing in customers' need and increasing in number of goods, so that Xuan Mai grocery store is needing to build a database to manage goods, instead of using traditionally method which was managing those by paperwork.

f) Components in the database description

- o The goods in stock are provided by many different suppliers and each supplier can provide multiple goods. Supplier information includes: Supplier ID, Supplier Name, Supplier Address, Supplier Email and Supplier Phone Number.

- o Each good will have information including: Goods ID, Unit, Name of goods, Date of manufacture, Expiry date and the minimum quantity required in the warehouse of that goods.

- o In a day, there will be different shifts for each employee and multiple employees may work in the same shift in a day. Information on the shift including: Shift order number, Salary of shift, Start time of shift and End time of shift. Employees can check the schedule to know their working time in a day.

- o There will be different goods receipt batches in a day and each batch will have a process manager. Every goods receipt batches, the following details will be stored: Goods receipt ID, Receipt amount, Goods receipt's price, receipt's time and notes of that goods receipt.

- o Similar to goods receipt, there will be different goods issue batches in a day and each batch will have a process manager. Every goods issue

batches, the following details will be stored: Goods issue ID, Issue amount, Goods issue's price, issue's time and notes of that goods issue.

- o In every goods issue, the goods will be delivered to a certain destination and there may be multiple locations for one goods issue. Information of the receiving location including: Location ID, Name of receiving place, Receiving address and Contact phone number at the receiving location.

- o At the receiving location, the goods will be delivered to the customers. Customer information is including: customer ID, customer name and customer phone number.

- o At the end of each day, an employee will take responsibility for stocktaking, and at the same time check the status of existing goods in stock. The information of an inventory is saved as follows: Stock inventory's ID, Goods existing quantity, Stock's status and Good inventory's time.

g) Functional Requirement

- o Manage the process of receipt products and delivery products

- o Modify information of products that are currently in the storage

- o Modify information of suppliers that are currently delivering to the storage

- o Check goods that need to be receipt on the next day (if the remaining good's stock in the inventory at the time of inventory is less than the minimum amount of that goods)

- o Find employee information

- o Check the status of goods based on end of day inventory

o Export information into Excel files

h) Management objectives

    o Managing receipt-issue of goods, goods' consumption and distribution of each type of goods

    o Manage the work of the storekeeper

i) Important output factors

    o The list of items currently in stock

    o Information of products that are currently in the storage

    o Information of suppliers that are currently in the storage

    o List of storekeeper staff currently working

    o Manage the status of the products in the storage at the end of the day

    o Manage the receipt and delivery products processes

    o Export the statistics into Excel files

j) Priority of the functions in the application

    o It can be divided into three levels

        ➢ **High**: The function that has a high priority is the one that plays a really important role, mainly affects to the process of the application. If it has problems, the application will not work.

        ➢ **Average**: The function that has an average priority is the one that plays an important role, if it is not stable, the application will work inaccurately and somehow bring many errors.

> ➢ **Low**: The function that has a low priority is the one that plays a non-important role of the application. If it does not exist, the application still works normally.

2. Project plan

After choosing the topic for the assignment, our group figured out the list of tasks that each member should have done during the project – doing period.

- ✓ Selecting topic for assignment

- ✓ Dividing tasks for each member

- ✓ Preparing document
    - o Making introduction

    - o Making problem description

    - o Making customer requirement specification

    - o Drawing use – case diagram and flowcharts

    - o Thinking and using suitable algorithms

    - o Making unit testing check list

    - o Checking the whole document

- ✓ Coding
  - o Displaying login menu for staffs / admin

  - o Checking login for staffs / admin

  - o Creating methods for adding / updating / deleting products for admin

  - o Creating methods for adding / updating / deleting suppliers for admin

  - o Creating methods for modifying staffs for admin

  - o Creating methods for managing goods receipt for staffs

  - o Creating methods for managing goods delivery for staffs

  - o Creating methods for checking products at the end of the day

  - o Creating methods for exporting statistics into Excel files

  - o Creating test cases for each method

- ✓ Preparing presentation
  - o Checking document and code sample

  - o Presenting

3.  Designing the software based on requirement specification
    a) Software overview
        o  Software functions:
            ➢ Ensuring accuracy, consistency, ease of use, and maintenance requirements.

            ➢ Functions that respond quickly to user requests.

        o  Context:
            ➢ Meet the research requirement and the needs of users

        o  Design:
            ➢ Friendly interface easy to use layout of logical buttons.

            ➢ Icons are suggestive, and the messages are easy to understand.

            ➢ The program is easy to understand and support the upgrade phase

b) Use - case diagram
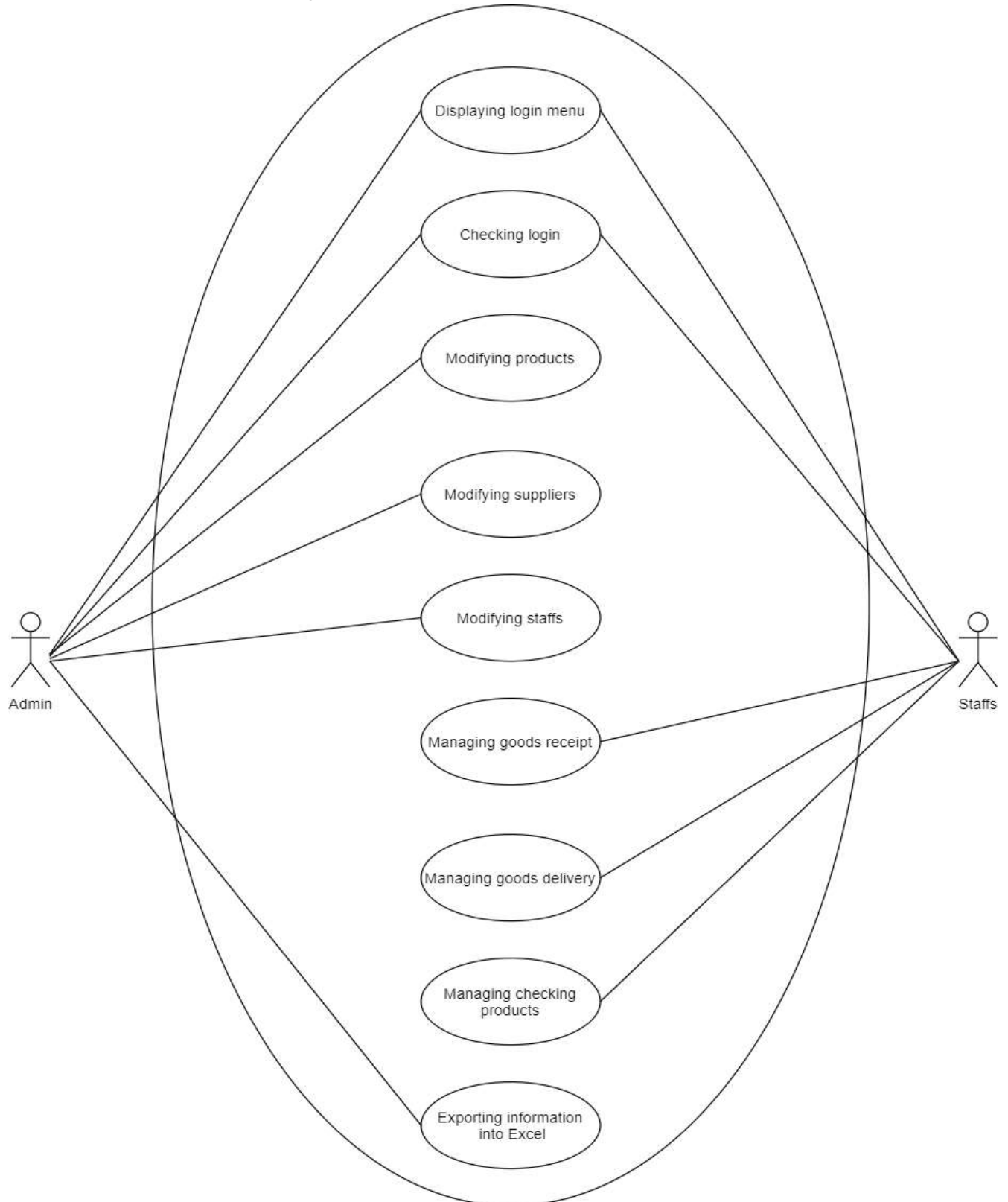


*Picture 5: The use-case diagram*

c) Main functions of the software
   o Displaying login menu for staffs / admin:

| Function's name | Display login menu for staffs / admin |
|---|---|
| Purpose | Login into the application |
| Explanation | When executing the program, the menu will appear and ask for login. Based on user's choice and fill in the login form (username, password), the method will login into the software as admin or staffs. |
| Pre-condition | None |

*Table 2: Display login menu for staffs / admin function*
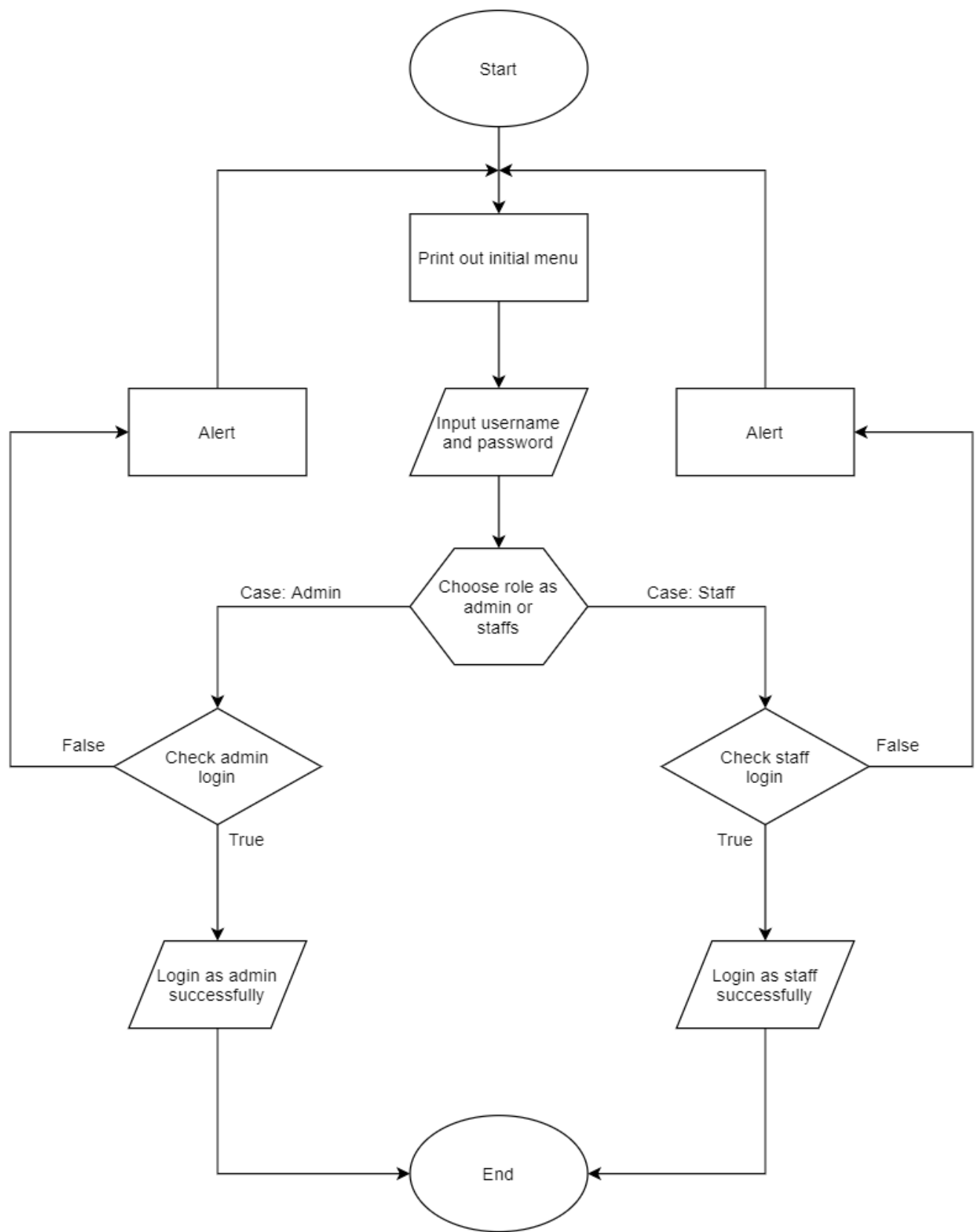
*Picture 6: Login menu flowchart*

o Checking login for staffs / admin:

| Function's name | Check login for staffs / admin |
|---|---|
| Purpose | Login into the application |
| Explanation | When user presses login, the database will check whether the username and the password for login as admin or staffs is correct or not (get the username from the database and the password will be encrypted using MD5 and then will compare with the encrypted string in the database) |
| Pre-condition | Input username and password into fields |

*Table 3: Check login for staffs / admin function*
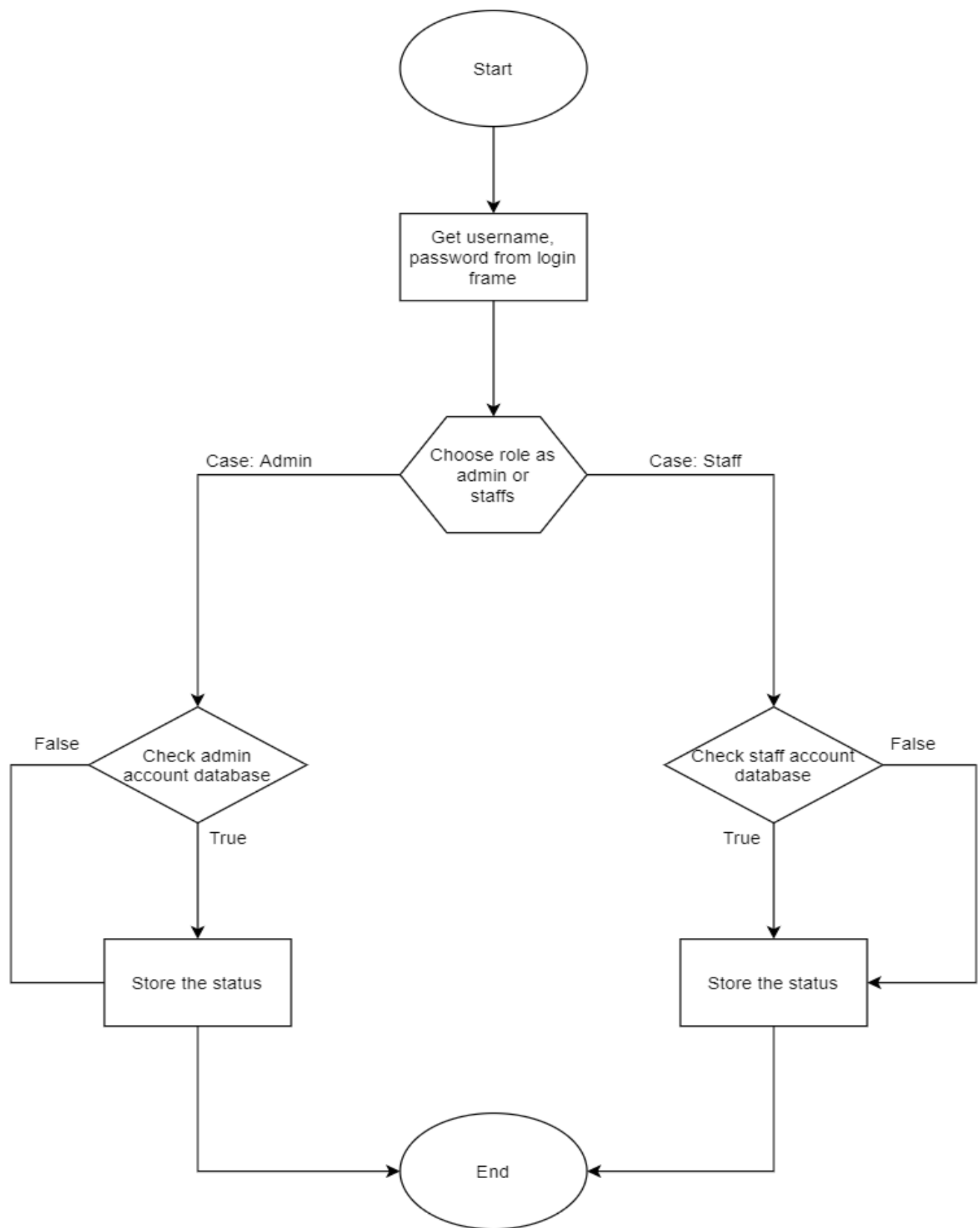
*Picture 7: Check login flowchart*

o Creating methods for adding / updating / deleting products for admin:

| Function's name | Add / Update / Delete products |
|---|---|
| Purpose | Modify the product existing in the database |
| Explanation | In the admin's menu, admin has the permission to add, update, and delete product based on the information in the database stored. When executing, return the result for the admin about the status of the method that user has chosen to modify the products in the database. |
| Pre-condition | Login as admin successfully |

*Table 4:* Modify *the products function*
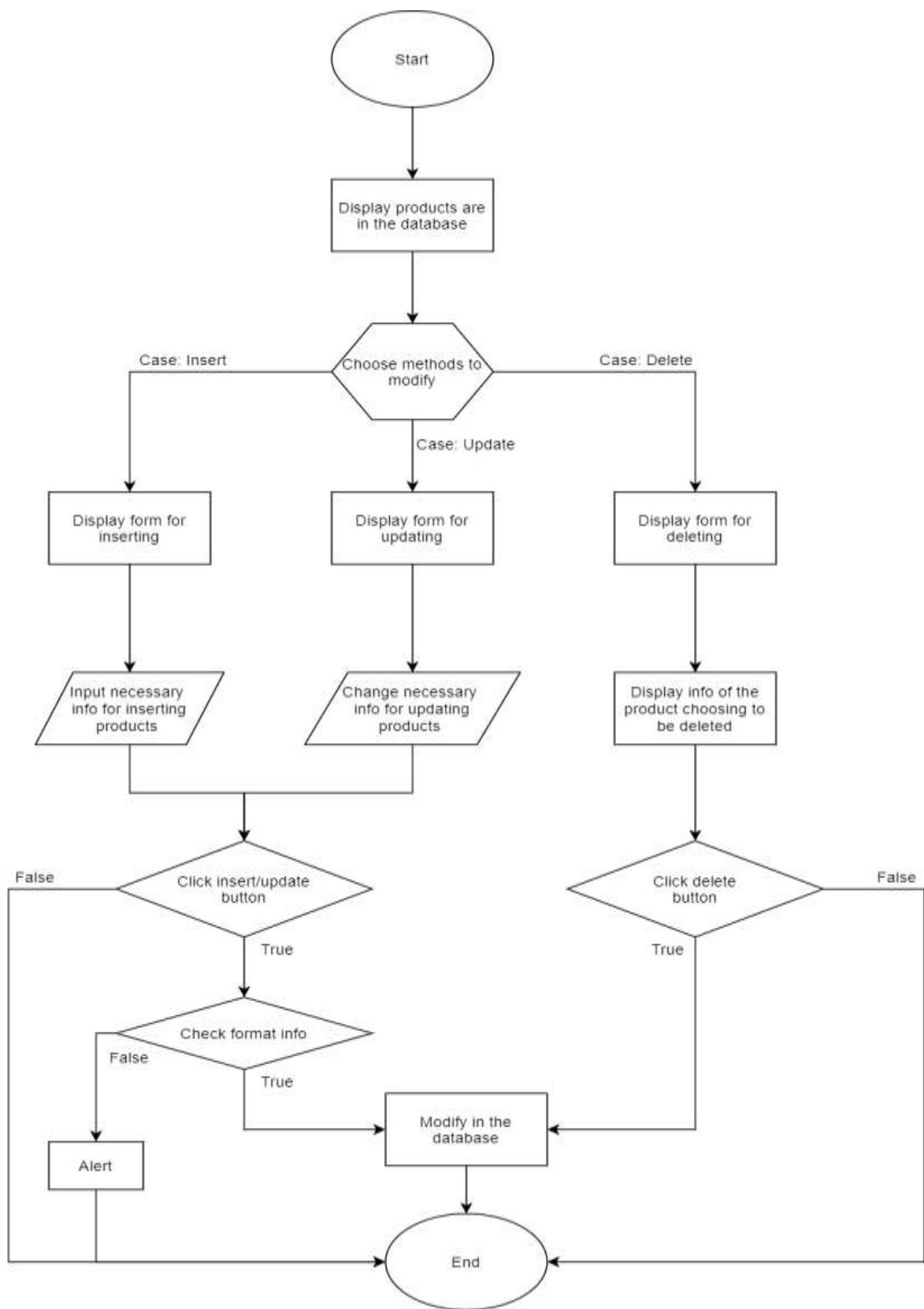
*Picture 8: Modify product flowchart*

o   Creating methods for adding / updating / deleting suppliers for admin:

| Function's name | Add / Update / Delete suppliers |
|---|---|
| Purpose | Modify the suppliers existing in the database |
| Explanation | In the admin's menu, admin has the permission to add, update, and delete suppliers based on the information in the database stored. When executing, return the result for the admin about the status of the method that user has chosen to modify the suppliers in the database. |
| Pre-condition | Login as admin successfully |

*Table 5:* Modify *the suppliers function*
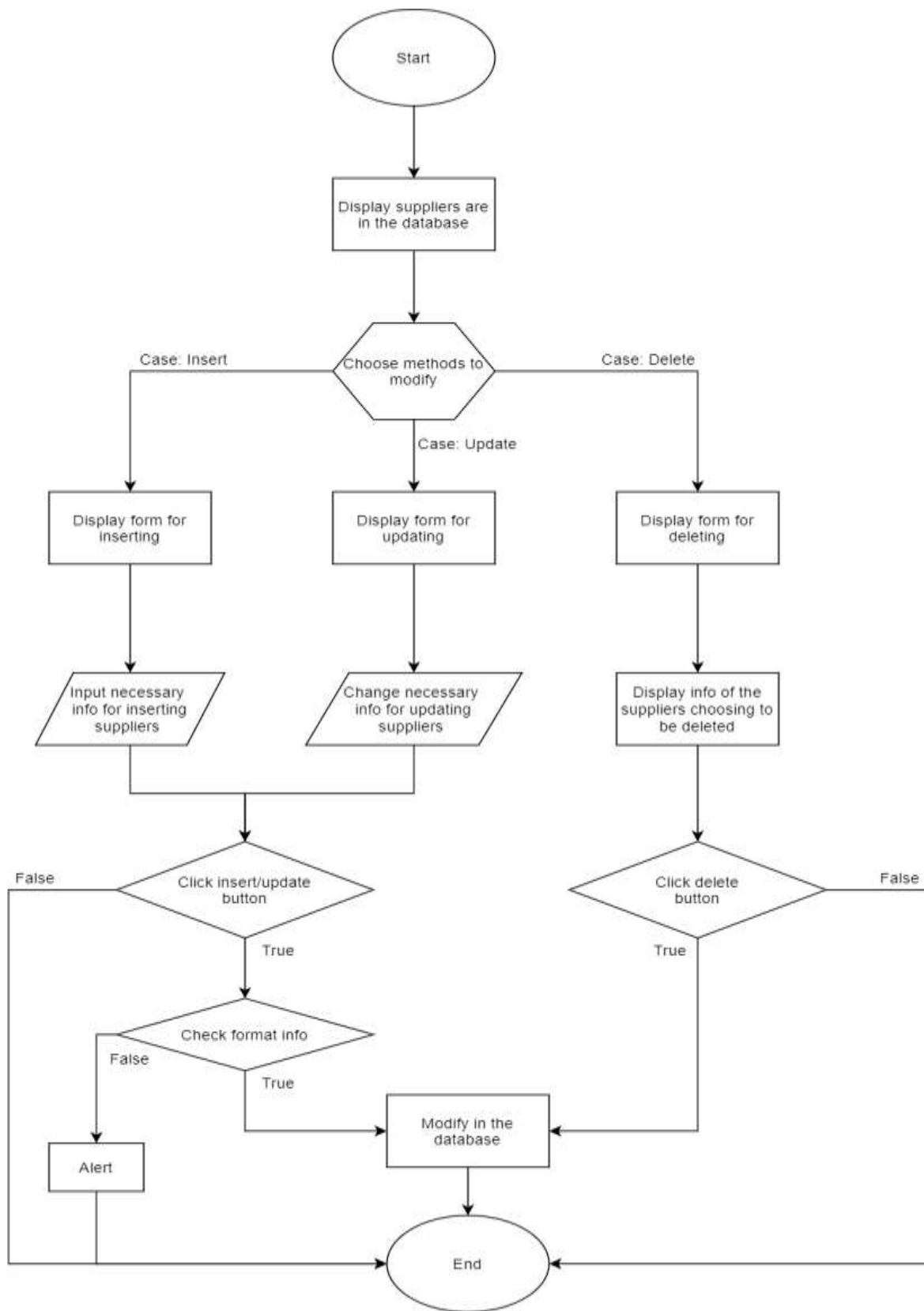
*Picture 9: Modify suppliers flowchart*

o Creating methods for modifying staffs for admin

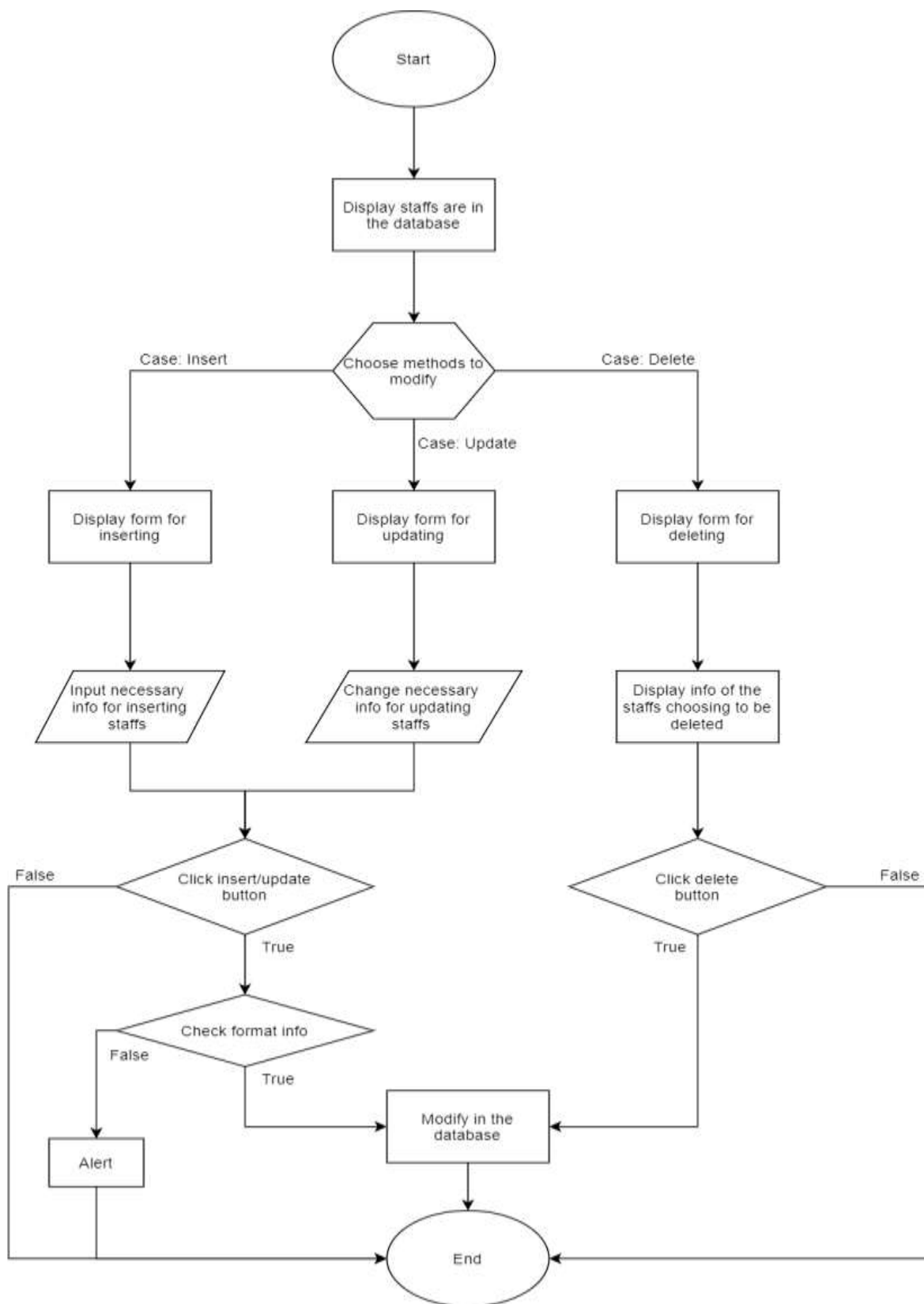| Function's name | Modify staffs |
|---|---|
| Purpose | Modify the staffs existing in the database |
| Explanation | In the admin's menu, admin has the permission to add, update, and delete staffs based on the information in the database stored. When executing, return the result for the admin about the status of the method that user has chosen to modify the staffs in the database. |
| Pre-condition | Login as admin successfully |

*Table 6: Modify staffs function*

*Picture 10: Modify staffs flowchart*

o Creating methods for managing goods receipt for staffs:

| Function's name | Manage goods receipt for staffs |
|---|---|
| Purpose | Manage the process of goods receipt and store into database |
| Explanation | In the staff's menu, staff has the permission to manage the goods receipt. When executing, return the result for the staff about the status of the goods receipt process. |
| Pre-condition | Login as staff successfully |

*Table 7: Manage goods receipt function*
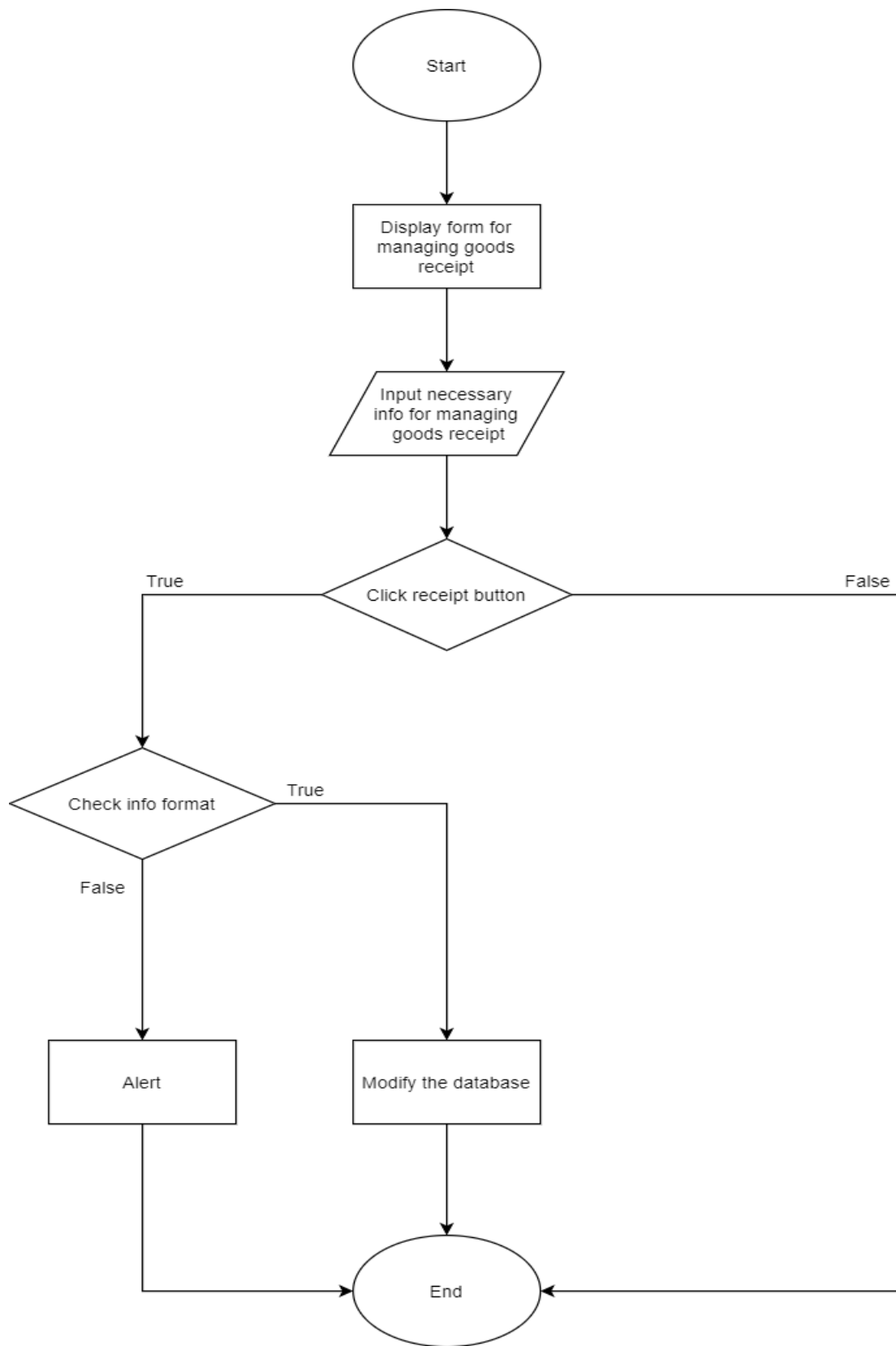
*Picture 10: Manage goods receipt flowchart*

o Creating methods for managing goods delivery for staffs:

| Function's name | Manage goods delivery for staffs |
|---|---|
| Purpose | Manage the process of goods delivery and store into database |
| Explanation | In the staff's menu, staff has the permission to manage the goods delivery. When executing, return the result for the staff about the status of the goods delivery process. |
| Pre-condition | Login as staff successfully |

*Table 8: Manage goods delivery function*

*Picture 11: Manage goods delivery flowchart*

o Creating methods for checking goods for staffs:

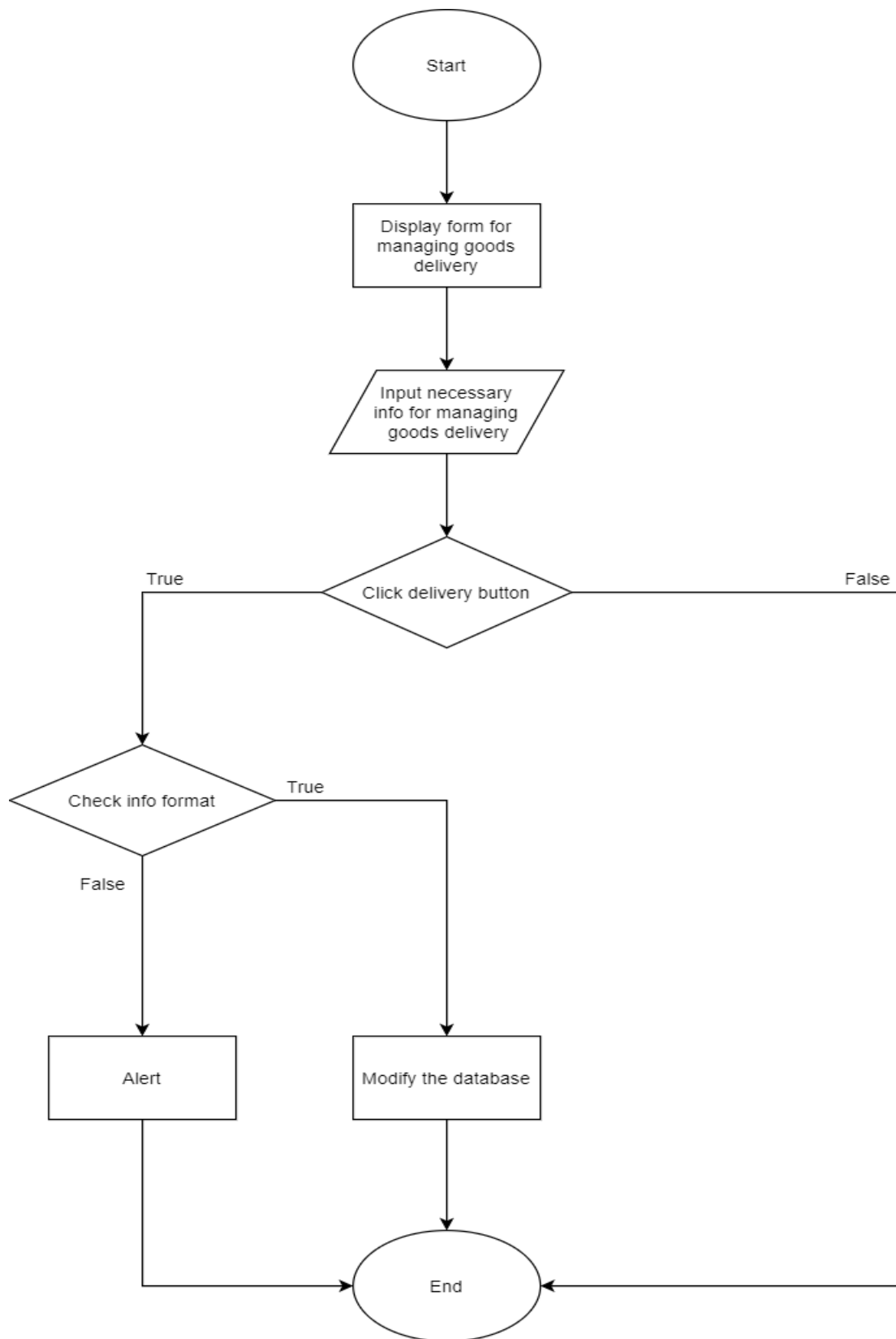| Function's name | Manage checking goods for staffs |
|---|---|
| Purpose | Manage the remaining of goods stored into database |
| Explanation | In the staff's menu, staff has the permission to check the products. When executing, return the result for the staff about the status of the goods checking process. |
| Pre-condition | Login as staff successfully |

*Table 9: Manage goods checking function*
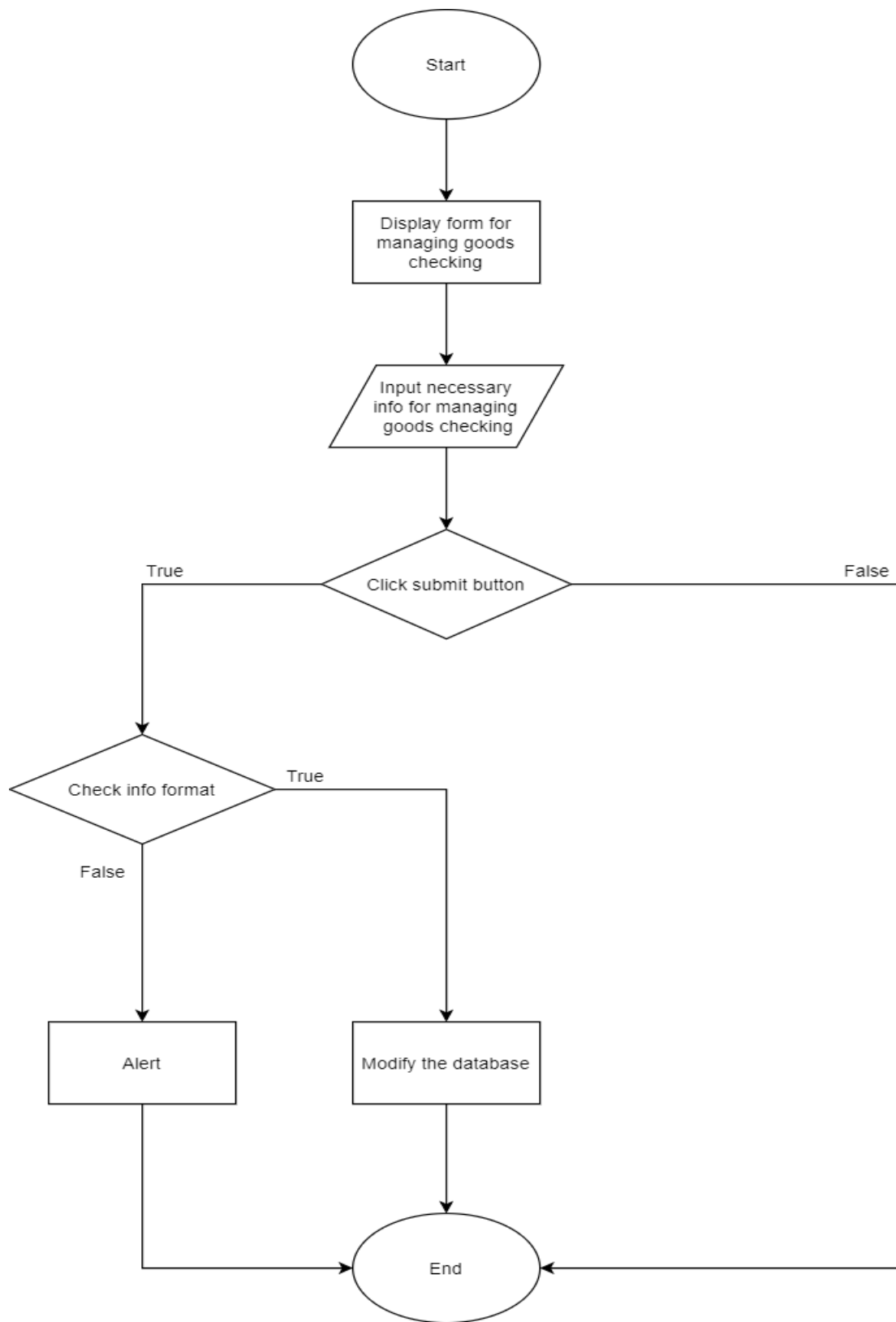
*Picture 12: Manage goods checking flowchart*

o Creating methods for exporting information to Excel:

| Function's name | Export information into Excel |
|---|---|
| Purpose | Export the information into Excel file |
| Explanation | In the admin menu, admin has the permission to export information into Excel file |
| Pre-condition | Login as admin successfully |

*Table 10: Export to Excel function*
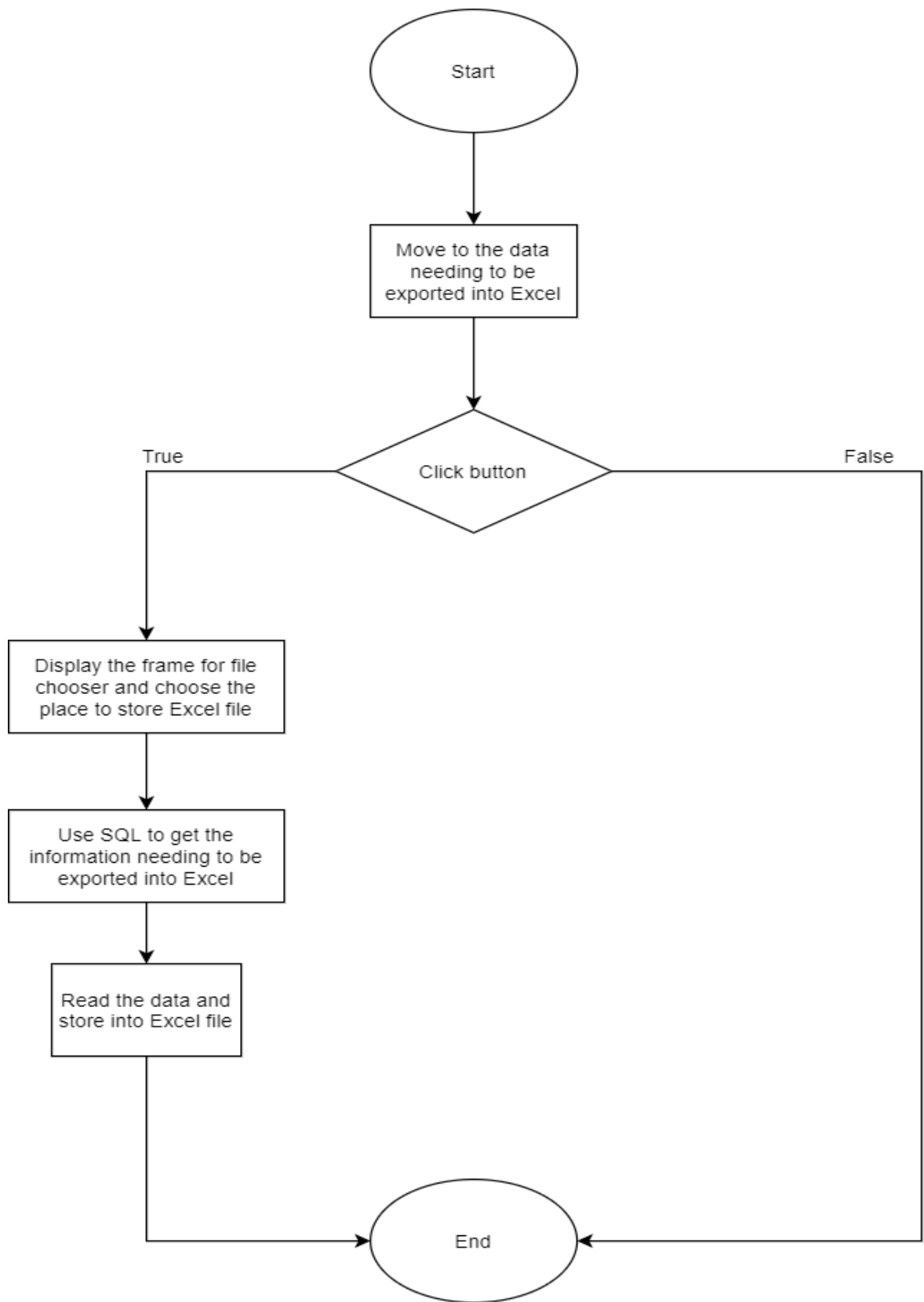
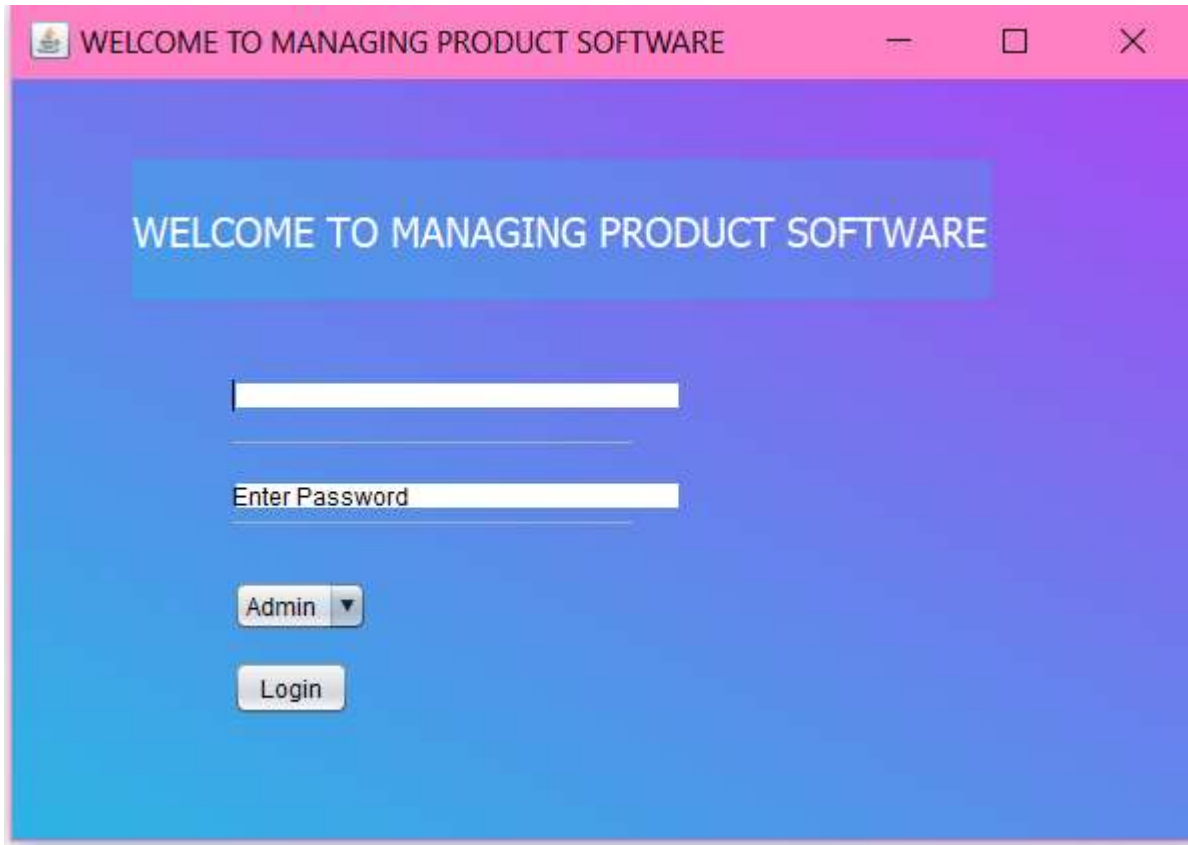*Picture 13: Export to Excel flowchart*

*Picture 14: Login GUI of the software*

4. Task sheet

The following table would specifically describe the plan for this project as well as tasks division for each member in the group.

| SN | Task | Person in charge | Start date | End date | Note |
|----|------|------------------|------------|----------|------|
| 1 | Selecting topic for assignment | All members | 19/02/2020 | 19/02/2020 | |
| 2 | Dividing tasks | Nghĩa | 26/02/2020 | 26/02/2020 | |
| 3 | Making project's introduction + problem definition (document) | Vinh | 26/02/2020 | 27/03/2020 | |
| 4 | Making project's customer requirement specification (document) | Thuận | 26/02/2020 | 27/03/2020 | |
| 5 | Drawing use – case diagram and flowcharts (document) | Thuận + Nghĩa | 26/02/2020 | 27/03/2020 | |

| 6 | Thinking and using suitable algorithms (code) | All members | 26/02/2020 | 27/03/2020 | |
|---|---|---|---|---|---|
| 7 | Displaying menu for staffs / admin (code) | Vinh | 26/02/2020 | 27/03/2020 | |
| 8 | Creating methods for adding / updating / deleting products for admin (code) | Nghĩa | 26/02/2020 | 27/03/2020 | |
| 9 | Creating methods for adding / updating / deleting suppliers for admin (code) | Vinh | 26/02/2020 | 27/03/2020 | |
| 10 | Creating methods for managing goods receipt for staffs (code) | Thuận | 26/02/2020 | 27/03/2020 | |
| 11 | Creating methods for managing goods delivery for staffs (code) | Thuận | 26/02/2020 | 27/03/2020 | |
| 12 | Creating methods for checking products and exporting to Excel | Thuận | 26/02/2020 | 27/03/2020 | |
| 13 | Creating test cases for each method (code + document) | Thuận + Nghĩa | 26/02/2020 | 27/03/2020 | |
| 14 | Preparing document | All members | 26/02/2020 | 27/03/2020 | |
| 15 | Checking document and code sample (presentation) | All members | 26/02/2020 | 27/03/2020 | |
| 16 | Preparing presentation | All members | 26/02/2020 | 27/03/2020 | |
| 17 | Presenting | All members | N/A | N/A | |

*Table 11: Task sheet*

5. Unit testing check list

| SN | Check task | Expected Result | Status | Note |
|---|---|---|---|---|
| 1 | Display the initial menu, staff's menu and admin's menu | True | Passed | |
| 2 | Input correct password for admin and staffs | True | Passed | |
| 3 | Modify products | True | Passed | |
| 4 | Modify suppliers | True | Passed | |
| 5 | Display goods receipts information | True | Passed | |
| 6 | Display goods delivery information | True | Passed | |
| 7 | Display the check of products in the database | True | Passed | |
| 8 | Input wrong username or wrong password when login | False | Passed | Alert user |
| 9 | Input wrong format of price | False | Passed | Alert user |
| 10 | Input wrong format of phone number | False | Passed | Alert user |

| 11 | Input wrong format of email | False | Passed | Alert user |
|----|------------------------------|-------|--------|------------|
| 12 | Input wrong format of quantity | False | Passed | Alert user |
| 13 | Miss fields when inputting product | False | Passed | Alert user |
| 14 | Input NULL at non-NULL fields | False | Passed | Alert user |
| 15 | Login with SQL injection method | False | Passed | Alert user |

*Table 12: Unit testing check list*

# III. CONCLUSION TO THE PROJECT

1. Project review and monitoring report
❖ General review

➢ Our group has basically completed the project with the support of all group's members and the instruction of teacher.

➢ All members try their best in order to complete given tasks, although there are many difficulties when doing the project.

➢ There are still many issues in both coding and making document that our group has not finished fixing yet.

➢ Advantages

• All members support each other to finish the task

• Each member has their own strengths to do the suitable tasks.

➢ Disadvantages

• Due to some members are not good at code or not good at preparing document, the given tasks are somehow inequal to members.

• Our group started at the end of the deadline, so all the tasks cannot be fully completed and checked before presenting.

❖ Project report

  ➢ Document

    • All of members have participated in making document.

    • All the given tasks from the project has been approximately approached.

    • Diagrams have been drawn basically but not fully functional completed.

    • The document has been checked carefully before submitting and presenting.

  ➢ Code

    • The code is mainly done by one member, others supported.

    • The code's structure is not well-organized.

    • The code is not well-optimized

    • The code is not well-designed

2. The later development of the project

  ❖ In the future, we will maintain the application so that the process of management will be easier

  ❖ We would also add some more features to the project such as alerting the needs of products or calculating total amount of money using in a fixed time.

3. Final check list

| SN | Task | Person in charge | Status | Evaluation | Note |
|---|---|---|---|---|---|
| 1 | Selecting topic for assignment | All members | Finished | 100% | |
| 2 | Dividing tasks | Nghĩa | Finished | 80% | |
| 3 | Making project's introduction + problem definition (document) | Vinh | Finished | 80% | |
| 4 | Making project's customer requirement specification (document) | Thuận | Finished | 80% | |
| 5 | Drawing use – case diagram (document) | Thuận + Nghĩa | Finished | 70% | |
| 6 | Thinking and using suitable algorithms (code) | All members | Finished | 80% | |
| 7 | Displaying menu for staffs / admin (code) | Vinh | Finished | 90% | |
| 8 | Creating methods for adding / updating / deleting products for admin (code) | Nghĩa | Finished | 70% | |
| 9 | Creating methods for adding / updating / deleting suppliers for admin (code) | Vinh | Finished | 70% | |
| 10 | Creating methods for managing goods receipt for staffs (code) | Thuận | Finished | 80% | |
| 11 | Creating methods for managing goods delivery for staffs (code) | Thuận | Finished | 80% | |
| 12 | Creating methods for products checking (code) | Thuận | Finished | 80% | |
| 13 | Creating test cases for each method (code + document) | Thuận + Nghĩa | Finished | 70% | |
| 14 | Preparing document | All members | Finished | 70% | |
| 15 | Checking document and code sample (presentation) | All members | Finished | 70% | |
| 16 | Preparing presentation | All members | Finished | 70% | |
| 17 | Presenting | All members | N/A | | |

*Table 13: Final check list*

# REFERENCES

1. Wikipedia: Java (programming language)
   Link: *https://en.wikipedia.org/wiki/Java_(programming_language)*

2. Wikipedia: Microsoft SQL Server
   Link: *https://en.wikipedia.org/wiki/Microsoft_SQL_Server*

3. Stack Overflow: Export JTable in excel file
   Link: *https://stackoverflow.com/questions/22560566/export-jtable-in-excel-file*

4. Apache POI - the Java API for Microsoft Documents
   Link: *https://poi.apache.org*

5. Flaticon - Free vector icons
   Link: *https://www.flaticon.com*