CEF 440 : INTERNET PROGRAMMING AND MOBILE PROGRAMMING

ASSIGNMENT 1

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### What is mobile application development?

Mobile application development is the set of processes and procedures involved in writing software for small, wireless computing devices, such as smartphones and other hand-held devices.

1. **What are the major types of mobile applications that exist and their differences.**

**Answer:**

There are 3 main types of mobile apps that exist namely:

* Native apps
* Web apps
* Hybrid mobile apps

1. **Native apps:**

Native apps are created specifically for an operating system or a platform.  
These apps keep mobile device operating systems in mind. This means that you can have apps native to Android or iOS. As they are built for one operating system, they cannot be downloaded on other devices. For example, they are using an iPhone app on an Android device.

The technology used for mobile apps – Native:  
Native app builders use the following programming languages to create their apps:

●JAVA  
●Python  
●C++  
●Objective-C  
●Kotlin  
●Swift  
● React

**Advantages:**  
As these apps have a single focus point, they have the added advantage of being faster and more reliable. They are efficient when used with the correct operating system and utilize the native device UI to give users a more optimized experience.

Native apps also directly connect with the mobile device’s hardware and can access broader features such as Bluetooth, camera roll, phonebook contacts, NFC, and more.

**Disadvantages:**

One major problem that is understandable with native apps is that it is only available to a single operating system user, e.g., people who only use iPhone or Android devices. So, the app needs to be duplicated for different platforms; otherwise, app publishers lose out on thousands of customers.

But, the code once used for an app cannot be duplicated. This means that new codes need to be generated and updated. This can be quite costly.

Also, if there is an update in the app, the user has to download the new file and reinstall the app. This takes up precious device storage space.

**Examples:** Calculator, Notepad, Games like Angry Birds

1. **Web apps:**

Web apps are responsive versions of specific websites that work on any device as they are delivered using mobile browsers.  
These apps are similar to Native apps because they are accessed from web browsers on mobile devices. They are not standalone apps as they do not require downloading and app installation.  
In reality, these web applications are responsive websites that adapt to multiple user interfaces depending on the user’s device. When you get the option to ‘install’ a web app, the website URL is bookmarked on your device.

The technology used for mobile apps – Web applications:  
The following are the technology used to build web applications:

●HTML5  
●JavaScript  
●CSS  
● Ruby

**Advantages:**

Not many development costs are involved as these apps are web-based and do not require customization. Also, since there is nothing to download, these apps do not take up much device storage memory like native apps. These apps are also easier to maintain, and no special downloads are required.

**Disadvantages:**

Web apps are completely dependent on the browser used. This means that users have varying experiences based on the functionality of their browsers. Also, these apps do not work offline. Even if they have an ‘offline mode,’ the divide needs to be connected to the internet to back up data or refresh previously stored information.

**Examples:** Child Fund international website, Financial Times

1. **Hybrid apps:**

Hybrid apps combine native and web apps but are warped in a native app style. It can have its icon or logo and be downloaded from an app store directly.  
These are web apps with the look and feel of native apps. They have a home screen icon, are built to be responsive, function offline, and even have faster performances than web apps. They are the perfect combination of both Native and Web apps.

**The technology used for mobile apps – Hybrid:**  
Hybrid apps are a mix of web technology and native APIs. They are built using:

●Objective-C  
●HTML5  
●Ionic  
● Swift

**Advantages:**  
The hybrid app is much faster and more responsive than a web app and is cheaper to build than native apps. These apps are considered minimum viable products – a way to prove the viability of moving forward with a native app.

These apps load faster and are ideal for countries with slow internet connections. They also have a more consistent user experience across all platforms. Finally, these apps have a single code base which is easier to maintain and update.

**Disadvantages:**

They are not as swift and influential as native applications.

**Examples:** Facebook, Twitter, Yelp

**Other than these three basic types of mobile apps, a few more need to be mentioned.**

* **Progressive Web Apps**

These are extensions of websites that you can save on your devices that work like apps. PWAs use web browsing APIs and have the functionalities of native apps. These web pages are added to your devices to mimic the web application. They also run faster irrespective of the device type or Operating System used.

**Advantages:**  
Progressive Web Apps use very little data and are automatically updated when you use them. There is no requirement for installation as PWAs are web pages. Another added advantage is that they can be easily shared by sending the URL.

**Disadvantages:**

The main disadvantage or con of using PWAs is that they are limited to the operating system in which they are used. Also, these apps can have integration problems. Also, PWAs are limited regarding key re-engagement features like adding to the home screen, updating notifications, etc.

**Examples:** Twitter, Washington Post

* **Cross-Platform-Apps**  
  These apps were created to be compatible with multiple operating systems and run on desktops, tablets, mobile phones, smartwatches, and even smart TVs.

**Advantages:**  
These applications have over 90% reusable codes that are easy to maintain and update. Also, they have a much broader reach than other applications. Since cross-platform apps run on any operating system, they are exposed to many users.

**Disadvantages:**

 Due to the abstract nature of these apps, the codes are hard to write. Developers who understand this cross-platform functionality and tools can only write these codes.

**Examples:** Firefox, Chrome, Adobe Reader

1. **Review of programming languages that are used for mobile programming**

**Answer:**

* C#
* Java
* Python
* HTML5
* Objective-C
* Kotlin
* Swift
* DART
* Javascript

**Some description of the languages used**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Language | Level of abstraction | Paradigm | Syntax | Routine syntax | Development time efficiency |
| Objective-C | High-Level | Object Oriented | Infix notation | Fast | Moderate |
| Java | High-Level | Object Oriented | Infix notation | Fast | Moderate |
| Javascript | High-Level | Object Oriented | Infix notation | Moderate | Fast |
| Python | High-Level | Object Oriented | Infix notation | Slow | Fast |
| PHP | High-Level | Object Oriented | Infix notation | Moderate | Fast |
| C# | High-Level | Object Oriented | Infnix notation | Fast | Moderate |
| C+ | High-level | Object Oriented | Infix notation | Vert fast | Slow |
| HTML5 | High level | Mark up language object oriented | Tag base syntax | N/A | Fast |

1. **What is a mobile app development frame work**

**Answer:**

A mobile development framework is a software framework that is designed to support mobile app development. It is a software library that provides a fundamental structure to support the development of applications for a specific environment.

Frameworks can be in three categories: native frameworks for platform-specific development, mobile web app frameworks, and [hybrid apps](https://en.wikipedia.org/wiki/Hybrid_app), which combine the features of both native and [mobile web](https://en.wikipedia.org/wiki/Mobile_web) app frameworks.

Examples of mobile frame works include:

* Flutter(Dart), which is used to developed hybrid apps
* React Native(javascript), which is use to develop hybrid apps
* Laravel(php), which is used to develop web apps
* Native Android SDK(Kotlin), which is used to develop mobile apps
* Native iOS(Swift), which is used to develop iOS mobile apps

1. **Review mobile app frame works by comparing them using key features e.g language, performance, cost, community support, complexity etc.**

**Answer:**

Having reviewed the available options, you’ll need to decide which is the most suitable mobile app development framework for you. This is decided mainly by the project goals and available funds. Here are the main aspects to consider when choosing technology for creating mobile apps.

**Supported platforms**

If you need an application for both iOS and Android (and also web), with a cross-platform framework it can be created from one set of code, saving financial resources and time. On the other hand, if you need an app for a single platform or have a big budget and team, go for separate native apps — this will ensure the best performance and lower risks of compatibility issues.

### Complexity

In theory, you can build any application with any of the frameworks, but in reality, some of them are not good at handling animation and heavy graphics. This is especially true of Apache Cordova and Ionic, which are based on web technologies and are more suitable for simple apps and MVPs than games or big complex projects. On the other hand, Flutter and React Native provide great optimization and their performance doesn’t fall short of native frameworks.

### Cost of development

An app cost can range from several thousand dollars to half a million and more. There are lots of factors in play, which we explain in the article on [*how to estimate a mobile app*](https://surf.dev/mobile-app-development-estimation/). Regardless of this, building a cross-platform solution will be cheaper and require fewer team members than developing two separate apps.

### Community support

Choosing an unpopular tool bears considerable risks: fewer educational resources, fewer people who can help if you run into an issue and fewer third-party libraries and plugins, which tangibly accelerate the development. According to [*2020 research*](https://www.statista.com/statistics/869224/worldwide-software-developer-working-hours/), 42% percent of developers consider React Native to be the best framework for hybrid mobile apps, followed by Flutter and Apache Cordova. However, the technologies are quickly evolving and it is important to keep track of the latest trends — for example, from 2019, the share of those who use Xamarin fell by 12% and those who prefer Flutter increased by 9%.

### Technological stack

Because every framework is based on different coding languages, development process and integrations can be made easier by choosing technologies which are already in use in the company (for example, if other products are built in .NET ecosystem, using Xamarin for a new app will be a logical choice). Also, if there are tight deadlines and the team already knows JavaScript (which is more widely known than Dart, for example), going for React Native or Ionic will speed up the process.

1. **How to collect and analyze the requirement of a mobile app the is to be developed**

**Answer:**

* Business goals and app objectives
* App user personas and stories
* App features, functional and non-functional requirement
* App UX, user flow, design notice
* App technology and infrastructure requirement
* Assumptions, constraints and dependencies

**Business Goals and App Objectives**

This part of the requirements document will cover the following questions:

* What business problem or need will the app solve?
* What is the unique selling point of the application that makes it different from its counterparts?
* What benefits will the application bring (financial benefits, customer retention, brand awareness, cost optimization, etc.)?
* How will the users actually use the app?

Defining the goals and objectives is an essential part of building a business requirements document for a mobile app. Understanding the business idea will help to define an effective set of functions for the solution.

**App User Personas and Stories**

User personas and stories should serve as a confirmation or refutation of any assumptions made about the users. A user persona is a detailed character description of a certain user type interested in your application. User story is an organic, everyday description of an app’s feature. User scenario is a basic story describing the user’s goal and how they manage to accomplish it.

This information is necessary for the future analysis of the mobile app business requirements document by multiple team members, from the technical to the marketing department.

That’s why it is essential to include a detailed description of user personas and stories with visual cues, like pictures with memorable faces, detailed screenshots of processes, etc. Direct customer interviews are a great way to confirm the validity of your idea.

**App Features, Functional and Non-Functional Requirements**

Any mobile app requirements document sample should include a detailed description of each major feature of the application. Each description should be complete with thorough characterization and at least one use case.

Besides the description of each function, you should add non-functional requirements for your application, like requirements regarding security, performance, compatibility with various devices, multi-language support, etc.

### App UX, User Flow, Design Notice

Having at least a general overview of the app’s UX and overall user flow is helpful from a technical standpoint, as it provides the basis for future design. This does not mean you should include a detailed wireframe, but light guidelines will go a long way.

With defined design needs and directions, it will be easier to create a well-thought-out and intuitive UI/UX that will be appealing to a user. This will also help to weed out ideas that might not be well-received.

### App Technology and Infrastructure Requirements

Defining the environment the app will be hosted in is crucial to make the app requirements document really helpful. For example, the requirements for Android app development are different from the requirements for a similar app for iOS, which is why specifying the target technology from the very beginning is critical.

Other business requirements worth mentioning include the infrastructure the app is going to be distributed through. Different app stores have policies and requirements that need to be accounted for during the development.

### Assumptions, Constraints & Dependencies

Another important aspect worth including in the app requirements are assumptions – events that can influence the project development, implementation, and success. For example, if you’re planning to use a third-party library, there is no guarantee that it will not close down in a few weeks or that it does not have any critical vulnerabilities.

In addition, any potential technical constraints should be mentioned as well. The limits of the application should be well-defined, including any potential external tools and third-party elements and integrations you cannot exclude from the development. Besides, feature dependencies should be included as well. If one feature does not work without the other, it is important to know that to properly strategize the development process.

1. **How to estimate the mobile app development cost**

**Answer:**

The cost of developing a minimum viable product for a mobile app from standard ranges between $15,000 and $230,000.

However, the exact amount you’ll pay may slightly differ with:

* The product complexity
* The type of app
* The development team involved
* The location of the development team.

**App Cost = Development Time \* Hourly rate of the development team**

These factors can affect mobile app development by as much as 100%. Thus, it’s imperative to consider what they entail and how to influence those factors to reduce development costs.