COS30017 Portfolio Report

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Overview

This report summarises what I have learned in COS30017 Software Development for Mobile Devices. It includes self-assessment against the various intended learning objectives, a justification of the portfolio pieces of work included and a reflection on my learning.

Self-Assessment Table

The table below indicates my self-assessment against the various intended learning objectives (ILOs).

ILO 1 : Explain the key differences between development of systems to run on mobile devices and on typical personal computing or internet-based environments, and apply this knowledge in the design of mobile device software.
ILO 2 : Design effective applications for a mobile device by taking into consideration the underlying hardware-imposed restrictions such as screen size, memory size and processor capability.
ILO 3 : Build, test and debug graphical applications for mobile devices by using the standard libraries that are bundled as part of the developers' toolkit for the mobile device.

ILO	Adequate	Good	Outstanding	Exemplary
1		✓		
2		✓		
3		✓		

Evidence (in Portfolio Pieces)

I have completed the following assignments and the evidence is presented as part of the portfolio pieces.

Assessment	Completed
Core Assignments (1 – 5)	✓
Extension Task (Assignment 6)	✓
Extension Task (Assignment 7)	✓
Custom Application (Assignment 10)	
Research Report (Assignment 11)	

Overview of pieces included

Assignment 1: In this assignment, we learned to get familiarized with the SDK, Emulator and IDE of Android Studio. We also explore various layouts and create simple apps to apply these layouts to them. Besides, we learned to achieve fluid layouts on different screen sizes.

Assignment 2: In this assignment, we were tested on our programming logic and get familiarised with Android Porgramming in Kotlin. We learned about the concept of string externalisation. We also learned how to manage UI event listeners and device rotation, create AlertDialogBox and use HashMap to store data.

Assignment 3: In this assignment, we learned how to work with RecyclerView to optimize performance. We also learned to create apps with multiple activities and passed objects between activitites using Parcelable objects and intents. Besides, we explore the use of fragments and the communications between fragments to learn to support dynamic UI.

Assignment 4: In this assignment, we learned to use material design componenets such as CardView widget, Staggered GridLayout and Tabbed Layout. We also learned how to read text file and retrieve the data from it in Kotlin. Besides, we set up a HTTP web server using Xampp and send a HTTP request using the Retrofit to retrieve data and Glide library to load the images.

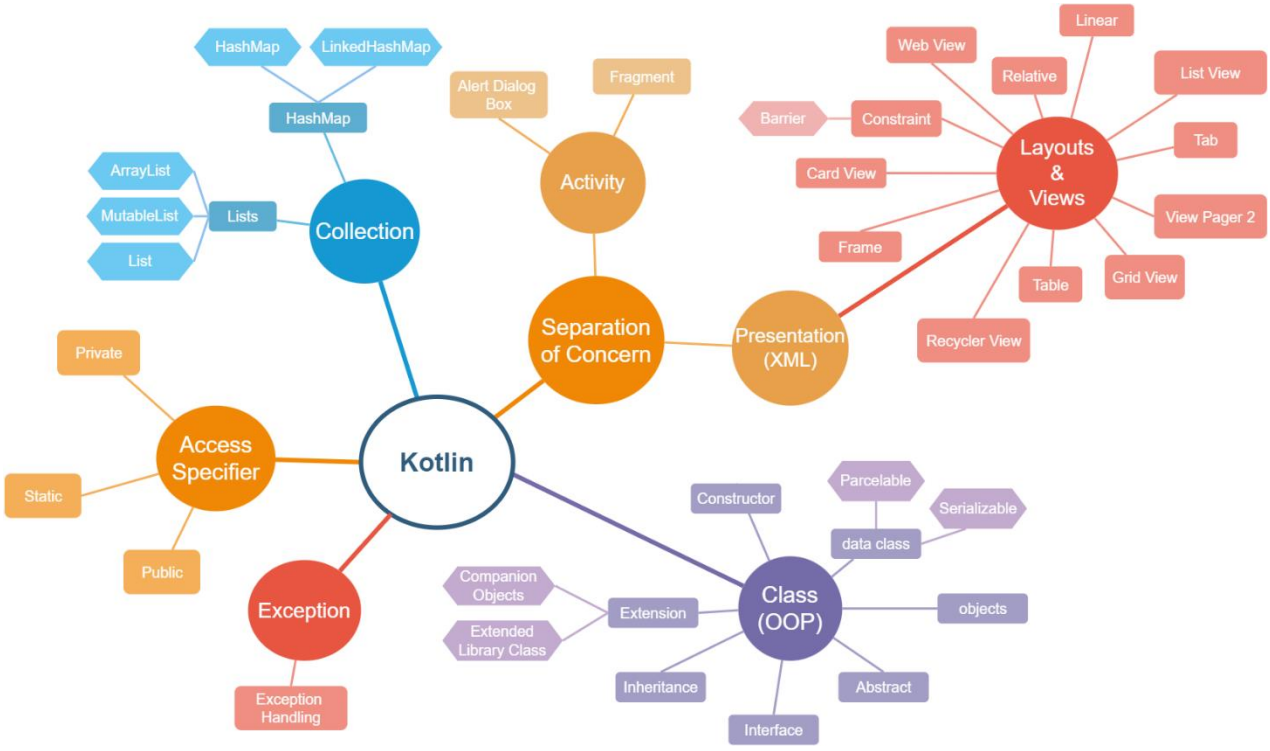
Assignment 5: In this assignment, we learned to incorporate with all the things we have learned throughout this semester and also demonstrated competency at using the SQLite to perform CRUD functions. Besides, we also learned how to implement the floating action button.

Assignment 6: In this assignment, we explored the use of camera API, Google Map v2 and MapView widgets. We also performed reverse geocoding with Google Maps Geocoding API service.

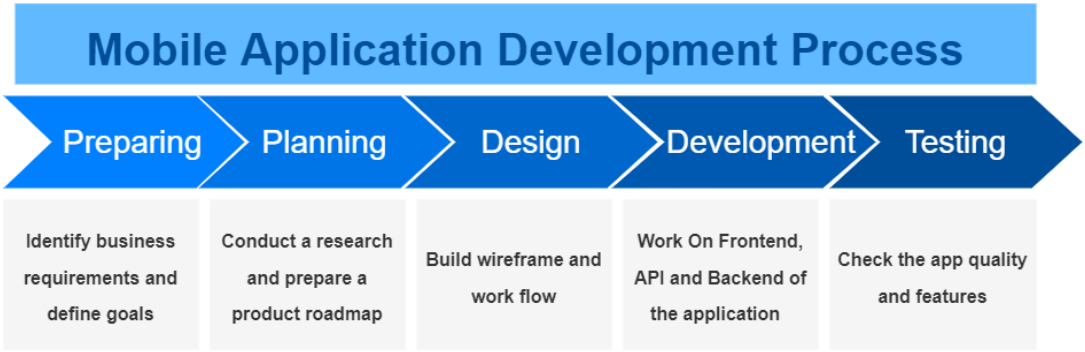
Assignment 7: In this assignment, we learned how to adopt seamless integration with open REST-based APIs and parse JSON data structure.

Reflection

Concept Map



Mobile Application Development Process



The mobile application development process involves analysis, planning, design, app development and testing. The first step of developing a mobile application is to understand the requirements of the business and define the goals to be achieved using the app. For example, having a loyalty program could be one of the purpose for a grocery purchasing application. After defining the app's objectives, we should start to prepare a product roadmap which consists of all the small tasks and efforts needed to achieve each of the goals. One of the most important part in this process is to conduct a research to find out the skills and efforts needed for each task. Whichever tasks that requires great effort will need to be prioritized and implemented first. After planning out the tasks and the development process, we will move on to build the app's wireframe and user flow map. The app wireframe provides a visual structure of our app's design and functional requirements. The user flow map can help us identify how the user interacts with the app and its navigation struture. Before

the actual app development, we will have to define the back-end, API and front-end technologies needed to support the app functionality. The final step is to perform an application testing to check if the application has achieved all the objectives and functional requirements.
In my opinion, the key areas to be focused on during the mobile application development are the preparing and planning of the project. The first thing I did in every of my assignments was to search online for the official documentations to first read and understand how the feature works. After having a brief understanding of the feature, I then searched for some educational resource sites or YouTube videos that provide solutions and tips for programmers. Doing research beforehand is extremely crucial as it helps me to operate the whole coding process more organized and efficiently.

Analysis and Problem Solving Approaches

The process of the first few assignments was such a mess. As I was yet to be familiar with Kotlin at first, I could not find out how to approach the problem. I did not know what resources to refer to on the Internet that could help me better understanding the task before the actual implementation. I ended up spending most of my time trying to understand other's codes on the Internet. This is where I started to realise that I needed to develop a roadmap beforehand to help understand the entire development process and also help identify the potential bottlenecks. Starting from assignment 4, I sketched the wireframe and tried to connect them together to understand the work flow of the application. After knowing how the application works, I further split the assignment into smaller tasks and do some online searching before the actual implementation to estimate the efforts and skills needed. For example in the task 1 of assignment 4, I first drew the wireframes to identify how many xml files and fragments are required to build the application. After connecting these wireframes together, I decide the order of pages to be implemented and search for online resources to find out how to implement the webview and grid view. In the process of implementing the application, I encountered difficulties to find out an algorithm to read the text file in Kotlin. To solve this problem, I tried to first understand how the data in the text file is organized. I attempted different algorithms and eventually managed to reassign each song into arrays and store them in a custom object. One of the most important parts in this process is the application testing where I would run a testing to check the functionality and integration of the app components. If the functionality is not yet completed, I will continue implementing it.

Comparison and Contextual Placement

I am taking the managing software projects course as well as this unit in this semester. Both types of development are very different from each other in terms of the development platform. This is because we chose to build an online catering website via the use of HTML, CSS, PHP, JavaScript and MySQL in MSP whereas Kotlin via Android Studio is used to develop android mobile application in this unit. We need to build the website using various programming languages on the web while still maintaining a good design pattern. On the contrary, Android comes with lots of inbuilt libraries and frameworks which allow us to build a mobile application with the connection to database, localhost, etc while using one single platform. Besides, Android SDK offers layouts, Activities and data structures which helps to maintain the separation of concerns.

Personally, I think that Mobile application development focuses more on the design and user experience while software development targets more on ensuring the standard quality of the software is satisfied. In software development, we monitor all the stages to maintain its quality and focus on delivering the right products. In the mobile development, we focus more on achieving a good coding standards and practices so that the code can be reusable.
I applied the Work breakdown structure (WBS) learned in MSP to the planning stage of mobile development. I found it particularly important in both software development as it helps to break large project into smaller tasks to get things done more efficiently and faster. In the process of developing the mobile application, I learned how to read the official documentations and referred to other online resources. In my opinion, the ability to read documentations is truly one of the most underrated and important skills to have in computer programming.

Generalization

There are several principles we learned in this unit that can be beneficial to my further learning. The concept of Convention Over Configuration is taught through the use of Android Studio. Android Studio compiles and executes the application projects by running a system which is known as Gradle in the background. It is a tool that is used to package all the elements of an application project together and automatically generate dependencies required to build the project. The project will be built using the Gradle which has a default set of configuration settings. However, it can also be overriden by settings in the build files if there are changes. This concept is what we know as Convention over Configuration. By applying the Convention over Configuration approach in the code, we can easily add new components into the examples that are already present in the program without having to change anything. In that way, we can simply add a new class which implements a paticular interface. We can easily add new components as we only have to follow a consistent pattern. This can help simplify development and allow developers to focus on delivering functionality as we only need to focus on the unconventional parts of the application.

The other most important principle to follow is Separation of Concerns. By keeping each component to do only what they need to do, we can minimize our dependecy on each of them. For example, UI-based classes such as Activity and Fragment should include the logic of the application where it handles UI and OS interaction. Keeping these classes separately can help avoid many problems regarding to the component lifecycle and make these classes testable. In Android Studio, string values, images and colours are separated so that it is easier for us to manage and maintain the external app resources more efficiently and organized.

Challenges in Mobile Development

I think the hardest part I found in Mobile Development is to think of different business logic behind the application. The task 3 in Assignment 2 requires us to calculate the total price based on certain business requirements. It is difficult to come up with an algorithm while I was still struggling with understanding the activity lifecycle or callbacks at that time. Besides, I think it is challenging to remain a positive attitude toward learning new things constantly. As there are many tools coming out with different versions all the time, we have to always be aware of the version we used and different features that are provided by certain versions of Android. This means we have to always keep ourselves updated with

the newest version of the features we used.

Explorations

Throughout all the assignments, I have explored different packages and libraries that are provided by Android. For example, I have used Retrofit from the REST Client library to create HTTP requests to GET data and process the HTTP response from a REST API. I first created a PHP file to create connection with localhost database to retrieve data and encode them into JSON format. In assignment 6, I learned how to parse JSON to get data from a nested object using Retrofit. Besides, I also learned how to set different permissions for the application in the Android Manifest file to allow our app to have additional access to restricted information such as our location, internet access, etc. To implement the Google Map, I have also explore how to generate the Google Map API key and integrate it in my application. I tried to implement the Camera API in my application to allow the use of camera on the Android device.