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Capstone Design

EGR 4402

AUI Merch Shop

Interim Report

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AUI MERCH STORE

Capstone Report

Student Statement:

I affirm that I have applied ethics to the design process and in the selection of the final proposed design, and that I have held the safety of the public to be paramount and have addressed this in the presented design wherever may be applicable.

_____________________________________________________

Chehbouni Nada

Approved by the Supervisor(s)

_____________________________________________________

Dr. Falah Bouchaib
Acknowledgements

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Table of Contents

List of Figures ......................................................................................................................... 7
List of Acronyms and Abbreviations ................................................................................. 8
Abstract ................................................................................................................................. 1
Introduction ............................................................................................................................. 2
Software Specifications ......................................................................................................... 3
  Functional Requirements. ................................................................................................... 3
    Search for a Product ........................................................................................................ 3
    See Product Details. ........................................................................................................ 3
    Add Item to Favorite. ...................................................................................................... 3
    Add/Delete Item from Cart.............................................................................................. 3
  Non-Functional Requirements .......................................................................................... 4
    Product Requirements. .................................................................................................. 4
    Organizational Requirements. ....................................................................................... 5
    External Requirements .................................................................................................. 5
STEEPLE Analysis .............................................................................................................. 7
  Socio-cultural: ................................................................................................................ 7
  Technological: ................................................................................................................ 7
  Economical: .................................................................................................................... 7
  Environmental: ............................................................................................................... 7
  Political: .......................................................................................................................... 7
  Legal: ............................................................................................................................... 8
  Ethical: ............................................................................................................................. 8
System Design ..................................................................................................................... 9
  Use Case Diagram .......................................................................................................... 9
  Class Diagram ................................................................................................................ 10
  Sequence Diagram ........................................................................................................ 11
    Admin ............................................................................................................................ 11
    User ............................................................................................................................... 12
  Database Design ............................................................................................................ 13
    Admins........................................................................................................................... 13
    Users.............................................................................................................................. 14
    Products........................................................................................................................ 14
    Favorite......................................................................................................................... 15
Cart Content ........................................................................................................................................ 16
Orders........................................................................................................................................... 17

Software Implementation .................................................................................................................. 18
Technologies Used .............................................................................................................................. 18
  Android Studio .................................................................................................................................. 18
  Firebase ........................................................................................................................................... 18
  Picasso ............................................................................................................................................ 19
  Android Image Cropper ..................................................................................................................... 19
  Circle Image View ............................................................................................................................ 19
  Elegant Number Button .................................................................................................................... 19
  Material Design by Google ............................................................................................................... 19
  Paper ................................................................................................................................................ 20

Implementation .................................................................................................................................. 21
  Main Activity ................................................................................................................................... 21
  Register Activity ............................................................................................................................. 22
  Login Activity ................................................................................................................................ 23
  Admin Category Activity .................................................................................................................. 24
  Admin Add Activity .......................................................................................................................... 26
  Admin Delete Activity ....................................................................................................................... 27
  Admin Check Orders Activity ......................................................................................................... 28
  Admin Order Details Activity ........................................................................................................... 29
  Home Activity .................................................................................................................................. 30
  Settings Activity .............................................................................................................................. 32
  Search Activity ............................................................................................................................... 33
  Favorite Activity .............................................................................................................................. 34
  Product Details Activity ................................................................................................................... 36
  Cart Activity ..................................................................................................................................... 37

Conclusion .......................................................................................................................................... 39

Future Works ..................................................................................................................................... 40

References ......................................................................................................................................... 41
List of Figures

Figure 1: Use Case Diagram ................................................................. 9
Figure 2: Class Diagram .................................................................... 10
Figure 3: Sequence Diagram (Admin) ................................................... 11
Figure 4: Sequence Diagram (User) ..................................................... 12
Figure 5: Database Design ................................................................. 13
Figure 6: Admins Node ................................................................... 13
Figure 7: Users Node ....................................................................... 14
Figure 8: Products Node .................................................................. 14
Figure 9: Favorite Node ................................................................... 15
Figure 10: Cart Content Node ............................................................. 16
Figure 11: Orders Node ................................................................... 17
Figure 12: Android Studio Logo ....................................................... 18
Figure 13: Firebase Logo ................................................................ 18
Figure 14: Picasso Logo .................................................................. 19
Figure 15: Google Material Design Logo . ....................................... 19
Figure 16: Main Activity .................................................................. 21
Figure 17: Register Activity ............................................................... 22
Figure 18: Login Activity (User) ........................................................ 23
Figure 19: Login Activity (Admin) ...................................................... 23
Figure 20: Admin Category Activity .................................................. 24
Figure 21: Admin Add Activity .......................................................... 26
Figure 22: Admin Delete Activity ....................................................... 27
Figure 23: Admin Check Orders Activity ............................................ 28
Figure 24: Admin Order Details Activity ............................................ 29
Figure 25: Home Activity Drawer ....................................................... 30
Figure 26: Home Activity ................................................................ 30
Figure 27: Settings Activity ............................................................... 32
Figure 28: Search Activity ................................................................. 33
Figure 29: Favorite Activity ............................................................... 34
Figure 30: Product Details Activity ................................................... 36
Figure 31: Cart Activity ................................................................... 37
List of Acronyms and Abbreviations

**AUI:** Al Akhawayn University in Ifrane.

**IDE:** Integrated Development Environment.
The object of this capstone project is to produce a mobile application which will be used to sell AUI’s merch to students of Al Akhawayn as well as outsiders.

The purpose of this application would be to allow the application’s users to browse through available merch and buy their desired items. The user would be able to look for items by category (hoodies, t-shirts, pants…) and add the ones he prefers to his favorite list. Each product would be displayed with its price and its description. In addition to that, the user should be able to add his chosen products to his cart or remove them as he pleases.

Every user would have the possibility to personalize his account by adding a profile picture and updating his information every time he would feel the need to. One of the characteristics that this project will be emphasizing on is the ease of use of the application. Everything should be clear and concise so that every possible type of user can still use the mobile application without having to face any issues or difficulties during the process.

This project will also propose a space specifically dedicated to the administrator(s). They would be allowed to add new products when they receive them or delete any product that become out of stock. They would also be allowed to check the orders placed by the application’s users and see their details in order for them to process them and ship them.

The main goal of the selling platform “AUI’s Merch Shop” would be to provide its users with a user-friendly interface and an easy way to buy their favorite AUI’s merch directly from their phones.
Introduction

Al Akhawayn University’s shop has always been the only place in which the university merch was sold. To check for a certain item’s availability, students needed to allocate some time and go there physically to search by themselves. It was also the only way for them to buy the university merch.

All these restrictions made me think of developing a selling platform that would play the role of an intermediary between the university and its students. This way, students would be able to check for products availability more easily and with less efforts. In addition to that, the university merch would be more accessible to anyone willing to buy it.

AUI Merch Store will provide an easier way for the university to sell its merch to whomever is willing to buy it. It will enable them to reach new potential buyers outside of the university as well as facilitate the selling process within the AUI community. Among the noteworthy facilitations provided by this mobile application, the fact that it will be completely free and available for everyone to use.
Software Specifications

Functional Requirements.

Search for a Product.

1.1.1. **User Requirement:** The user *shall* be able to *search* for a product by *name* or by *category*.

1.1.2. **System Requirement:** The system *should* provide a *searching tool* to the user allowing him to search by *name* or *category*. The system *should* also display the result in a list.

See Product Details.

1.1.3. **User Requirement:** The user *shall* be able to see each products’ details such as the *price* and the *description*.

1.1.4. **System Requirement:** The system *should* display the information relative to each product to the user.

Add Item to Favorite.

1.1.5. **User Requirement:** The user *shall* be able to *add* items to his “*favorite list*”.

1.1.6. **System Requirement:** The system *should* allow the user to *add* his *favorite items* to a list through a “*favorite*” *button*.

Add/Delete Item from Cart.

1.1.7. **User Requirement:** The user *shall* be able to *add* or *delete* products from his *cart*.

1.1.8. **System Requirement:** The system *should* provide an “*add to cart*” button for each product that would allow the user to add items to his cart. The system *should* also provide a “*delete*” button in the cart window that would allow the user to delete an item *already added* in his cart.
Non-Functional Requirements.

Product Requirements.

1.1.9. Usability.

1.1.9.1. **User Requirement**: The interface **should** be easy to use and **user-friendly**.

1.1.9.2. **System Requirement**: The system **should** consist of a **user-friendly interface**.

The advice/error messages **should** be clearly displayed and the **drawer activity** should be understandable and contain clear buttons.

1.1.10. Efficiency.

1.1.10.1. **Performance**.

1.1.10.1.1. **User Requirement**: The user **shall** be able to see all the products and perform the tasks as **quickly** as possible.

1.1.10.1.2. **System Requirement**: The system **should** retrieve all the products from the database and display them to the user as fast as possible. The tasks involving interactions the **database** should all be handled quickly and a **smooth** transition between all the activities should be guaranteed.

1.1.10.2. **Space**.

1.1.10.2.1. **User Requirement**: The system **should not** waste space on the mobile device,

1.1.10.2.2. **System Requirement**: The system **should** get rid of all **irrelevant** and **redundant** data as soon as it made use of it.

1.1.11. Reliability.

1.1.11.1. **User Requirement**: The system **should** not crash unexpectedly.

1.1.11.2. **System Requirement**: The system’s failure rate **should** be inferior to 1%. 

1.1.12.1. **User Requirement**: The system **shall** look the same on all mobile devices.

1.1.12.2. **System Requirement**: The system **should** look and work similarly on different mobile devices even though the **android version** and the **screen resolution** is not the same.

Organizational Requirements.

1.1.13. Delivery.

1.1.13.1. **User Requirement**: The system **should** be delivered before the end of April.

1.1.13.2. **System Requirement**: The system **should** be completed, tested and available to use by April 24\textsuperscript{th}, 2020.


1.1.14.2. **System Requirement**: The system **should** be implemented using **JAVA** as a programming language and make use of the latest **android packages**.

1.1.15. Standards.

1.1.15.1. **User Requirement**: Not Applicable.

1.1.15.2. **System Requirement**: The system **should** comply with the android **quality guidelines**.

External Requirements.

1.1.16. Interoperability.

1.1.16.1. **User Requirement**: The system **should** allow the user to upload a profile picture.

1.1.16.2. **System Requirement**: The system **should** allow the user to access his gallery and upload images directly from it.
1.1.17. Ethical.

1.1.17.1. **User Requirement**: Not Applicable.

1.1.17.2. **System Requirement**: Not Applicable.

1.1.18. Legislative.

1.1.18.1. Privacy.

1.1.18.1.1. **User Requirement**: The system *should* handle users’ data carefully.

1.1.18.1.2. **System Requirement**: The system *should* store users’ data where it cannot be accessed by other users or applications.

1.1.18.2. Safety.

1.1.18.2.1. **User Requirement**: Not Applicable.

1.1.18.2.2. **System Requirement**: Not Applicable.

1.1.18.3. Security.

1.1.18.3.1. **User Requirement**: The system *should* be secure.

1.1.18.3.2. **System Requirement**: The system *should* efficiently handle the database requests and responses in such a way to avoid data to be intercepted by third parties.
STEEPLE Analysis

**Socio-cultural:** This application will provide an easier way for the AUI store to sell its merch to whomever is willing to buy it. It will allow a better communication between the shop of Al Akhawayn, the students and the staff.

Taking into consideration nowadays’ technological advancements and the fact that smartphones and new technologies are more accessible, such an application would be available for a large range of people. It would also be handier and more useful for students as well as for outsiders.

**Technological:** With the growing accessibility of new technologies and smartphones, people are starting to use selling platforms more frequently as it became more convenient for them.

**Economical:** All the resources that are going to be used in this application are available to use with no cost. This is one of the reasons why this application will be completely free and accessible for every person that wants to make use of it. The main goal of such a project is to help the students and other potential buyers to overcome the restriction of being physically present in the university shop, and this will make them more susceptible to buy the university’s merch. That is why this initiative might help the university to increase their merch sales.

**Environmental:** This application will not have any environmental impact.

**Political:** This application will not have any political impact.
Legal: All the resources that will be used in the application are completely legal and are not considered illicit in Morocco.

Ethical: User’s privacy will be considered as a priority. All data collected from the user will be used in a transparent way and nothing will be done without the user’s consent.
System Design

Use Case Diagram.

Figure 1: Use Case Diagram
The figure above represents the use case diagram of this project. It has two actors which are the admin and the user. The specific actions allowed for each one of these two actors are specified in the diagram.

**Class Diagram.**

The diagram above illustrates the class diagram of this project. It has six classes. The user class is linked to the cart, favorite list and products classes while the admin is linked to the products class and the orders class since he can manage both of them.
The figure above is a representation of a sequence diagram which actor is the admin. It consists of three lifelines and three interacting objects: AUI Merch Store, Firebase Database and Firebase Storage.
The figure above is a representation of a sequence diagram which actor is the user. It consists of three lifelines and three interacting objects: AUI Merch Store, Firebase Database and Firebase Storage.
Database Design.

The firebase real time database consists of six nodes, one for each of the following: the admins, the users, the products, the cart content, the favorite products and the orders. Below a detailed view of each of the nodes and the information it contains.

**Admins.**

The admin node contains the necessary information about all the admins of the application. Its primary key is the admin’s username. The admin’s email, name, password and username are all stored under this node.
Users.

The users' node contains information about all the registered users. Its primary key is the user’s username. As shown above, every user has its address, email, name, password, phone number and username under his specific node. Each user also has the image URL corresponding to where his profile picture was stored in the Firebase Storage stored among his data under the same node.

Products.

Figure 7: Users Node.

Figure 8: Products Node.
The products’ node contains the necessary information about all the available products. The primary key is composed of the date and the time in which the specific product has been added to the database. The products’ information stored are the following: the product ID, the product name, the product price, the description of the product, the category of the product, the date and time in which the product has been stored and finally the image URL corresponding to the location of the product’s image in the Firebase Storage.

**Favorite.**

The favorite node contains data related to the products that are added to the favorite list. It contains a node for each user so that the favorite products of each one of them do not overlap. Each user has, then, the list of the products he added to his favorite under the node with his username. Unlike in the products’ node, the date and the time in which the product has been added are not stored in the favorite list of products because they are not useful in this case. However, the image URL is kept because it is used to display the product’s image in the recycler view implemented within the “Favorite” activity of the application.

![Favorite Node](image-url)
When a user adds a specific product to his cart, an admin view and a user view are directly created under the cart content node. Under each one of these two nodes, a node with the username of that specific user is added. Under this last node, a list of the products that user added to his cart is inserted. The ID of each product is stored along with all the necessary information related to it. The quantity attribute is added in this case, because it is retrieved
from the “Product Details” activity that comes just before the “Cart” activity. In this activity, the user is allowed to choose how many of a specific product he wants to purchase before adding it to his cart.

**Orders.**

![Orders Node](image)

The orders’ node is used to keep track of every user’s placed orders and display them to the admin in the “Check Orders” activity. The total price of the order is calculated and stored along with the user’s shipping address, phone number, name, and username. The date and time of the order are also stored under the same node.
Software Implementation

Technologies Used.

Android Studio.

This application is built using Android Studio which is the official IDE for Google's Android operating system.

Firebase.

This application is also built using Firebase which is a developed platform for mobile and web applications.

**Firebase Realtime Database**: It is a cloud-hosted database by Firebase that allows data to be stored and synchronized in real time ("Firebase Realtime,” 2020).

**Firebase Storage**: It allows the storage of content generated by the user such as images and videos. In this project, it is used it is to store products’ images and users’ profile pictures (East, 2016).
**Picasso.**

Picasso is a widely used image library for Android. It is created by Square, and its goal is to handle image loading and processing as well as to simplify the process of displaying images that provides from external locations ("Introduction," n.d.)(Johnson, 2014).

**Android Image Cropper.**

Android Image Cropper is an image cropping library for android (Teplitzki, 2013).

**Circle Image View.**

Circular Image View is used to provide a circular image view for Android (Dodenhof, 2014).

**Elegant Number Button.**

Elegant Number Button is an Android library which is used to implement a number counter with increment and decrement buttons (Vetrivelu, 2016).

**Material Design by Google.**

Figure 14: Picasso Logo.

![Picasso Logo](image1.png)

Figure 15: Google Material Design Logo.

![Material Design Logo](image2.png)
Material Design is a design language created by Google. It can be used to design web applications and is also available to use for many other platforms such as android and iOS ("Material Design," n.d.).

**Paper.**

Paper provides quick and efficient storage and retrieval of Java/Kotlin objects on Android (Masny, 2015).
Implementation.

Main Activity.

Figure 16: Main Activity.

This is what the main activity of the AUI Merch Shop app looks like. It has two buttons. The top one redirects the user to the “Register Activity” where a user willing to start using the app can create a new account, while the bottom one redirects him to the “Login Activity” where the user will be prompted to enter his credentials to sign in and access his private space.
Register Activity.

In the register activity, the user is asked to enter the necessary information for him to create a new account. Google’s Material Design was used to design the text fields as well as the buttons. Each text field is of type “Text Input Edit Text” and is contained by a “Text Input Layout”. The password text field contains a toggle icon that make the password either visible or not.

After the user enters all his information, the system checks if there is an already existing user...
with the same username and, if it is the case, displays an error message. Otherwise, the user is added to the database as a new member.

**Login Activity.**

The login activity consists of two panels, one for the users and another one for the admins. The default panel is the user panel. It is where the user is prompted to enter his credentials in order to login and start his session. The username is used as a primary key in the database and that is why I opted for it to be used in the login process alongside with the password. A password
toggle is used in the password text field of this activity as well. The user can choose whether he wants to stay logged in or be logged out after closing the app by checking the checkbox placed under the password input layout. This feature is implemented using Paper. When the user clicks on the “I’m an admin” button, it is set as invisible along with the “Stay Logged In” checkbox. On the other hand, the “I’m not an Admin” button, that was set to invisible in the user panel is set to visible and can be used by the admin to bring him back to the user panel. If the username or the password entered are wrong, an error message is displayed in the layout input corresponding to the wrong entry.

Admin Category Activity.

Figure 20: Admin Category Activity.
The “Admin Category” activity is the first activity to which the admin is redirected after logging in. In this activity, he can either add new products, delete already existing ones if they are not available in the stock anymore, check new orders or logout and end his session.

When the admin’s intention is to add a new product, he can click on the picture corresponding to the category of the products he wants to add. After that, he will be sent to the “Admin Add” activity which is the next activity I am going to discuss. The “Delete Products” button will, if clicked, lead the admin to the “Admin Delete” activity in which he will have all the available products displayed. He will then have to click on a specific product then choose whether he wants to delete it or not. The “Check new orders” button will lead the user to another activity in which all the user’s pending orders will be displayed while the “Logout” button will direct him back to the main activity shown above.
In the “Admin Add” activity, the admin is asked to fill the text fields with the product’s information. He is also asked to upload a picture of the product by clicking on the image view at the top. If no picture is uploaded, a toast message appears to the user notifying him that the product picture is mandatory. When the admin clicks on the “Add Product” button, a toast message appears to the user asking him to not leave the text fields empty, if one or more of them are left unfilled. Otherwise, the image uploaded by the admin is stored in the firebase.
storage and a URL for this image is generated. This URL is, then, stored in the database along with all the product’s information.

**Admin Delete Activity.**

![Image of Admin Delete Activity](image-url)

In the “Admin Delete” activity, a recycler view is used to display all the products stored in the database. An image view of the product has been added to the layout used in the recycler view of this activity to allow the admin to differentiate between the products more easily. An “On Click Listener” was set on the image view. That way, when the admin clicks on the product image, an alert dialog will appear asking him whether he wants to delete the product from the database or not. If it is the case and the admin click on “yes”, the product will be deleted from
the Firebase Database and this action cannot be undone. On the other hand, if he chooses no, the alert dialog will disappear and no further action will be taken.

**Admin Check Orders Activity.**

![Admin Check Orders Activity](image)

In the “Admin Check Orders” activity which parent activity is the “Admin Category” activity, the admin have access to all the orders placed by the users. This activity is also implemented using a recycler view. The layout used is, however, different from the previous one. In this one, information concerning each order is displayed. The admin can see the full name of the user who placed the order, his mobile phone, his address, the order’s total price and, finally, the date and time in which the order has been placed. The layout contains a button that will, if pressed,
lead the admin to the “Admin Order Details” activity in which he can see the products included in each order.

Admin Order Details Activity.

The “Admin Order Details” is also implemented using a recycler view. However, the layout used in this recycler view contains only the name of the product, its price and the quantity the user chose to order.
When a user log in, the first activity he is sent to is the “Home” activity. This activity is implemented as a drawer activity. When the user swipes to the right from the left side of his phone or press the hamburger button on the left of the toolbar at the top, the drawer appears. Its header contains the user’s full name and his profile picture just above it. The user is given to choose one of the four proposed options available in the drawer menu: Cart, Search, Settings and Logout. When choosing the “Cart” option, the user will be sent to the “Cart” activity where he can see the products he added to his cart through the “Product Details” activity. The “Cart”
activity can also be accessed using the floating action button that can be seen at the bottom of the picture. When the “Search” option is chosen, the user is redirected to the “Search” activity. In this activity, he can search for a specific product by typing his name in the text field. He can also search for products by category and sort them by name or price. The profile picture of the user that is shown in the drawer’s header as well as the user’s information can be updated or added in the “Settings” activity. It can be accessed when clicking on the “Settings” option in the drawer menu. The “Logout” button, which is the last option available in the menu of the drawer, allows the user to end his session and leads him to the “Main” activity afterwards.

These are the available menu options for the time being. However, more might be added as new adjustments are planned for future works. In addition to the drawer, a recycler view has been added to this activity. Its role is to display the products’ image along with their name, description and price. This is done using a specific layout that is common between this activity, the “Favorite” activity and the “Search” activity. An “On Click Listener” is set on the image view so that clicking on the picture would lead the user to another activity in which the product’s details are displayed and through which he can add that specific product to his cart.

The layout used in this activity and the two other activities stated above also contains a checkbox with a predefined icon. This checkbox’s role is to add the product displayed by that specific holder to the favorite list if checked. Unchecking it will, on the other hand, delete that product from the user’s favorite list. When loading the data to be displayed in the recycler view, each product is compared to the products existing in the favorite list. If there is a match, the heart icon is shown in the holder as checked, and if there is no match, it would mean that the product is not in the user’s favorite list and the heart icon will be seen as unchecked. Since this layout is common between the “Home” activity, the “Search” activity and the “Favorite” activity, the favorite list can be managed directly from any of those three activities only by using the implemented checkbox. Moreover, a custom toolbar has been designed for the home activity. It contains two items in its menu represented by the two icons shown at the top. The first one redirects the user to the “Favorite” activity, while the other one sends him to the “Search” activity.
The “Settings” activity is the activity in which the user is allowed to add his phone number and his address to his info. He can as well update his full name or other fields that might be added in the future. In addition to that, the user can upload a profile picture to personalize even more his profile. This picture will then be displayed in the drawer’s navigation header along with his full name. When the user clicks on the “Change Profile Picture” button he is redirected to his gallery where he can choose the picture he wants to associate to his account. This step is not mandatory, as it can be done by the user only if he chooses to. If the user does not want to
update the information related to his profile anymore, he can go back to the “Home” activity by clicking on the close button at the top, or he can click on the “Update” button after writing the necessary information in its corresponding text field to overwrite the already existing data in the database or to add the new one.

**Search Activity.**

![Search Activity](image)

The “Search” activity can be accessed from the search option implemented in the “Home” activity’s drawer or from the search icon added to the top toolbar of the same activity. It allows the user to look for a specific product by typing its name in the text field at the top. It also gives him the possibility to display the available items by category or sort them by price or name.
using an exposed dropdown menu for each of the two characteristics stated above. Just like the “Home” activity and the “Favorite” activity, this search activity was also implemented using a recycler view. The layout used in this recycler view is the same one used for the previously stated activities. It consists of a text view for each of the product’s name, description and price. It also contains an image view that displays the product’s image to the user. The customized checkbox is also present in the layout used for this activity, which means that the favorite list can also be managed from the search activity. A listener is added to the image view in this page too which allows the user to access the “Product Details” activity from it as well.

**Favorite Activity.**

![Figure 29: Favorite Activity.](image-url)
The “Favorite” activity is where the user of the application can access the list of products or items that he liked the most. As stated in the description of the previous activity, it also contains a recycler view using a similar layout to the one described above. The “Product Details” activity can still be accessible from the “Favorite” activity by clicking on the product’s image. The name of the product, its description and its price are also still displayed. That way the user will still know the necessary details about every product added to his list of favorite items without having to go back to the home activity or to the search activity. When the heart icon at the bottom right of the layout is checked by the default since the product exists under the favorite node of the database. However, when it is unchecked by the user, the products is immediately deleted from the database and can no longer be seen in this activity since it is not among the user’s favorite product’s anymore. The last noteworthy detail about this activity, is that a navigation icon has been added to the toolbar at the top of the activity. It consists of a back button that brings the user back to the “Home” activity when he clicks on it.
Product Details Activity.

Above, a preview of how the “Product Details” activity looks like. It contains an image view that takes the dimension of the product’s image that was originally uploaded by the admin during the “Admin Add” activity. Text view with the same product’s name, description and price are added just below the image view. The feature that makes this activity different from all the previous ones is that, now, the user can add the products to his cart after choosing the quantity he wants to purchase first. It is the only activity in which the “Elegant Number Button” library has been used. It is the library used to add the counter button under the text views. The
user can choose the quantity he desires using that button then click on the “Add to Cart” button. A toast message will then be displayed to the user to tell him that his product has been successfully added to the cart. A checkbox similar to the ones used in the previous recycler view’s layout might be added to this activity later on. That way, the user’s favorite list can also be managed directly from this activity as well.

**Cart Activity.**

![Cart Activity](image)

The “Cart” activity is the only activity of this application that is left to discuss. It contains a recycler view just like the other activities. However, the layout used for this one is not similar
to any of the ones used in all the user’s activities. For the cart activity, the layout used in the recycler is the exact same one used in the “Admin Order Details” activity’s recycler view. It displays the names of the product’s added, their quantity and the total price for a specific product depending on the chosen quantity. If a user wants to delete a product from his cart, he can simply click on the specific product’s holder. An alert dialog will appear when he does so. Then he will have the choice to either update the products quantity or to delete the item from his cart. If he chooses the first option, he will be redirected to the product’s details page while, if he chooses the second one, the product will be deleted from the cart content node in the database and will not be displayed in his cart anymore. When the user finishes choosing the items he wants to buy and clicks on the “Next” button, he is asked to enter the address he wants to be shipped to and the phone number he wants to be contacted with. After this step, a toast message is displayed to the user notifying him that his order was confirmed while he is redirected back to the “Home” activity. Instead of receiving a simple toast message, a new activity in which a confirmation message is displayed to the user might be added in the future.
Conclusion

To conclude, this mobile application provides a user-friendly interface that allows its users to buy Al Akhawayn University’s merch directly through it. It plays the role of an intermediary and gives the opportunity to the students, the faculty or any other potential buyer to have a insight on the products available to purchase in the university’s shop without having to move their and be physically present. It proposes an interface for both users and admins that can be any of the university’s staff member.

The administrators of the app will be able to manage the products to display to the user by either adding new ones or deleting already existing ones. They will also have access to an activity designed specifically for them to check the newly received orders and manage them. The users, on the other hand, can take advantage of the application to place orders based on the products originally proposed by the admins of the app. They will be able to add and delete specific products from their list of favorite items as they please. They can also add them to their carts and place an order that would be sent and received by the administrators as soon as it is confirmed. In addition to that, the user’s will be able to personalize their account to some extent through the settings option proposed in the application.

To sum up, I learned a lot from this first android development experience. I chose to challenge myself and started this project with no knowledge of the subject at all. I do not regret making this choice since I acquired a lot of experience during all its phases. I was able to go back and refresh my memory regarding the Java language as well as many concepts of Object-Oriented programming I had learned about during some of my previous classes. I was also able to gain understanding of many tools I have never made use of before like the Firebase Database and the Firebase Storage that ended up very useful for this project. I really enjoyed using Google’s material design tools to personalize my mobile application and design it. It was also completely new to me but I appreciated learning about its different components and how to manipulate them.
Future Works

In the AUI Merch Shop mobile app, I tried to implement all the necessary features to make it a useful online shopping platform. However, I still feel like it is missing a lot. That is why I thought that making some adjustments and adding other features to the app would be important. First of all, I thought of restructuring my Firebase Real Time Database to make orders more manageable in the case of many orders coming from the same user. Secondly, I am planning to add a favorite checkbox in the “Product Details” activity to make the users able to add and delete products from their lists of favorites from all the activities of the application except the “Cart” activity. Another important improvement I am planning to make to the app would be to give more options to the users of the app for them to manage their account information since for now they are only allowed to change their name, their address and their phone number from the “Settings” activity. In addition to that, online payment is to be implemented in future versions of the app. Last but not least, I thought of adding other product categories to enlarge the scope of available choices and allow the administrators to add more products from other categories than the ones that are already available to choose from.
References


