FURNITURE E-COMMERCE APPLICATION

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1. Introduction

1.1 What the Problem is

Todays, with the proliferation of online shopping, the scope of products that users purchase online is expanding. Furniture which is also added and can be considered new in online shopping is one of these products. It can be said that the number of funiture applications is not enough compared to other e-commerce products.

The user/customer wants to be able to view its sizes, color options, model options, price and some other features to determine the suitable one for his/her home/office while he/she is shopping in a furniture application. However, potential customer wants to be able to read the opinions of users who have purchased this product before, or vice versa, the user/customer wants to share opinions with potential customers about the product that he/she have purchased.

1.2 Goals for the Project

This project is being developed as semester assignment to improve our object oriented program writing for CME 2210 Object Oriented Analysis and Design class in Dokuz Eylul University Engineering Faculty .

Online shopping is a trend that changes and mobilizes people's shopping habits. In this project, we aim to create an application which sells house and office furnitures online. It is an application of store that contracted with many brands. Development of the project is planned in Java programming language and the project itself will work on Android system.

The term end-user addresses individuals with mostly beginner or intermediate level technical knowledge. All of the features that are planned for the application will be developed according to this audience. With the development of modern production techniques and factories, variety of the furniture keeps growing. One of the effects of this growth is expansion of furniture usage areas like houses, offices, restaurants, coffee shops and even modern interior design. This expansion causes more furniture demand in the market.

This project will be targeting to provide more resource and reduce unoccupied demands in the industry.

1.3 Stakeholders

When it comes to software, various stakeholders can actuallybe mentioned. The most important stakeholders may be furniture company owners and managers. When the software is finished, they will want to know every detail about the project. We plan to inform them step by step about the project with all details. Besides, of course, the stepsto be followed will be talked about.

Company owners and managers will be informed that the project was developed to meet all the expectations of a customer while it is being developed. They will be affected when they see that our application provides every convenience an online shop of customer expect from an application. In addition, much attention will be paid to the project being easily understandable and operable. Thus, company employees will be able to easily solve software problems and make necessary updates quicly. So the company minimizes the level of energy, time and money loss.

Another stakeholders are customers and so important that satisfying their expectations. Instead of visiting huge stores/companies for hours, customers can quickly purchase furniture from their homes via mobile application. They will have to chance to imagine the furniture they see in their homes and choose the right one more comfortably and get them in a short process. This opportunity and comfort also makes them very pleasure.

1.4 Motivation for the Project

Along with the increasing demand for online shopping, the demand for furniture online shopping is increasing. Many furniture companies also want to startselling online. In parallel, furniture companies that started online sales are looking for a better system and mobile application. In order to close this gap in the market, such an e-commerce, the mobile application will attract a lot of attention. Furniture company owners will not be able to say no to an application that is easy to operate, understand and maintain.

In addition, since the project team consists of responsible and hard working people, the project will proceed quickly and smoothly and will achieve a successful result.

1.5 Process Flow Preview

First of all, we planned how the regular process will proceed as a team. The work can be followed up by the whole team and the communication is continuous. It was decided to meet frequently or to conduct online interviews. However, it was decided to actively use GitHub during the sofware development period.

As a first step, we have determined the examination and requirements of existing furniture e-commerce websites and mobile applications. After the needs have been determined, we started making the plans. While planning our structure, we paid attention to be object oriented as much as possible and the structures to be used are effective. In the process ,we tried to use suitible structures that would not cause any problems, considering that some changes, additions or removals might be required in the initial plan.

Knowing that various changes can be made in the process,we tried to plan the processcompletely. Our plan continues by repeating itself and renewing itself so far.

2. Analysis and Design

2.1 Plan for Requirements Engineering

Inception Task:

As a first step to starting a project, we have identified some questions as a team. While determining these questions, expectations , questions of of a customer / user / stakeholders, we considered which needs the software would meet and for which industry it was developed.

- What should be the basic operations of the project, what should the product reveal?
- Who are our target audience?
- For which environment will the software be developed?
- What can we add extra to the project apart from its basic functions, what should we add?
- What other features should be provided in the project? (performance, security etc.)

Elicitation Task:

The next step after the questions is to identify the problems that we may encounter in the project, to produce solutions to them in order and to find answers to some questions we asked in the previous step. In addition, to determine the target audience and potential stakeholders of our project.

Elaboration Task:

Various researches were conducted in line with the questions identified, some people were spoken, and the process of the project was planned. Some scenarios were created in line with the project and solutions were offered based on these scenarios. Necessary classes and functions were determined in the software section, the required attributes of the classes and how the functions affect each other were planned.

Negotiation Task:

Requirements are listed in order of importance and the first steps we will put into action are determined. When determining these, attention was paid to be within the time and energy savings.

Specification Task:

The specification template of the project has been created, product features, user classes / characteristics, safety and security requirements, quality attributes and
what interfaces are to be used with this software determined. It was decided which operating environment the project would be developed for. To visualize the project
some models were created.

Validation Task:

As it was nearing the end, the plans made so far were reviewed with the team, wrong or missing parts were arranged. The process has been made clear with all the requirements and objects.

Requirements Management:

The possible changes that may occur in the project process regarding the requirements are taken into consideration. It was decided to proceed in a way not to lose time during the changes to be made. Requirements Management will occur throughout the project process flow as changes or alterations can occur under any circumstances.

2.2 Functional Requirements

Hardware Requirements:
The project is being developed to simulate an online furniture selling application on Android operating system, all it takes is an Android operating system smartphone or tablet with internet access.

Application Interface Tasks:
The system contains two actors: User (a.k.a. end-user) and Admin. So there are some Interfaces for both actors:

USER:
- Login
- Add Address
- Address List
- Search Product(Product List)
- Product Details
- Cart View
- Favorites View
- Create Order
- Show Order
- Show Invoice
- Update Details
- Category List

ADMIN:
- Add Product
- Add Campaign
- Add Coupon
- Update Order

Although many intterfaces are visible, some will have the same look.

Software Tasks:

It will contain some of the very common features of an e-commerce application.

- User Registration & Logging In
- CRUD Actions for User Attributes
- Multiple Address Implementation per User
- Product Cart
- Product Categorizing & Brand-Based Filtering
- Order & Invoice Generation
- Invoice Taxation
- Commenting & Rating on Products

To increase product value, following additional features planned to be implemented:

- Favorite Product Listing
- Product-Based Discount Campaigns
- Category-Based Discount Coupons
- Multi-Material Products
- User Product Browsing History

Even though these features are also common in similar applications, it is not a requirement to develop these additional features.
All of the features will be available to execute on visualized activities and an end-user will be able to use the final product.

Structures Requirements:

The whole structure of the project is planned to contain 21 base classes:

- 20 Model & Relation Classes
- 1 Interface
- 1 Abstract Class

Since the application will be developed for Android OS, additional class requirements expected to occur in the development progress in order to manage application logic and screens (activities).
This version of the document contains classes that are only planned to produce product value.

All of the project expectations given by superiors, which are:

- Fulfilling OOP Structure Default Requirements
- Usage of Inheritance
- Usage of Polymorphism
- Usage of Encapsulation
- Usage of Data Structures: List, Queue and Stack

will be met without an exception.

Project will be developed in Java programming language in Android Studio development environment.
Data structures like List, Queue and Stack will not be developed from scratch. They will be implemented from Java default packages.

No additional external libraries planned to be used.

Development progress is planned to be finalized due end of 2019-2020 Spring semester.

Additional details about requirements can be found further in this document.

REQUIREMENT	*SOLUTION*
-Tool	-Android Studio
-Encapsulation Principle	-All classes are designed in Encapsulation principle.
-Polymorphism	-Method overloading: class constructures, -Method overwriting: product display methods.
-Inheritance	-Absturact product class is distributed to children products classes. The products with material will implement Materialable interface.
-List	-One-to-many and many-to-many relations between instances, photos of products.
-Stack	-To store last visited products.
-Queue	-Invoice list for user.

2.3 Non Functional Requirements

Performance Requirements:

- ✓ Customers can quickly find the products or categories they are looking for in different ways
- ✓ The customers can login quickly, the order and payment process is fast and smooth
- ✓ Easy to maintain
- ✓ Speedy performance / transmission of data
- ✓ Ability to work with the same efficiency on different Android devices

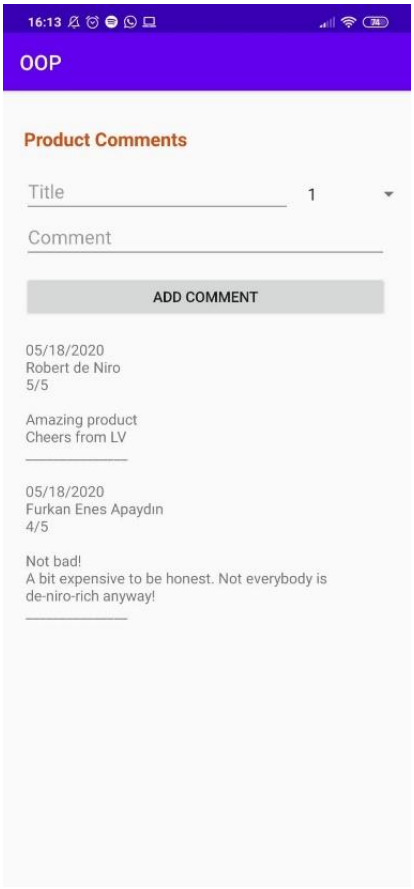
Security Requirements:

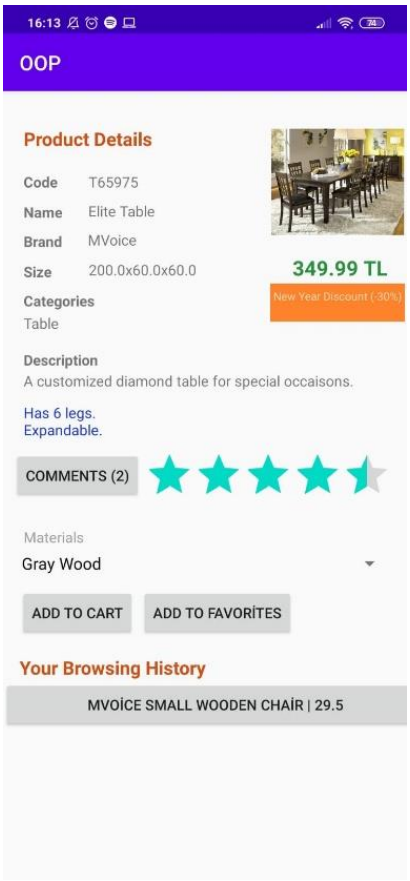
- ✓ Validation layers during login
- ✓ Customer information is kept confidential and not shared outside the relevant people / institutions
- ✓ Failure to access the user or admin account with incorrect login information

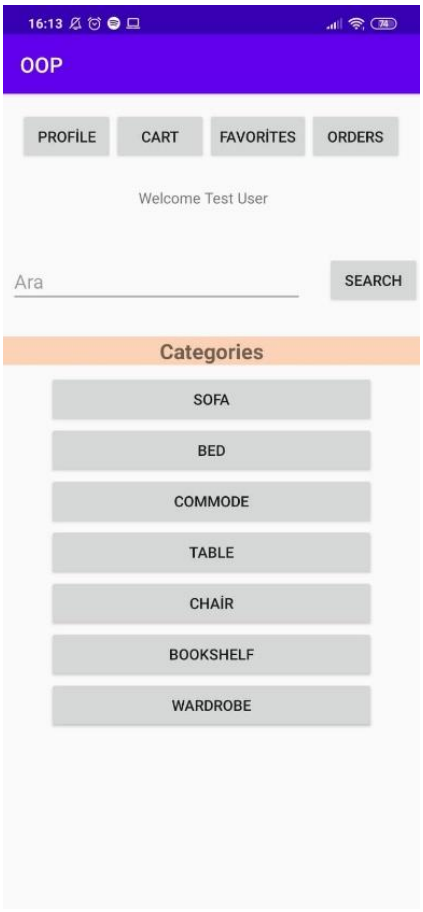
Quality Attributes:

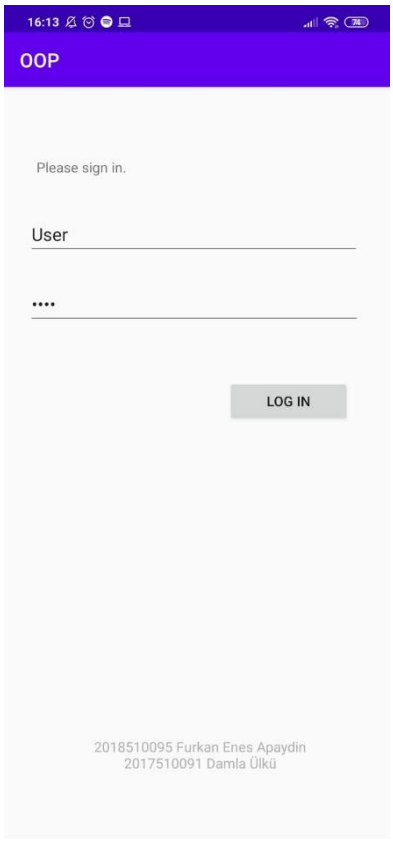
- ✓ Simple and stylish appearance
- ✓ Easy to see and use navigation
- ✓ Maintain readable content
- ✓ Search and payment options for logged-in people

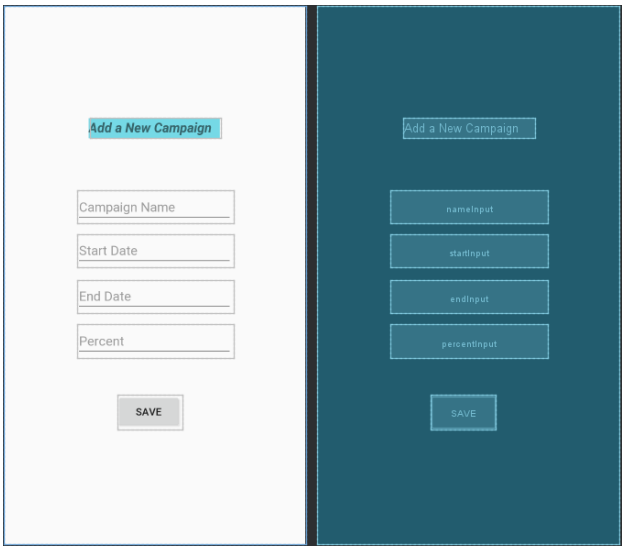
Screenshot Mockups:

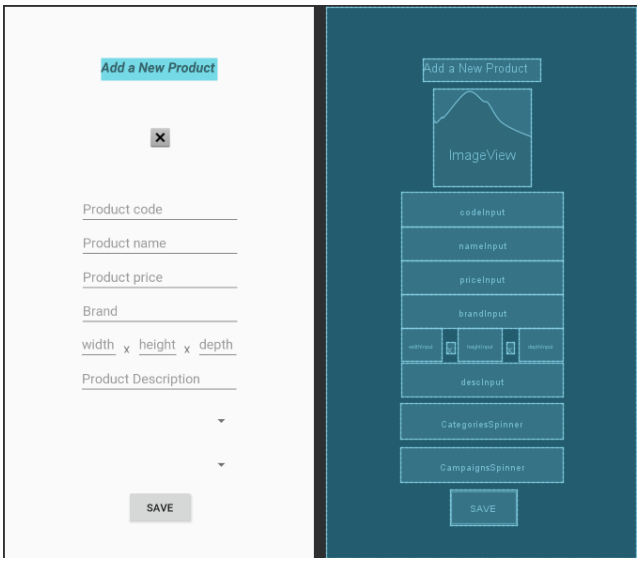




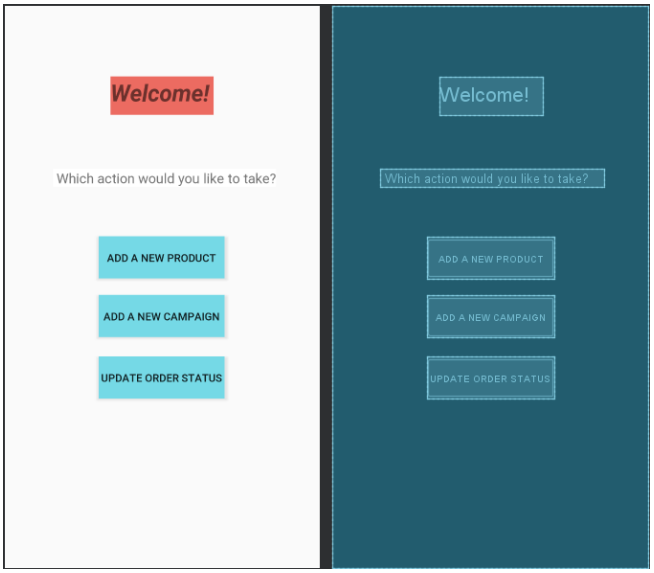



16:13
OOP
Please sign in.
User
••••
LOG IN
2018510095 Furkan Enes Apaydin
2017510091 Damla Ülkü


Add a New Campaign
Campaign Name
Start Date
End Date
Percent
SAVE
Add a New Campaign
nameInput
startInput
endInput
percentInput
SAVE


Add a New Product
Product code
Product name
Product price
Brand
width x height x depth
Product Description
SAVE
Add a New Product
ImageView
codeInput
nameInput
priceInput
brandInput
descInput
CategoriesSpinner
CampaignsSpinner
SAVE


16:13
OOP
Edit Profile
Test
User
5556667788
test@ceng.deu.edu.tr
SAVE


Welcome!
Which action would you like to take?
ADD A NEW PRODUCT
ADD A NEW CAMPAIGN
UPDATE ORDER STATUS
Welcome!
Which action would you like to take?
ADD A NEW PRODUCT
ADD A NEW CAMPAIGN
UPDATE ORDER STATUS

2.4 Use Cases

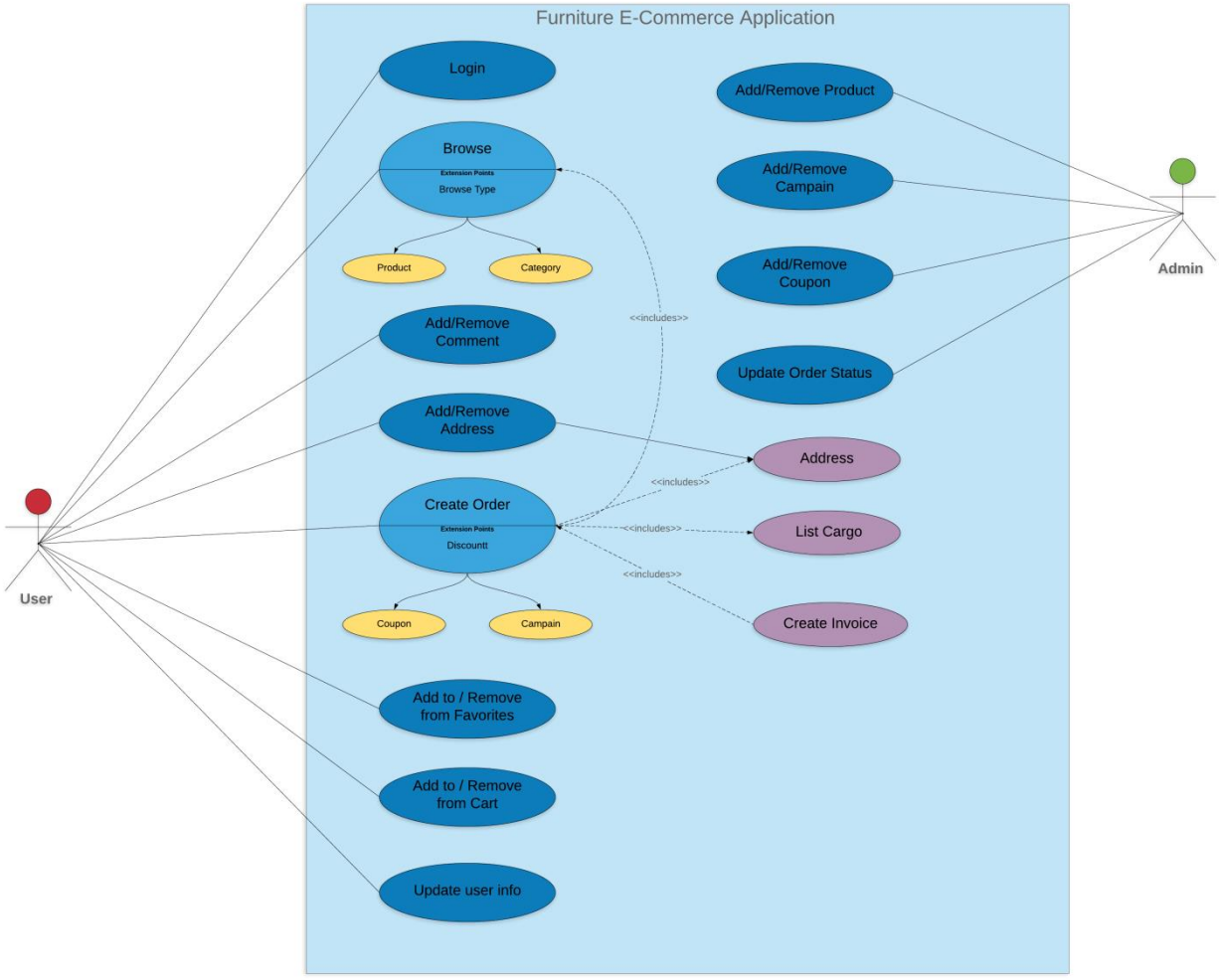
Use Case #1: ***Creating Order***
Primary Actor: User
Goal in Context: To create orders with the products in the user's cart
Preconditions: User has added products to her/his package and wants to buy them
Trigger: The user has information about the products in the basket and the total price of the cart.
Scenario:
1. User: Log in to application by entering correct username and password.
2. User: Search for products he/she wants to buy and adds them to the cart.
3. User: Confirm the cart and proceed to the payment step.
4. User: If there is coupon/campaign fort his order, fee is reduced and confirm the order.
Exceptions:
1. User Username/Password incorrect: User is sent to main page to reenter credentials
2. There is no such coupon: There is no discount on the total price, the user tries another code
3. Order disapproved: User is sent to the payment page
Frequency of use: Couple times per day/ week
Channel to actor: Furniture E-Commerce Application
Secondary Actors: Admin and company managers
Channels to Secondary Actors:
1. Furniture E-Commerce Application
2. Phone/E-mail
Open Issues:
1. How many days can the user cancel the order after confirming?
2. How many days can the user change the delivery address after confirming the order?
3. How many days can the user return / exchange after receiving the order?
4. How much time does the Car Renter have on their account before an amount of time has passed before the system automatically logs them out due to inactivity?

Use Case #2: ***Update Order Status***

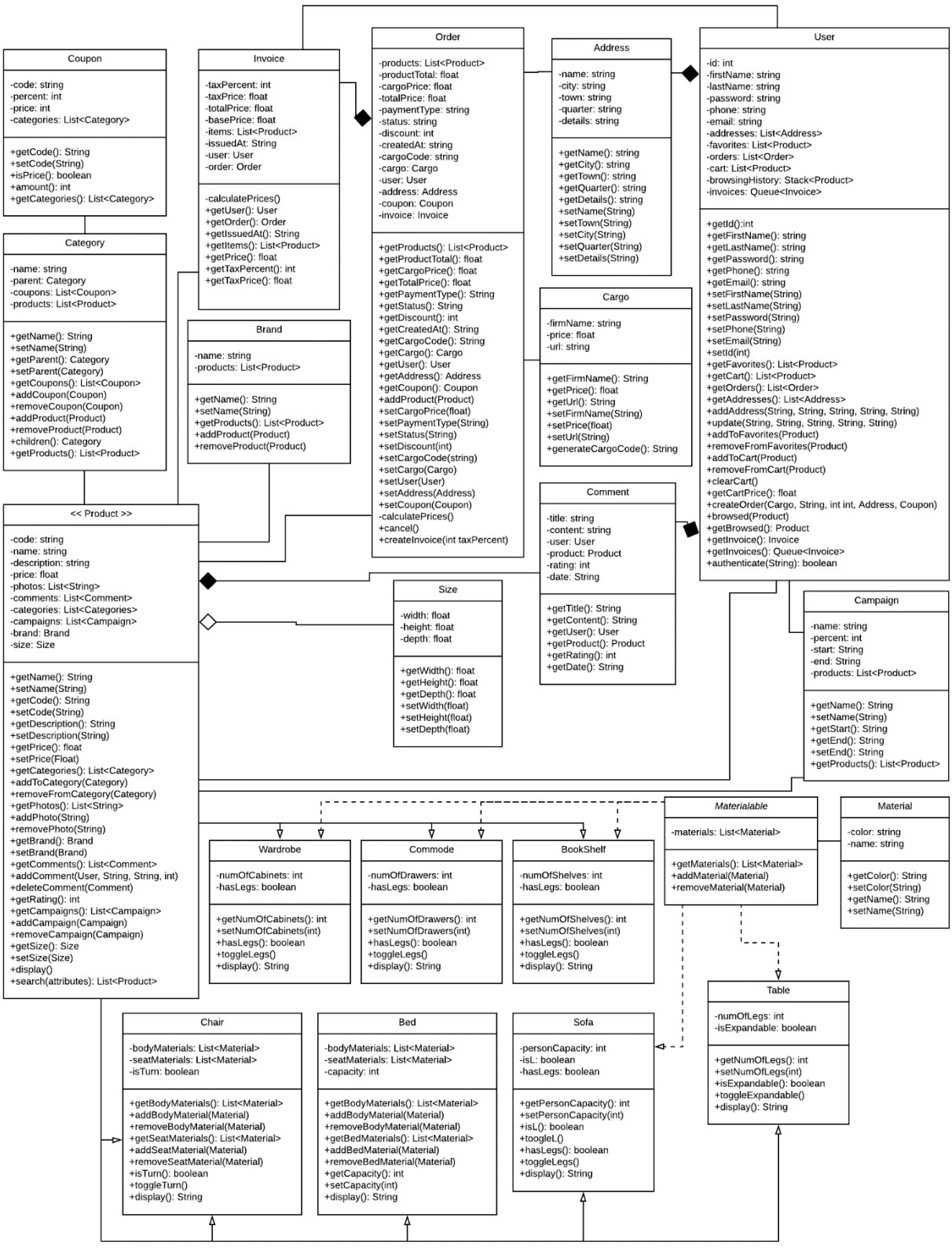
Primary Actor: Admin
Goal in Context: To follow the status of order until the user receives the order after the order
Preconditions: An order has been created
Trigger: When the order is created, admin receives information via the system
Scenario:
1. Admin: Log in to application by entering username and password.
2. Admin: To make status updates according to the information provided by the shipping company.
Exceptions:
1. Order canceled before shipping: To update the status of order as “canceled”.
2. The order equested to be returned: Order returned information is entered into the system.
Frequency of use: Couple times per day/ week
Channel to actor: Furniture E-Commerce Application
Secondary Actors: Shipping company and user
Channels to Secondary Actors:
1. Information via the system
2. Phone/E-mail
Open Issues:
1. Can the user return the product when the return period has passed?
2. Can the delivery address be changed after the order has been shipped?

2.5 Models

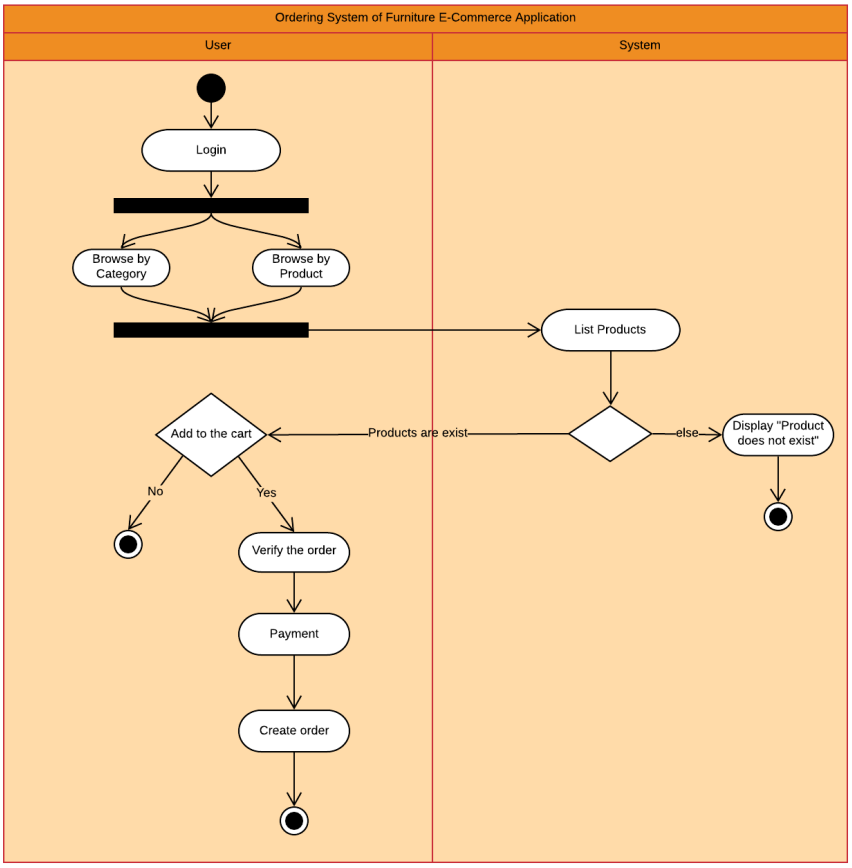
-Use Case Diagram:



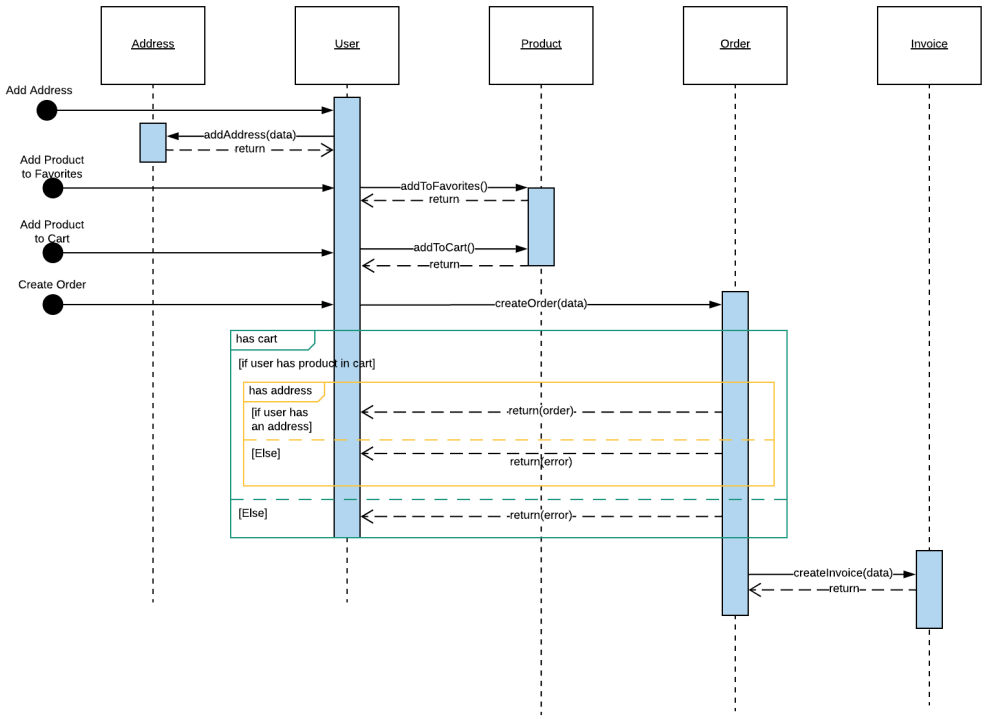
-Class Diagram:



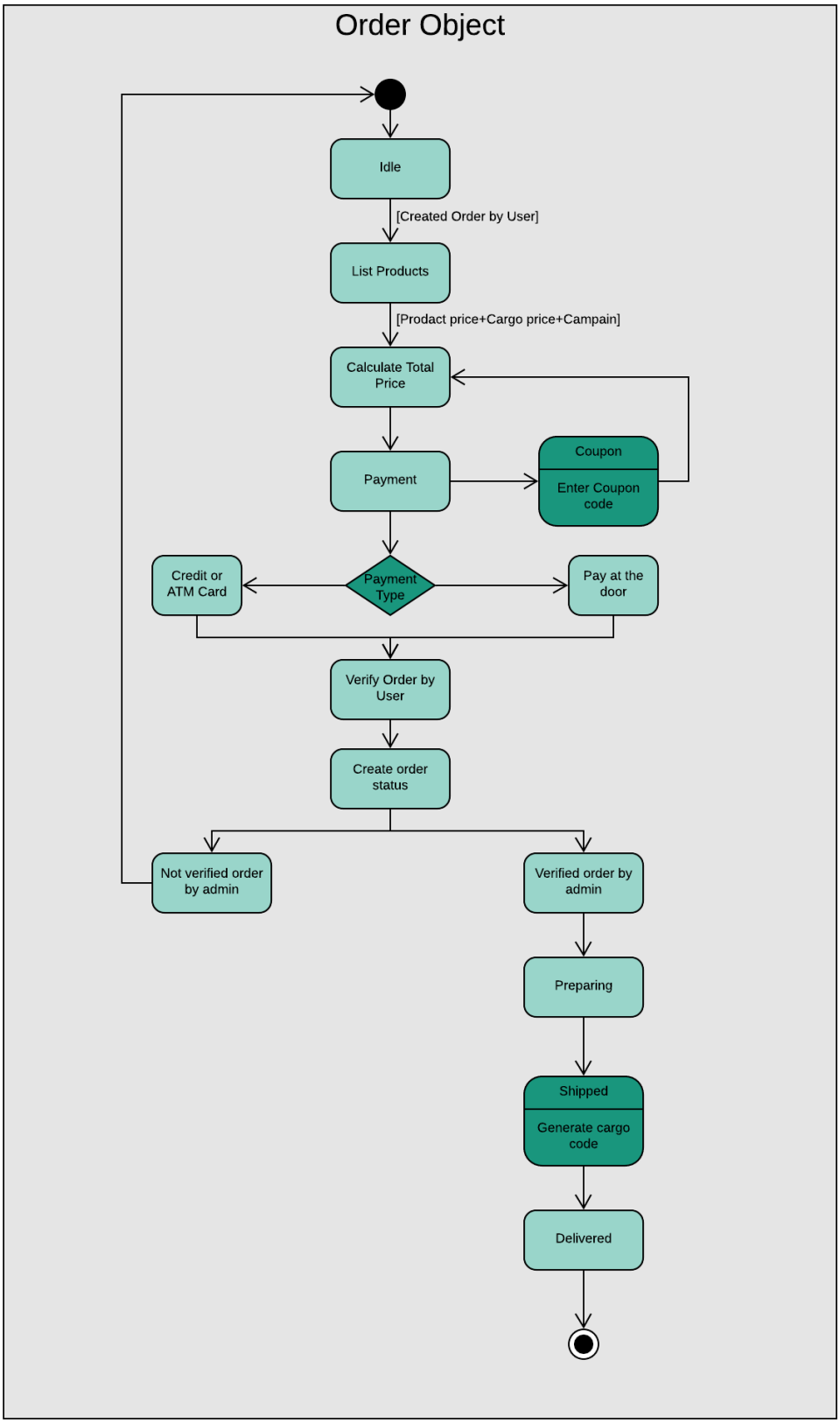
-Activity Diagram:



-Sequence Diagram:



-State Diagram:



3. Project Plan

3.1 Task Description

Team Meetings
Our two-person team frequently meets to keep up-to-date with the business divisions and developments in the project. The meetings that started physically at the beginning of the project continue online due to the pandemic. The content of the meeting is mostly in the form of planning the next step, solving it if there is a problem or informing about the updates made. We plan to stay in touch in the same way until the project is completed.

Design Models and Mockups
One of the most important steps to determine the requirements for the project is to create models, diagrams and models. Planning of the software part was made on these models. Important requirements were determined in line with models and mockups.

Database Creation
A sample small product database that have product's photos, price, description, name, brand and so on was created to be tested. So when there are products in the system, we tried to identify the deficiencies and problems by following the operation. Thus, when stakeholders test the system, they will encounter fewer problems.

Employee Software Creation
Software was developed by planning, database, models, diagrams and mockups under the guidance of software until this stage. Care was taken to ensure that the software was understandable and clear in order to avoid difficulties during the development, maintenance and testing phase.

Application Creation
The application was developed using Java language based Android Studio by using the guide of the mockups, requirements, and models. The website will be implemented using high-quality and actual design techniques. The application will enable customers to reach the products in the database immediately. They can also have the ability to search for a certain products they want to buy. Users will not be allowed to access the database without logging into my site.

Testing
In addition to making frequent small tests while the application is being developed, the necessary tests will be applied both on the user side and the software side when the project is completely completed. During the tests, problems will be detected and solved.

Finalization and Reports
One of the most important parts of the project is of course reporting. We decided to follow a process in the reporting and documentation section: Instead of writing at last, it will be written step by step in order to transfer the process more accurately. When the project gets functionality, it will be very useful to understand the report implementation and follow-up. Also all testing and function processes are finalized at this stage.

3.2 Task Assignment

The team worked collaboratively in the planning of the project, determining the requirements and making some decisions. After that, the tasks were shared equally. Collaborative works: Deciding on the subject of the project, writing the first two batches of the report, determining the methods, parameters and some necessary values, creating the draft of the class diagram.

Damla: Use Case Diagram, Activity Diagram, State Diagram drawing, adding diagrams and descriptions to the report and editing, creating some of the Java classes determined, writing the attributes and methods, transferring the developments in the code part to the report, creating the admin activies in Android Studio, interface designs and coding, testing, bringing the report into IEEE format and adding missing parts.

Furkan: Class Diagram, Sequence Diagram drawing, writing diagram descriptions, creating some of the specified Java classes, writing attributes and methods and making necessary arrangements and eliminating all of them, Stack and Queue implementation, Creating user activies, interface designs and coding, Admin interface deficiencies elimination, testing and solving problems, checking reports.

At the same time, there have been collaborations in places where we had difficulties or could not do throughout the project.

3.3 Deliverables and Milestones

We had five major Milestones in this project:

1. Completion of Requirements Gathering.
2. Completion of Code.
3. Completion of Graphical User Interfaces.
4. Completion of Testing.
5. Completion of Reporting.

These milestones were almost all completed on schedule and yielded a Deliverable at the end of each.

Our four corresponding deliverables (respectively) in this project were as follows:

1. Utilizable plan, models, diagrams and mockups.
2. A finished and easily navigational Graphical user interface.
3. A clean and maintainable software.
4. A completed report.

3.4 Project Schedule

DATE RANGE	TASKS
26.02.2020-09.03.2020	Selecting the project, determining the requirements, writing the "Introduction" and "Requirements" parts of report and creating the outline of the class diagram
09.03.2020-02.04.2020	Drowing the Class, Sequence, Use Case, Activity, State Diagrams and adding to the report with their explainations
02.04.2020-15.04.2020	Writing the necessary classes and functions, methods, atteributes into them and adding the progress in the code to the report
15.04.2020-30.04.2020	Implementation of the Stack and Queue classes and adding the progress in the code to the report
30.04.2020-27.05.2020	Creating activities and GUIs, testing, solving the problems, reporting and finalization

Requirements: 8 hours – 7,14%
Design and code: 56 hours – 50%
Testing: 12 hours – 10,71%
Manual and Final Report: 32 hours – 28,57%
Demonstration and Adjustments: 4 hours – 3,58%
Total: 112 hours - 100%

4. Testing

4.1 Features to be Tested

At this stage, we will test whether we can implement the features we aimed at the beginning of the project. The features we tested were as follows:

- To ensure that the application itself ran
- Check that it works on devices with Android operating system
- Checking login processes
- Checking page load time
- Performance evaluation

4.2 Test Cases

There are two points we need to test: frontend and backend: the organization and functioning of our Java classes in itself, the application process on the user side.

- Make sure that the operation of our classes and methods do what we want
- Make sure OOP structure is set up correctly
- To ensure that the data structures we use are used correctly
- Checking that the necessary elements are used correctly in the interfaces
- Control of transitions between the pages
- Check that admin processes are done correctly
- Control of the basic operations of the user in the application (adding / removing products to the cart, commenting, ordering, adding products to favorites etc.)

4.3 Testing Schedule

The testing phase started right after the project started to be written, thus correcting the errors we detected early will prevent the big mistakes that will occur later. Of course, when the project is completely finished, the entire business will be checked again from the beginning and the problems will be resolved quickly in encountered situations.

5. Conclusion

5.1 The Problem and Solution

The problem that giving us a project based on Java as a homework to be written by our teachers and this project had to meet all the requirements and data structures required from us in the project.

The solution was to develop a Java language based project and we decided to do our furniture e-commerce shopping application. While developing the application in line with the project we selected, Stack and Queue structures were used as requested from us and adhered to the OOP principles. A working application has been developed with its GUIs.

5.2 The Team and the SE Process

The team members took an active role in every stage of the project and had the opportunity to fully control the project. This made it easier for every employee to fulfill their requirements, to maintain and test.

5.3 Engagement of Umbrella Activities

Five of the main Umbrella activities we used were as follows:

1. Software Configuration Management- Which was used to ensure that theproject was controlled, monitored, and on schedule.
2. Formal Technical Reviews- This activity was essentially implemented for coding and front end part. Having smooth seen to view code and ensure that everything met the requirements.
4. Risk Management- This activity was used to assess and identify potential risks with creating the software such as assuring that not too much time and energy be spent on the project.
5. Just In Time(JIT)- This activity has been used in parallel with the risk management activity to spend less resources, time and energy, and to create the business at the right time.

5.4 The Stakeholder's that Benefited

If we have steaks, they will be able to use this application comfortably and be satisfied. With this application, they will be able to deliver their products to more customers quickly and in real time.

5.5 The Team's Benefits

We had a member who is very experienced in developing applications in our team, as well as a member developing a mobile application for the first time. At this point, the transfer of experience between them was very valuable.

For the first time, our member who participated in such a project experienced the application development and frontend side, developed himself in Java language, experienced the right to write a project report and create models.

Our more experienced member gained this experience for the first time using Android Studio.

6. User Manual

6.1 Software Description

The application basically contains product data. The system will allow customers to access the data if they log in. Customers will be able to access and purchase products in the system in real time.

My site has both user and admin interfaces. Admins will provide information flow between users and products / orders.

6.2 How To Use The Software

There are two actors who operate and use the application; user and admin.

Admin mostly uploads / defines required data (product, campaign etc.) to the system as brand employees or makes status updates regarding orders.

On the User side, there are more operations and options.
First of all, they have to enter and do it in order to access the content of the application.
After logging in, the last system is directed to the Home Page.

- Users can access their profiles, baskets, favorites and orders from this page,
- They can also view the categories in the system and search for products through the search bar,
- By clicking the categories, they can access the products in that category,
- They can see the product details by clicking on the products,

Users can;

- add products to their favorites or basket,
- comment on products and rate them,
- delete the products they add to the basket,
- create orders with the products in the basket and pay them through the application and buy them,
- access the invoice of their orders,
- view their search histories,
- update their profiles or add more than one address,
- When they create an order, they can choose the shipping company and follow the order status,
- Also they can cancel the order.

The interfaces of the application are very plain and clear, and therefore easy to use and understandable.

6.3 Troubleshooting Common Problems

The Application

Problem: Page Not Loading
● Make sure your internet is working properly or connection is stable. You may need to restart the application.
● If you are sure your internet connection is working properly, there might be a software problem, please report the situation.

Problem: Application Sudden Shutdown
● There may have been a problem with your device's operating system, you can try resetting your device.
● If you are sure your device is working properly, there might be a software problem, please report the situation.

Problem: Failure To Login
● You may have entered the login information incorrectly. Make sure that you have entered the information correctly.
● Make sure your internet is working properly or connection is stable. You may need to restart the application.
● If you are sure yor internet connection is working properly and login informations are correct the user may not be properly added to the system, please report the situation.

The Software

Problem: The Changes Made By The Step Not Reflected In The System
● There may be errors in the codes written in the classes where admin operations are performed.
● There may be errors in the functions of admin processes.

Problem: Users Not Being Able To Perform Some Operations (creating orders, commenting, adding products to the cart etc.) /Application Error
● Please make sure to enter the inputs in the correct format.
● Java classes are written assuming that the inputs received are entered in the correct format. Since it is not checked whether the inputs are entered in the correct format, there may be a problem with the functioning of the functions when they are in the wrong format.