An Android Development Project Report

On

GROCERY LIST APPLICATION USING KOTLIN

IN ANDROID STUDIO

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UNDER

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Virtual Internship - Android Application Development Using Kotlin

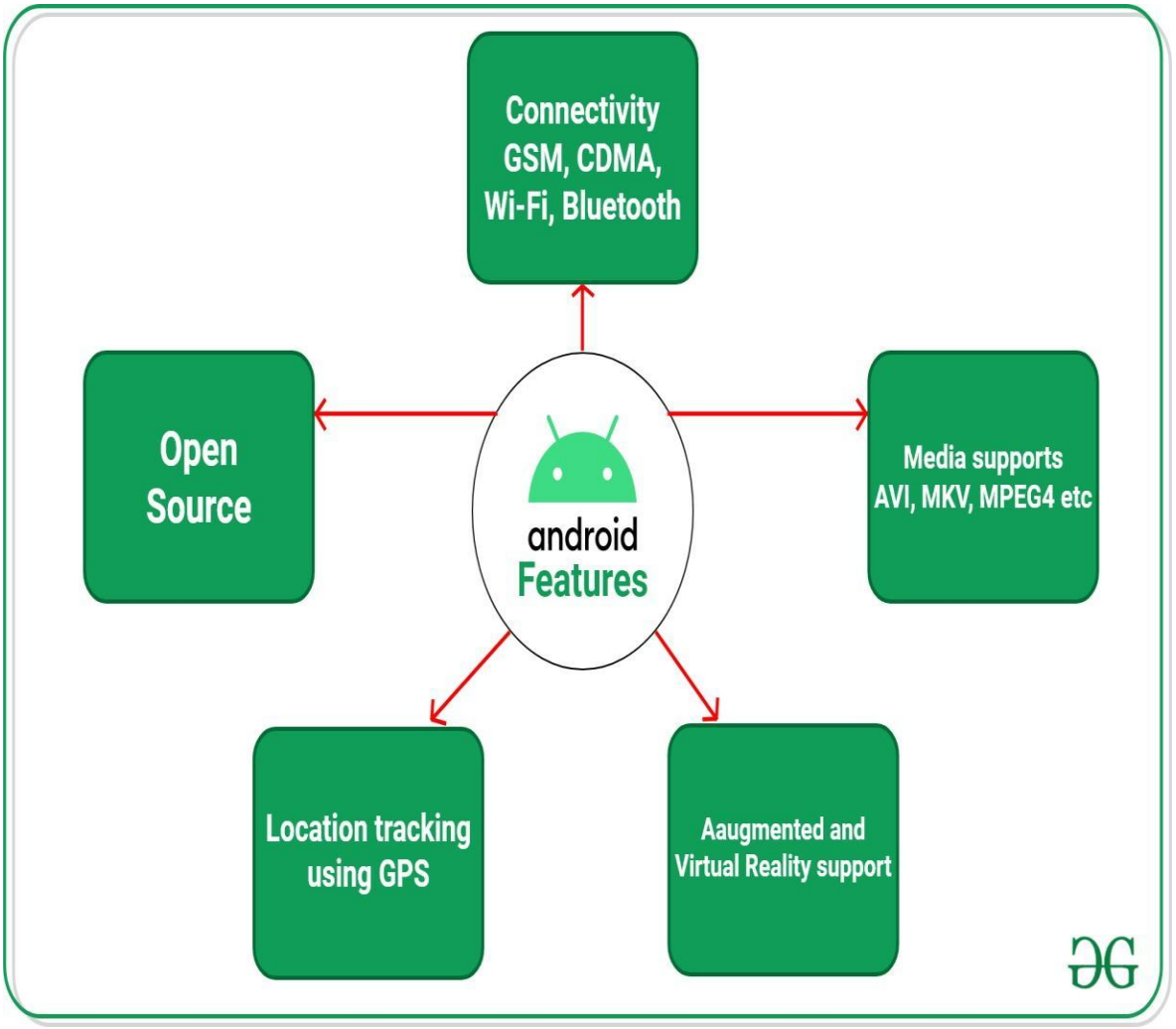
Introduction to Android Development

Android operating system is the largest installed base among various mobile platforms across the globe. Hundreds of millions of mobile devices are powered by **Android** in more than 190 countries of the world. It conquered around **71%** of the global market share by the end of 2021, and this trend is growing bigger every other day. The company named **Open Handset Alliance** developed Android for the first time that is based on the modified version of the Linux kernel and other open-source software. **Google** sponsored the project at initial stages and in the year 2005, it acquired the whole company. In September 2008, the first Android-powered device was launched in the market. Android dominates the mobile OS industry because of the long list of features it provides. It's user-friendly, has huge community support, provides a greater extent of customization, and a large number of companies build Android-compatible smartphones. As a result, the market observes a sharp increase in the demand for developing Android mobile applications, and with that companies need smart developers with the right skill set. At first, the purpose of Android was thought of as a mobile operating system.
However, with the advancement of code libraries and its popularity among developers of the divergent domain, Android becomes an absolute set of software for all devices like tablets, wearables, set-top boxes, smart TVs, notebooks, etc.

Features of Android

Android is a powerful open-source operating system that open-source provides immense features and some of these are listed below.

- Android Open Source Project so we can customize the OS based on our requirements.
- Android supports different types of connectivity for GSM, CDMA, Wi-Fi, Bluetooth, etc. for telephonic conversation or data transfer.
- Using Wi-Fi technology we can pair with other devices while playing games or using other applications.
- It contains multiple APIs to support location-tracking services such as GPS. We
- can manage all data storage-related activities by using the file manager.
- It contains a wide range of media supports like AVI, MKV, FLV, MPEG4, etc. to play or record a variety of audio/video.
- It also supports different image formats like JPEG, PNG, GIF, BMP, MP3, etc.
- It supports multimedia hardware control to perform playback or recording using a camera and microphone.
- Android has an integrated open-source WebKit layout-based web browser to support User Interfaces like HTML5, and CSS3.
- Android supports multi-tasking means we can run multiple applications at a time and can switch between them.
- It provides support for virtual reality or 2D/3D Graphics.



Android Versions

The following table shows the version details of android which is released by Google from 2007 to date.

Code Name	Version	API level	Release date
–	Android 1.0	1	September 23, 2008
–	Android 1.1	2	February 9, 2009
Cupcake	Android 1.5	3	April 30, 2009
Donut	Android 1.6	4	September 15, 2009
Eclair	Android 2.0 – 2.1	5-7	October 26, 2009
Froyo	Android 2.2 – 2.2.3	8	May 20, 2010
Gingerbread	Android 2.3 – 2.3.4	9-10	December 6, 2010
Honeycomb	Android 3.0.x – 3.2.x	11 – 13	February 22, 2011
Ice Cream Sandwich	Android 4.0 – 4.0.4	14 – 15	October 18, 2011
Jelly Bean	Android 4.1 – 4.1.2	16 – 18	July 9, 2012
Kitkat	Android 4.4 – 4.4.4	19	July 9, 2012
Lollipop	Android 5.0 – 5.1	21 – 22	October 17, 2014
Marshmallow	Android 6.0 – 6.0.1	23	October 5, 2015
Nougat	Android 7.0 – 7.1	24 – 25	August 22, 2016
Oreo	Android 8.0	26	August 21, 2017
Pie	Android 9.0	27	August 6, 2018
Android Q	Android 10.0	29	September 3, 2019
Android 11	Android 11.0	30	September 8, 2020
Snow Cone	Android 12.0 – 12.1	31-32	October 4, 2021
Tiramisu	Android 13		UPCOMING

Programming Languages used in Developing Android Applications

- **Java**
- **Kotlin**

Developing the Android Application using Kotlin is preferred by Google, as Kotlin is made an official language for Android Development, which is developed and maintained by JetBrains. Previously before Java is considered the official language for Android Development. Kotlin is made official for Android Development in Google I/O 2017.

Advantages of Android Development

- The Android is an open-source Operating system and hence possesses a vast community for support.
- The design of the Android Application has guidelines from Google, which becomes easier for developers to produce more intuitive user applications.
- Fragmentation gives more power to Android Applications. This means the application can run two activities on a single screen.
- Releasing the Android application in the Google play store is easier when it is compared to other platforms.

Disadvantages of Android Development

- Fragmentation provides a very intuitive approach to user experience but it has some drawbacks, where the development team needs time to adjust to the various screen sizes of mobile smartphones that are now available in the market and invoke the particular features in the application.
- The Android devices might vary broadly. So the testing of the application becomes more difficult.
- As the development and testing consume more time, the cost of the application may increase, depending on the application's complexity and features.

Kotlin Android Basics

Kotlin is a statically typed, general-purpose programming language developed by JetBrains that has built world-class IDEs like IntelliJ IDEA, PhpStorm, Appcode, etc. It was first introduced by JetBrains in 2011 and a new language for the JVM. Kotlin is object-oriented language, and a "better language" than Java, but still be fully interoperable with Java code. Kotlin is sponsored by Google, announced as one of the official languages for **Android Development** in 2017.

Kotlin Hello World Program

```
fun main()

{

    println("Hello Geeks");

}
```

Key Features of Kotlin

- **Statically typed** – Statically typed is a programming language characteristic that means the type of every variable and expression is known at compile time. Although it is statically typed language, it does not require you to explicitly specify the type of every variable you declare.
- **Data Classes**– In Kotlin, there are Data Classes which lead to auto-generation of boilerplate like equals, hashCode, toString, getters/setters and much more.
- **Concise** – It drastically reduces the extra code written in other object-oriented programming languages.
- **Safe** – It provides the safety from most annoying and irritating NullPointerExceptions by supporting nullability as part of its system.
  Every variable in Kotlin is non-null by default.
- **Interoperable with Java** – Kotlin runs on Java Virtual Machine (JVM) so it is totally interoperable with java. We can easily access use java code from kotlin and kotlin code from java**.**
- **Functional and Object Oriented Capabilities** – Kotlin has rich set of many useful methods which includes higher-order functions, lambda expressions, operator overloading, lazy evaluation, operator overloading and much more.
  Higher order function is a function which accepts function as a parameter or returns a function or can do both.
- **Smart Cast** – It explicitly typecasts the immutable values and inserts the value in its safe cast automatically.
- **Compilation time** – It has higher performance and fast compilation time.
- **Tool- Friendly** – It has excellent tooling support. Any of the Java IDEs – IntelliJ IDEA, Eclipse and Android Studio can be used for Kotlin. We can also be run Kotlin program from command line.

Advantages of Kotlin Language

- Easy to learn – Basic is almost similar to java. If anybody worked in java then easily understand in no time.
- Kotlin is multi-platform – Kotlin is supported by all IDEs of java so you can write your program and execute them on any machine which supports JVM.
- It's much safer than Java.
- It allows using the Java frameworks and libraries in your new Kotlin projects by using advanced frameworks without any need to change the whole project in Java.
- Kotlin programming language, including the compiler, libraries and all the tooling is completely free and open source and available on GitHub.

Applications of Kotlin Language

- You can use Kotlin to build Android Application.
- Kotlin can also compile to JavaScript, and making it available for the frontend.
- It is also designed to work well for web development and server-side development. Native
- App Development
- Desktop App Development
- Web Development
- Cross-platform mobile app development

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CHAPTER 1: Introduction

1.1 ABSTRACT

Shopping is one of the activities that some people consider part of their life, while others do not even think of it. This comparison makes us discover people's problems with shopping. People have shopping problems such as limited time, expats in foreign countries without cars, a transportation issue, people consider physical shopping as a waste of time, health issues, long-distance to market and the difficulty in obtaining some items.

As the problems mentioned above, we have explored our idea, which is related to personal shopping. Therefore, we have built an application that combines different market shops, i.e. (Malls, supermarkets, and pharmacies).

This personal grocery shopping is an innovative app that allows the customers to get all their needs and suggest items based on previous history. Then deliver items to their doorstep and can facilitate online shopping procedure where customers can browse unlimited products all at one time. This work supports people in exploiting their time to be safer and more accessible than wasting it physically.

Moreover, people can order the product from home instead of going around for long distances for shopping. In addition, this app could help people who are facing health problems and unable to buy something physically to avoid future problems.

Finally, some people do not have transportation methods for shopping, and they should keep pace with the evolution.

1.2 OBJECTIVE

The main aim of this project is to list the items so that whenever users go to grocery stores, users will not be able to forget their items and this grocery application helps the users to tackle their day to day chaos more effortlessly.

1.3 PROBLEM TARGETED

It’s not easy for the users to remember every item in this hectic lifestyle, they frequently can’t recall their required necessity so we decided to build an app to store the items in the database for their future use. After buying the items users can delete the added items in the database.

1.4 PROBLEM’S PRIMARY GOALS

The goal of this project is to make an app that stores the user items in a cart and can modify and delete the added item in the list. To develop a reliable system, I have some specific goals such as:

- Develop a system such that users can add item details like product name, product Quantity, and Product Price.
- Develop a database room that is used to store the user data which already been added by the user in the cart and the user can also remove the previously added item in the cart.
- Develop a good UI design that user friendly to the user.
- Develop a good UI that is supported for all android devices.

1.5 INTRODUCTION

Android is an open-source operating system that runs on the Linux kernel. With the advent of new mobile technologies, the mobile application industry is advancing rapidly. Consisting of several operating systems like Symbian OS, iOS, blackberry, etc., Android OS is recognized as the most widely used, popular and user-friendly mobile platform. This open-source Linux kernel based operating system offers high flexibility due to its customization properties making it a dominant mobile operating system.

Android applications are developed using the java language. Google has its own Software Development Kit (SDK) which enables these java codes to control devices like mobile phones, tablets, etc. Android mobile application development provides a flexible platform for developers where they can use both java Integrated Development Environment (IDEs) and android java libraries.

Google android SDK delivers a special software stack that provides developers an easy platform to develop android applications. Moreover, developers can make use of existing java IDEs which provides flexibility to the developers. Java libraries are predominant in the process of third-party application development. Cross-platform approaches make sure that developers do not have to develop platform-dependent applications. With the help of these approaches, an application can be deployed to several platforms without the need for changes in coding. However, android is more prone to security vulnerabilities which the majority of the users do not take into account. Any android developer can upload their application on the android market which can cause a security threat to any android device. These applications do not have to go through rigorous security checks.

Android is an open source and Linux-based Operating System for mobile devices such as smartphones and tablet computers. Android was developed by the Open Handset Alliance, led by Google, and other companies.

Android offers a unified approach to application development for mobile devices which means developers need only develop for Android, and their applications should be able to run on different devices powered by Android. The first beta version of the Android Software Development Kit (SDK) was released by Google in 2007 where as the first commercial version, Android 1.0, was released in September 2008.

On June 27, 2012, at the Google I/O conference, Google announced the next Android version, 4.1 Jelly Bean. Jelly Bean is an incremental update, with the primary aim of improving the user interface, both in terms of functionality and performance.

The source code for Android is available under free and open source software licenses. Google publishes most of the code under the Apache License version 2.0 and the rest, Linux kernel changes, under the GNU General Public License version 2.

We are going to build a grocery application in android using Android Studio. Many times we forget to purchase things that we want to buy, after all, we can't remember all the items, so with the help of this app, you can note down your grocery items that you are going to purchase, by doing this you can't forget any items that you want to purchase. In this project, we are using (MVVM) for architectural patterns, Room for database, Recycler View and Coroutines to display the list of items.

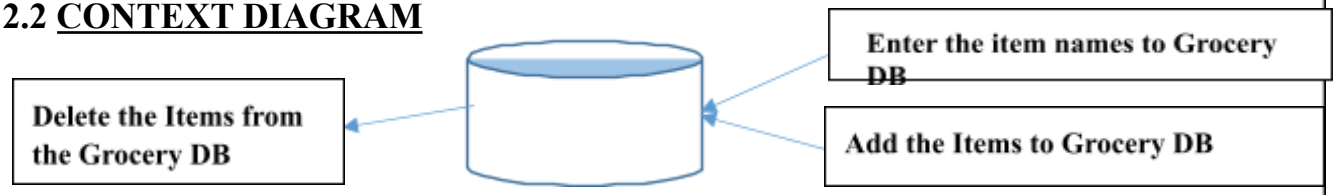
CHAPTER 2: Background & Diagrams

2.1 BACKGROUND

The grocery cart application project will help the user or admin to store the list of items in proper sequence. User/Admin can add and remove the items in the list according to his/her will.

- UI DESIGN IN THE ANDROID PLATFORM
- ANDROID APPLICATION DEVELOPMENT
- DATABASE CONNECTION TO STORE USER DATA

2.2 CONTEXT DIAGRAM



CHAPTER 3: Technical Requirements

3.1 SOFTWARE

The Software Package is developed using Kotlin and Android Studio, basic SQL commands are used to store the database.

Operating System: Windows 11

Software: Kotlin and Java

Emulator: Pixel 4 API 30

3.2 HARDWARE

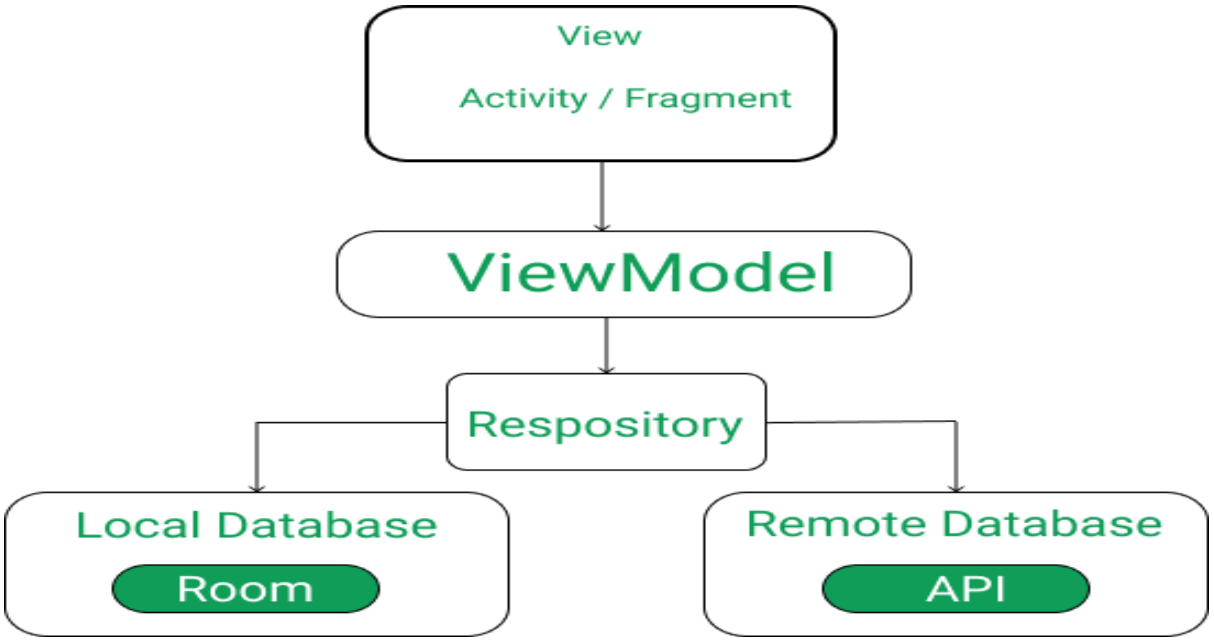
RAM: 16 GB RAM
ROM: 20 GB ROM

CHAPTER 4: Implementation and Designing

In this project, we are using MVVM (Model View ViewModel) for architectural patterns, **Room** for database, Coroutines and RecyclerView to display the list of items.

MVVM (Model View ViewModel)

MVVM architecture in android is used to give structure to the project's code and understand code easily. MVVM is an architectural design pattern in android. MVVM treat Activity classes and XML files as View. This design pattern completely separate UI from its logic. Here is an image to quickly understand MVVM.



ROOM Database

Room persistence library is a database management library and it is used to store the data of apps like grocery item name, grocery item quantity, and grocery item price. Room is a cover layer on SQLite which helps to perform the operation on the database easily.

RecycleView

RecyclerView is a container and it is used to display the collection of data in a large amount of data set that can be scrolled very effectively by maintaining a limited number of views.

Coroutines

Coroutines are a lightweight thread, we use coroutines to perform an operation on other threads, by this our main thread doesn't block and our app doesn't crash.

Step By Step Process Step

1: Create a New Project

To create a new project in Android Studio please refer to How to Create/Start a New Project in Android Studio. Note that select **Kotlin** as the programming language.

Step 2: Before going to the coding section first you have to do some pre-task

Before going to the coding part first add these libraries in your gradle file and also apply the plugin as 'kotlin-kapt'. To add these library go to **Gradle Scripts > build.gradle (Module: app)**.

Step 3: Implement Room Database

a) Entities class

The entities class contains all the columns in the database and it should be annotated with @Entity (tablename = "Name of table"). Entity class is a data class. And @Column info annotation is used to enter column variable name and datatype. We will also add Primary Key for auto-increment. Go to **app > java > com.example.application-name.** Right-click on **com.example.application-name** go to new and create Kotlin file/class and name the file as **GroceryEntities**. See the code below to completely understand and implement.

b) DAO Interface

The DAO is an interface in which we create all the functions that we want to implement on the database. This interface also annotated with @Dao. Now we will create a function using suspend function which is a coroutines function. Here we create three functions, First is the insert function to insert items in the database and annotated with @Insert, Second is for deleting items from the database annotated with @Delete and Third is for getting all items annotated with @Query. Go to the **app > java > com.example.application-name**. Right-click on **com.example.application-name** go to new and create Kotlin file/class and name the file as **GroceryDao**. See the code below to implement.

c) Database class

Database class annotated with @Database(entities = [Name of Entity class.class], version = 1) these entities are the entities array list all the data entities associating with the database and version shows the current version of the database. This database class inherits from the Room Database class. In **GroceryDatabase** class we will make an abstract method to get an instance of DAO and further use this method from the DAO instance to interact with the database. Go to the **app > java > com.example.application-name**. Right-click on **com.example.application-name** go to new and create Kotlin file/class as **GroceryDatabase**.

Step 4: Now we will implement the Architectural Structure in the App

a) Repository class

The repository is one of the design structures. The repository class gives the data to the ViewModel class and then the ViewModel class uses that data for Views. The repository will choose the appropriate data locally or on the network. Here in our Grocery Repository class data fetch locally from the Room database. We will add constructor value by creating an instance of the database and stored in the db variable in the Grocery Repository class. Go to the **app > java > com.example.application-name**. Right-click on **com.example.application-name** go to new and create Kotlin file/class as **GroceryRepository**. Go to **app > java > com.example.application-name**. Right-click on **com.example.application-name** go to new and create a new Package called **UI** and then right-click on UI package and create a Kotlin file/class.

b) ViewModel class

ViewModel class used as an interface between View and Data. Grocery View Model class inherit from View Model class and we will pass constructor value by creating instance variable of Repository class and stored in repository variable. As we pass the constructor in View Model we have to create another class which is a Factory View Model class. Go to **app > java > com.example.application-name > UI**. Right-click on the UI package and create a Kotlin file/class and name the file as **GroceryViewModel**.

c) FactoryViewModel class

We will inherit the Grocery ViewModel Factory class from ViewModelProvider. NewInstanceFactory and again pass constructor value by creating instance variable of GroceryRepository and return GroceryViewModel (repository). Go to the **app > java > com.example.application-name > UI**. Right-click on the **UI** package and create a Kotlin file/class name it **GroceryViewModelFactory**.

Step 5: Now let's jump into the UI part

In the **activity_main.xml** file, we will add two ImageView, RecyclerView, and Button after clicking this button a **DialogBox** open and in that dialog box user can enter the item name, item quantity, and item price.

Step 6:

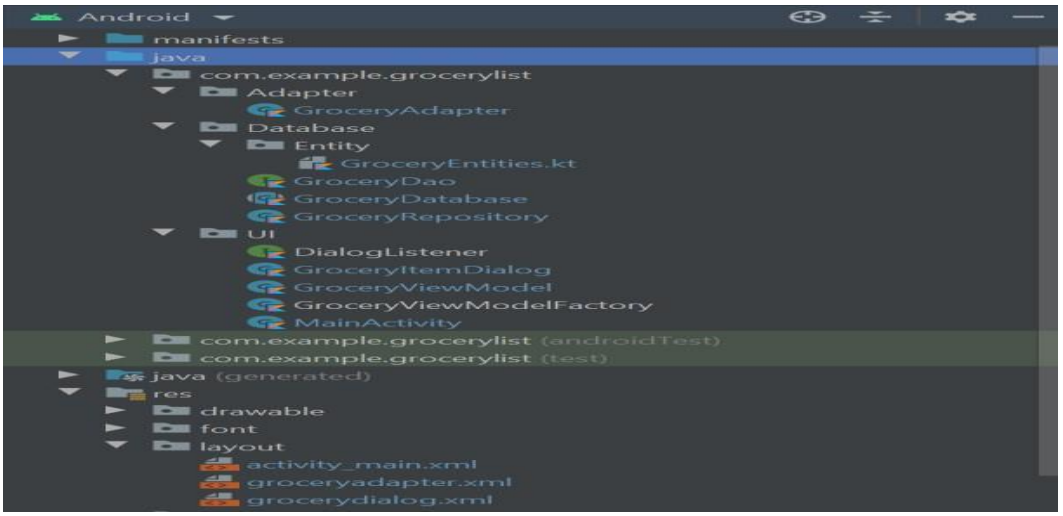
Let's implement **RecyclerView**. Now we will code the UI part of the row in the list. Go to **app > res > layout**. Right-click on layout, go to new, and then add a **Layout Resource File** and name it as **GroceryAdapter**. We will code adapter class for recycler view. In the GroceryAdapter class, we will add constructor value by storing entities class as a list in list variable and create an instance of the view model. In Grocery Adapter we will override three functions: onCreateViewHolder, getItemCount, and onbindViewHolder, we will also create an inner class called grocery view holder. Go to the **app > java > com.example.application- name**. Right-click on **com.example.application-name** go to new and create a new Package called **Adapter** and then right-click on Adapter package and create a Kotlin file/class name it **GroceryAdapter**.

Step 7:

To enter grocery item, quantity, and price from the user we have to create an interface. To implement this interface we will use DialogBox. First create UI of dialog box. In this dialog box we will add three edit text and two text view. Three edit text to enter grocery item name, quantity and price. Two text view one for save and other for cancel. After clicking the save text all data saved into the database and by clicking on the cancel text dialog box closes. Go to the **app > res > layout**. Right-click on **layout**, go to new and then add a **Layout Resource File** and name it as **GroceryDialog**. To add a clicklistener on save text we have to create an interface first in which we create a function. Go to the **app > java > com.example.application-name > UI.** Right-click on the **UI** package and create a Kotlin file/class and create an **interface** name it as **DialogListener**.

Step 8:

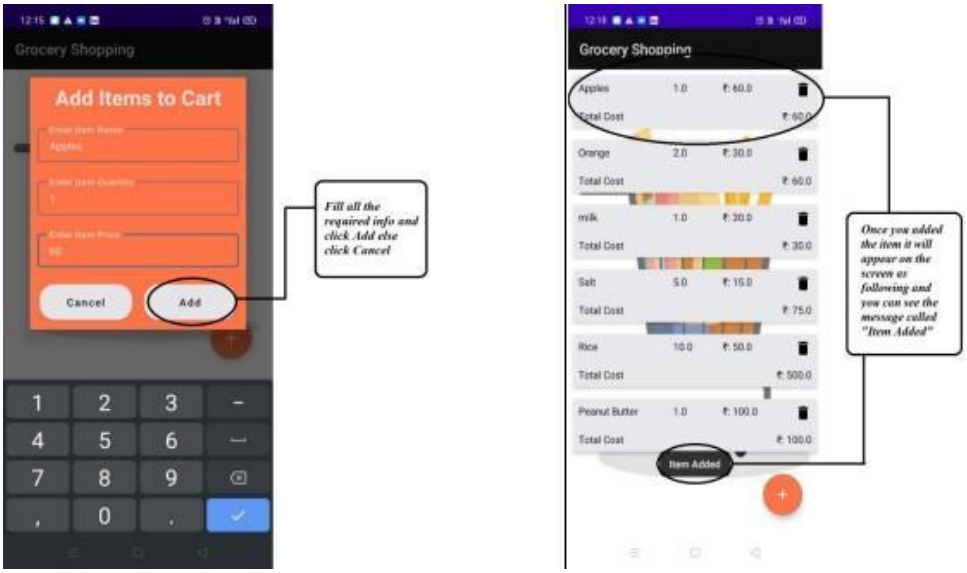
In this final step we will code in our **MainActivity**. In our **MainActivity**, we have to set up the recycler view and add click listener on add button to open the dialog box.

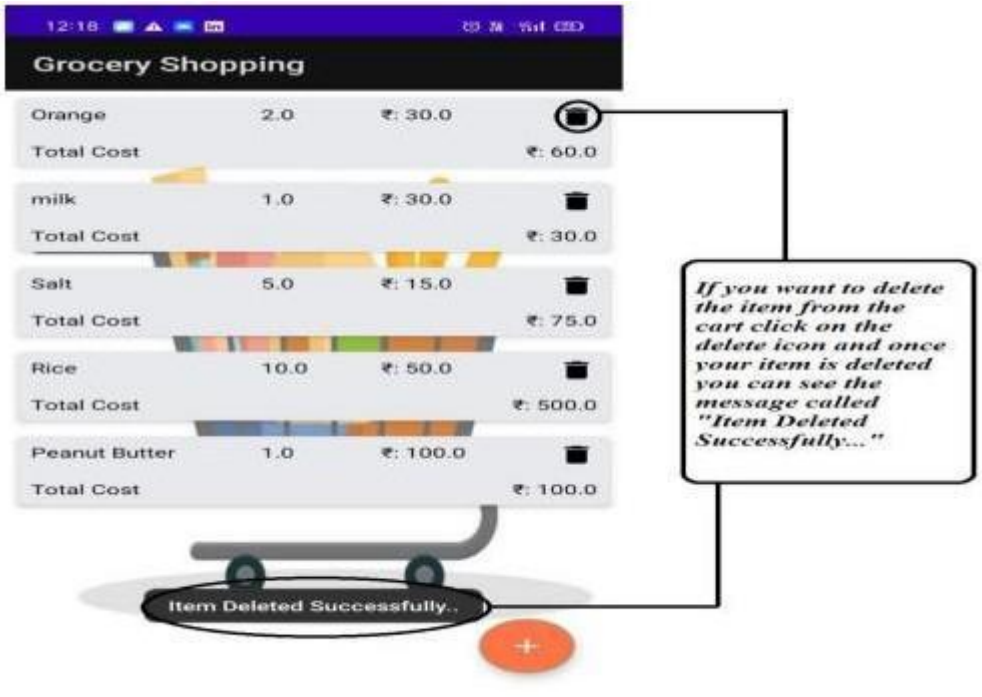


Complete Project Structure

CHAPTER 5: Conclusion and Future Scope

5.1 Expected Outcome





5.2 Conclusion & Future Scope

This grocery application will help to store the list of data items include name of item, price and quantity required. Admins store his/her data in the list, the grocery application very helpful to users.

Future Scope:

This application helps to store the list of items by Admin. In Future we can also add scheduled addition of items according to requirement of user.

The Features are:

- Add User Panel
- Add Admin Panel
- Provide Login Authentication
- Add Image to user Product and Rating

CHAPTER 6: URLs, Ids, Acknowledgements, Reflection Notes and References

6.1 URLs & Account

Ids

- **GitHub URL:**

https://github.com/smartinternz02/SPSGP-104385-Virtual-Internship---Android-Application-Development-Using-Kotlin

- **Smart Internz Registered ID:**

apraveen1012@gmail.com

- **Demo Link:**

https://drive.google.com/file/d/1pzsIqwlflIJ_a0_SIYJJgk-0-fGHNCLK/view?usp=sharing

6.2 Acknowledgements

I have taken much efforts in this project. However, it would not have been possible without the kind support and help of many individuals and organizations. I would like to extend my sincere thanks to all of them.

I am highly indebted to SMARTINTERNZ (Experiential Learning & Remote Externship Platform to bring academia & industry very close for a common goal of talent creation) for their guidance and constant supervision as well as for providing necessary information regarding the project & also for their support in completing the project. I would like to express my gratitude towards member of (Smart Internz) for their kind co-operation and encouragement which help me in completion of this project.

I would like to express my special gratitude and thanks to industry persons for giving me such attention and time.

My thanks and appreciations also go to people who have willingly helped me out with their abilities.

6.3 Reflection Notes

I thoroughly enjoyed my internship and had a very valuable experience under my belt. I know this will help when looking for jobs and needing references.

I know that practical experience is the best, and internships give students that hands-on experience they need. I feel that quality internships are essential to develop key skills that we can't get in a classroom. Skills such as multitasking, communicating, learning to deal with diversity, and dealing with deadlines are different when you are working for someone else, not yourself like everyone do it college. Internships are also a great way to network with people in the industry. Our mentor and co-workers were great about giving us contacts and referring us to open positions in the industry.

I have learned that stressing over little things will not get us anywhere. I have learned to work well as a team and that without my counter parts the work would not get done. Another aspect that I learned throughout the internship is to never be afraid to ask lots of questions. By asking questions we get answers.

6.4 References

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- https://github.com/smartinternz02/SPSGP-68275-Virtual-Internship---Android-Application-Development-Using-Kotlin
- https://www.youtube.com/watch?v=vdcLb_Y71Ic
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- https://www.geeksforgeeks.org/introduction-to-kotlin/