

Mobile Application Development

Mobile Application Development fundamentals

Introduction to the module

- ✓ **Student Centered Learning module**
- Module Code: IT2010
- Credit Value: 4
- Method of Delivery
 - Lectures – 1 hour/week
 - Tutorials (practical) – 2 hours/week
 - Labs - 2 hours/week
- Courseweb Enrollment Key: IT2010

Lecture Plan

- **Mobile Application Development fundamentals**
- Mobile Platforms
- Introduction to Android Operating System
- Main Components of Android Application
- Android Interface Design Concepts
- Data handling in Mobile App Development
- Sensors and Media Handling in Android Applications
- Kotlin Language to develop Android Mobile Apps
- Android Application Testing and security aspects

Assessment Criteria

Continuous Assessments

Midterm Examination (MCQ) - 20 %

- Mini Project (Group Project) - 30 %
 1. Project Phase 1 – 10%
 2. Project Phase 2 – 20%

End Semester Examination

- Final Examination (Online) - 50 %

Lecturer Panel

- Lecturer in-charge of the module
Ms. Disni Sriyaratna (disni.s@sliit.lk)
- Malabe
Mr. Nelum Chathuranga Amarasena (nelum.a@sliit.lk)
Mr. Thusithanjana Thilakarathna (thusithanjana.t@sliit.lk)
- Metro
Mr. S.M.B. Harshanath (harshanath.s@sliit.lk)
- Kandy
Ms. Gihani Gunarathna (gihani.g@sliit.lk)
Ms. Nilanka Singhagosha (nilanka.s@sliit.lk)
- Matara
Ms. Suriyaa Kumari (suriyaa.k@sliit.lk)

Learning Outcomes of the Lecture

At the end of this Lecture students will be able to:

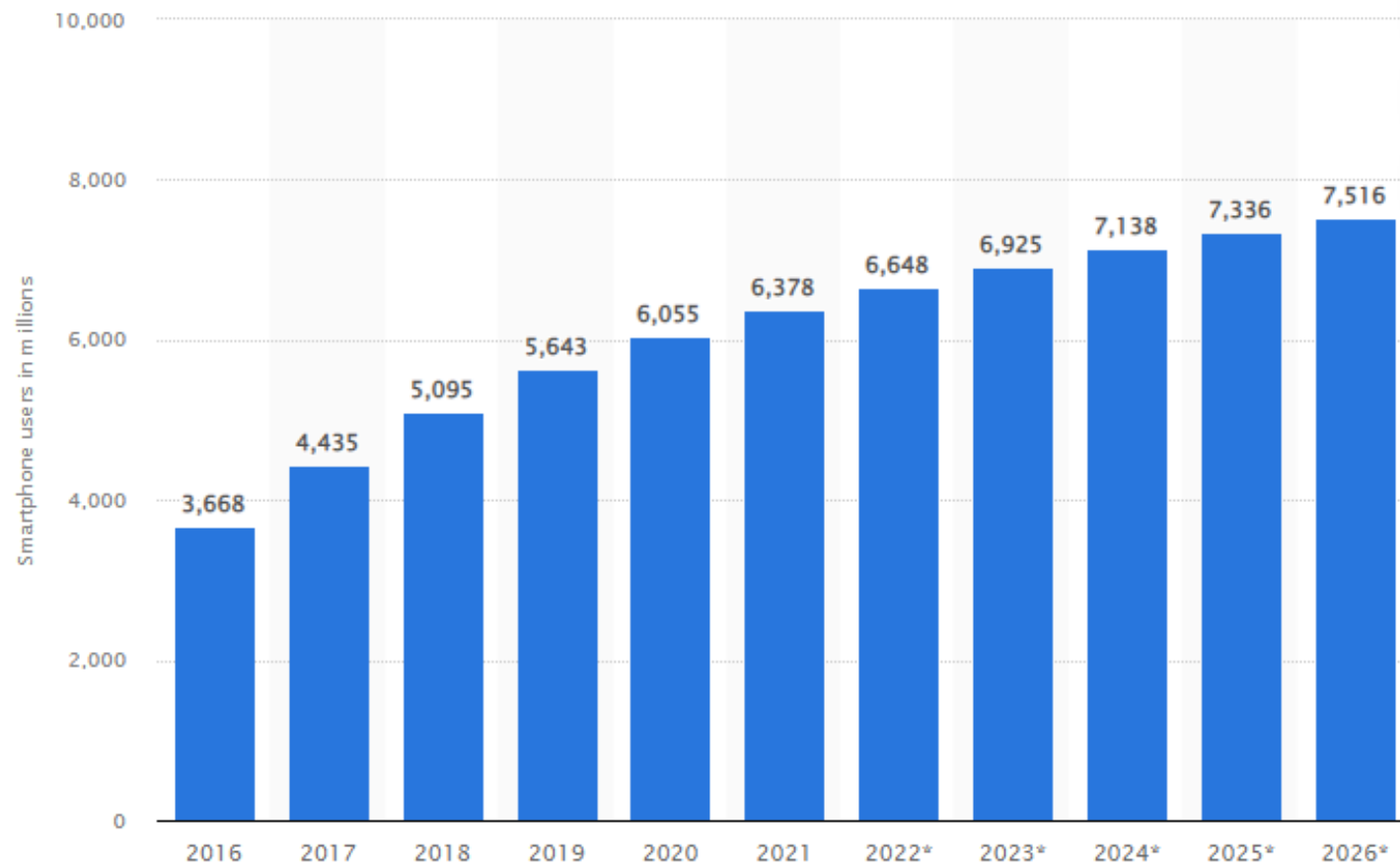
- Understand the fundamentals of mobile Application Development.

Why a Mobile App?

- Mobile phones are no longer the ordinary communication device. It has various incredible features and opportunities offered to the users.
- The number of smartphone users is growing up day by day. (In 2020, it's 3.5 billions)
- Business organizations are more like to have mobile applications for their business instead of investing in a mobile friendly version of their websites.
- Good mobile application will add value to the business.



Smartphone users growth around the world



Reference: <https://www.statista.com/statistics/330695/number-of-smartphone-users-worldwide/>

Mobile Application Development

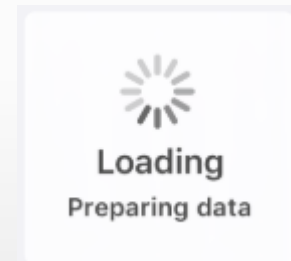
- Mobile application development refers to the creation of apps for use on devices such as tablets, smartphones, automobiles and watches.
- Mobile development often incorporates features of mobile devices that may not be available on desktop devices.

An example of this is the ability to operate a device or play a game simply by moving the smartphone around in space.



Key Features of Mobile Applications

- Great UI (User Interface)
- Fast loading time and high performance
- Extremely helpful user support
- Adapts to a user's needs
- Compatible with a mobile platform



Reasons for Mobile App failures

- The app doesn't have a market
- The app does not have adequate security
- The app does not perform quickly enough
- The app does not fully consider UX/UI
- The app's listing in the marketplace is not persuasive
- Hard to adjust web version to the smartphone screen
- Due to limited functions



Fundamentals of Mobile Application Development

Choice of Technology

- In advance to choosing any technology platform, one must ensure it is feasible in every way possible.
- Most appearing platforms are Android, iOS and Windows, and they are evolving rapidly with frequent handy updates. These platforms make it practically possible for developers to build unique features and impressive interface to deliver outstanding user experience.
- Choosing the right platform means your apps will be supported by numerous devices used by customers.

Fundamentals of Mobile Application Development

Clear recognition of requirements

- Define and set your final goals where you want to reach so that you can make a clear strategy and avoid confusion down the path of development.
- Knowing your goals enrich your vision and helps you develop apps that hit the precise pain point.
- Detailed analysis of the product and target audience helps to build an effective app

Fundamentals of Mobile Application Development

Dynamic Functionalities

- Mobile application users like to explore a heterogeneous set of interactive functionalities such as GPS, transactions, messages, responsiveness, sensors, and even audio/video.
- Most application use these interactive functionalities to attract users.

Fundamentals of Mobile Application Development

Security and Speed Efficiency

- Security problems are potential threats to customers who will become the end users of the app. Choose a reliable, secure, authentic resources and industry-standard processes to build the app to ensure its highly secure.
- A mobile app should respond instantly to process customer requests in time. Ensure that the application is effective normal internet environment.

Fundamentals of Mobile Application Development

Testing Quality and Consistency

- Testing the app is a crucial stage for any developer as it confirms whether or not the app is ready to deploy.
- An ideal app testing method must include testing on different devices of varied screen sizes in order to measure its performance and view its compatibility.
- Developer must also necessarily maintain the consistency while coding the app to make sure the entire mobile app development process, along with its documentation and program updates and interface, is genuine, consistent and clear.

Fundamentals of Mobile Application Development

Introduce a Pilot Version

- Once the development team is confident that they have built a well-tested, mature and fully functional app, they can go for launching the pilot product.
- The course of ideal mobile app development must end with the launch of pilot version.
- It helps developers receive the feedback and responses from the users and judge the success of the app.

Mobile Application Design Tools (Prototyping tools)

*"If a picture is worth a thousand words, a
prototype is worth a 1000 meetings"*

Mobile Application Design Tools (Prototyping tools)

- Invision
- UXPin
- Sketch
- Slicy
- Skala Preview
- Placelt
- AdobeColor
- FontFace Ninja
- Illustrator & Photoshop
- Omnigraffle
- Proto.io
- After Effects
- Fluid UI

Groups formation to the project

- Register your 4 member groups into given links in courseweb.
- First phase Evaluation → 7th Academic Week
- Final Evaluation → 12th Academic Week

NOTE: The above dates are fixed. No extensions will be given.

Thank You

Mobile Application Development

Mobile Platforms

Lecture Plan

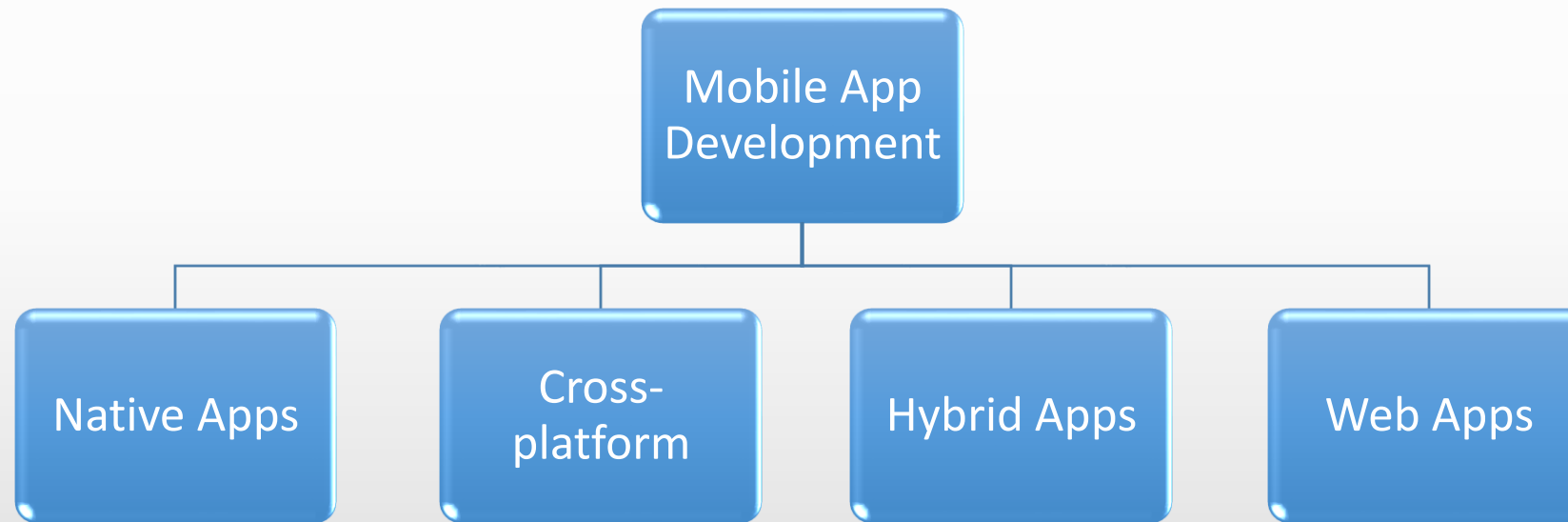
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Learning Outcomes of the Lecture

At the end of this Lecture students will be able to:

- Comprehend native mobile operating systems.
- Describe cross-platform mobile development.
- Describe Hybrid mobile development.

Mobile Application Development



Native Mobile Application

- A native mobile app is an application developed using platform-specific development tools.
- These apps are developed individually for each of the three popular mobile operating systems.





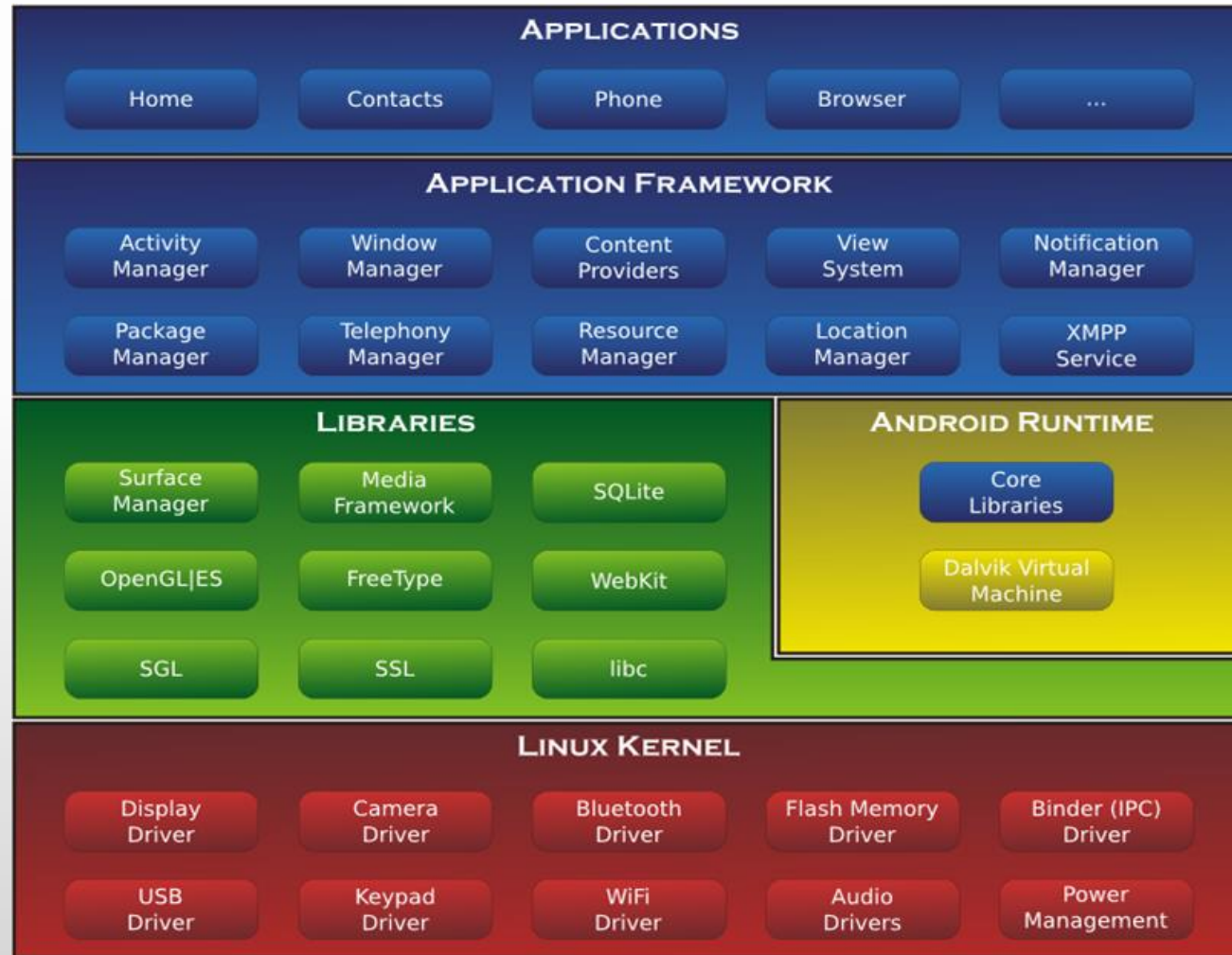
Android

- Android is a mobile operating system developed by Google, based on a modified version of the Linux kernel and other open source software. It is primarily designed for touchscreen mobile devices such as smartphones and tablets.
- Android is the most popular mobile operating system at present.
- Founders of android were Rich Miner, Nick Sears, Chris White, and Andy Rubin.





Android Architecture



Android versions





Android Devices

Devices using android operating system

Smartphones

- Samsung
- Sony
- HTC
- Google
- LG
- Lenovo
- Oppo
- Huawei





Android Devices

Tablets

- Samsung Galaxy Tab
- Asus ZenPad
- Huawei MediaPad
- Lenovo Yoga Tab
- Amazon Fire HD
- Sony Xperia Z4 Tablet
- Nvidia Shield Tablet K1





Android Devices

TV

- Sony Bravia Smart TV
- Sharp Smart TV
- Philips Smart TV



Smartwatch

- Ticwatch
- LG Watch Style
- Misfit Vapor
- Asus ZenWatch
- Fossil Q Venture





Android Devices

Development Environments

- Android Studio
- Eclipse
- Apache Cordova
- App Inventor for Android
- C++ Builder
- Blue J
- FlashDevelop
- Titanium



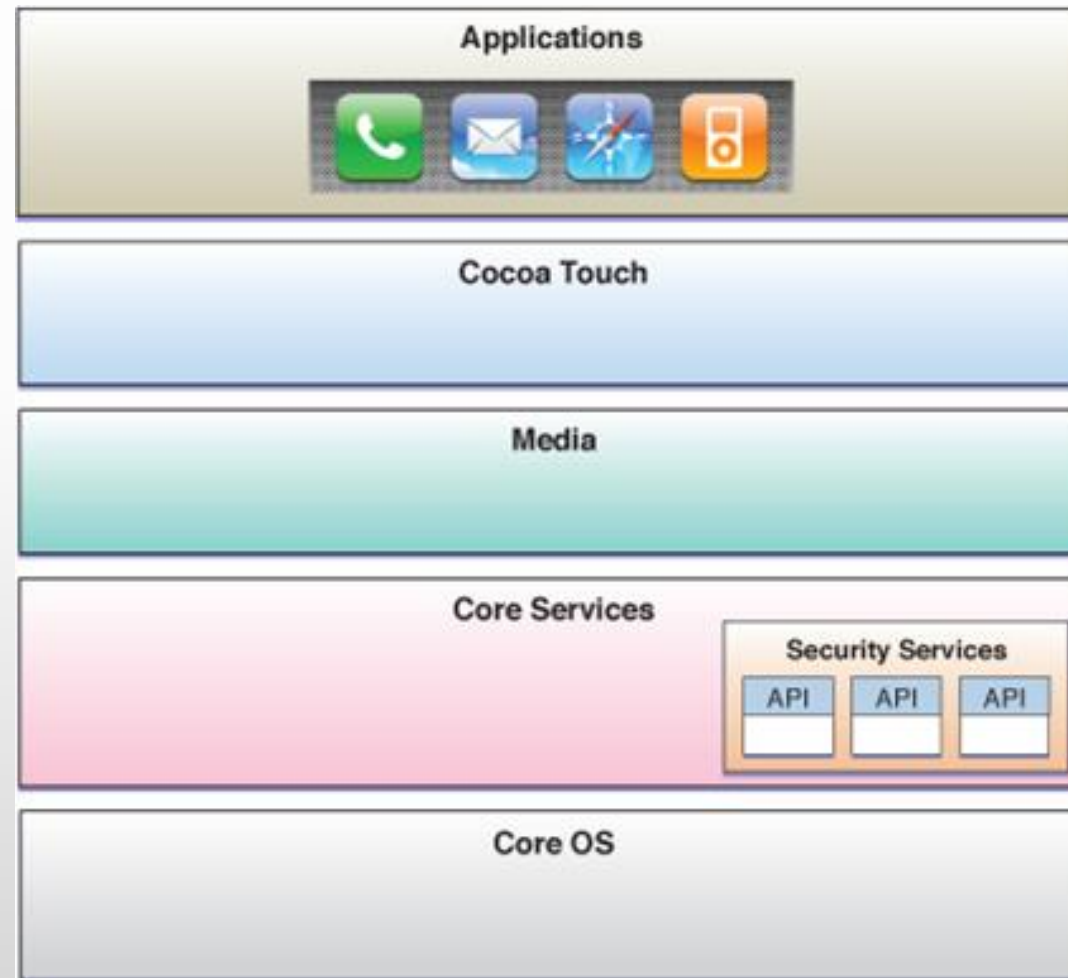


- iOS is a mobile operating system created and developed by Apple Inc.
- It is exclusively designed for Apple hardware.
- It is the second most popular mobile operating system globally after Android.
- Founders of iOS/Apple were Steve Jobs, Steve Wozniak, and Ronald Wayne





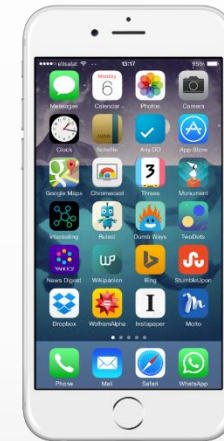
iOS Architecture



iOS Devices

Devices using iOS operating system

- iPhone
- iPod Touch
- iPad
- iPad Mini
- iPad Pro
- Apple TV
- Apple Watch





Development Environments

- Xcode
- AppCode
- Apache Cordova





Windows Mobile

- Windows Mobile is a discontinued family of mobile operating systems developed by Microsoft.
- Its origin dated back to Windows CE in 1996, though Windows Mobile itself first appeared in 2000 as PocketPC 2000.
- It was renamed "Windows Mobile" in 2003, at which point it came in several versions and was aimed at business and enterprise consumers



Windows Mobile

Devices using windows mobile operating system

- Dopod 515
- Krome Intellect iQ200
- Mitac Mio 8390 and 8860
- Motorola MPx200
- O2 Xphone
- Orange SPV E200 and e100
- QTEK 7070 and 8080
- Sagem myS-7



Windows Mobile

Development Environments

- Visual Studio
- Apache Cordova



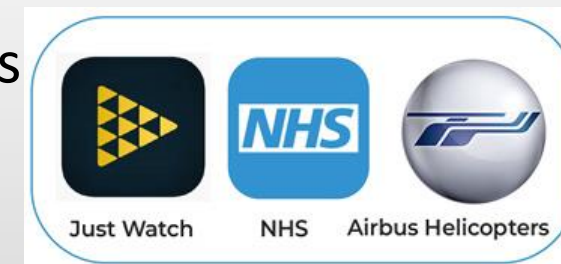
Hybrid App Development

- Less time for development.
- Allows for code sharing.
- Blend web elements with mobile ones.
- Create codebase using standard web technologies (HTML, CSS, JavaScript)

Tools:

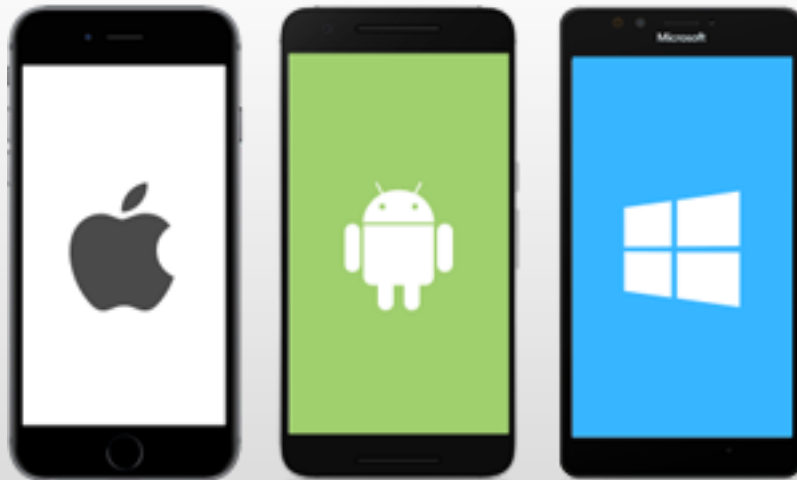


Examples



Cross-platform mobile application development

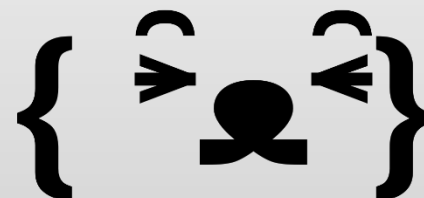
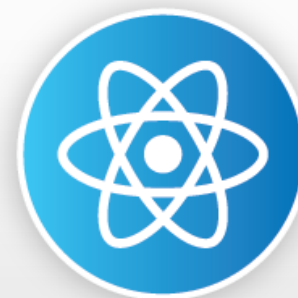
Cross-platform mobile application development refers to the development of mobile apps that can be used on multiple mobile platforms.



Cross-platform mobile application development

Development Environments

- Apache Cordova
- PhoneGap
- Xamarin
- Ionic
- Framework 7
- React Native
- Jasonette



Cross-platform mobile application development

Advantages

- Codes can be reused
- Controls Cost
- Quicker development time
- Easier Implementation
- Sameness and Uniformity

Cross-platform mobile application development

Disadvantages

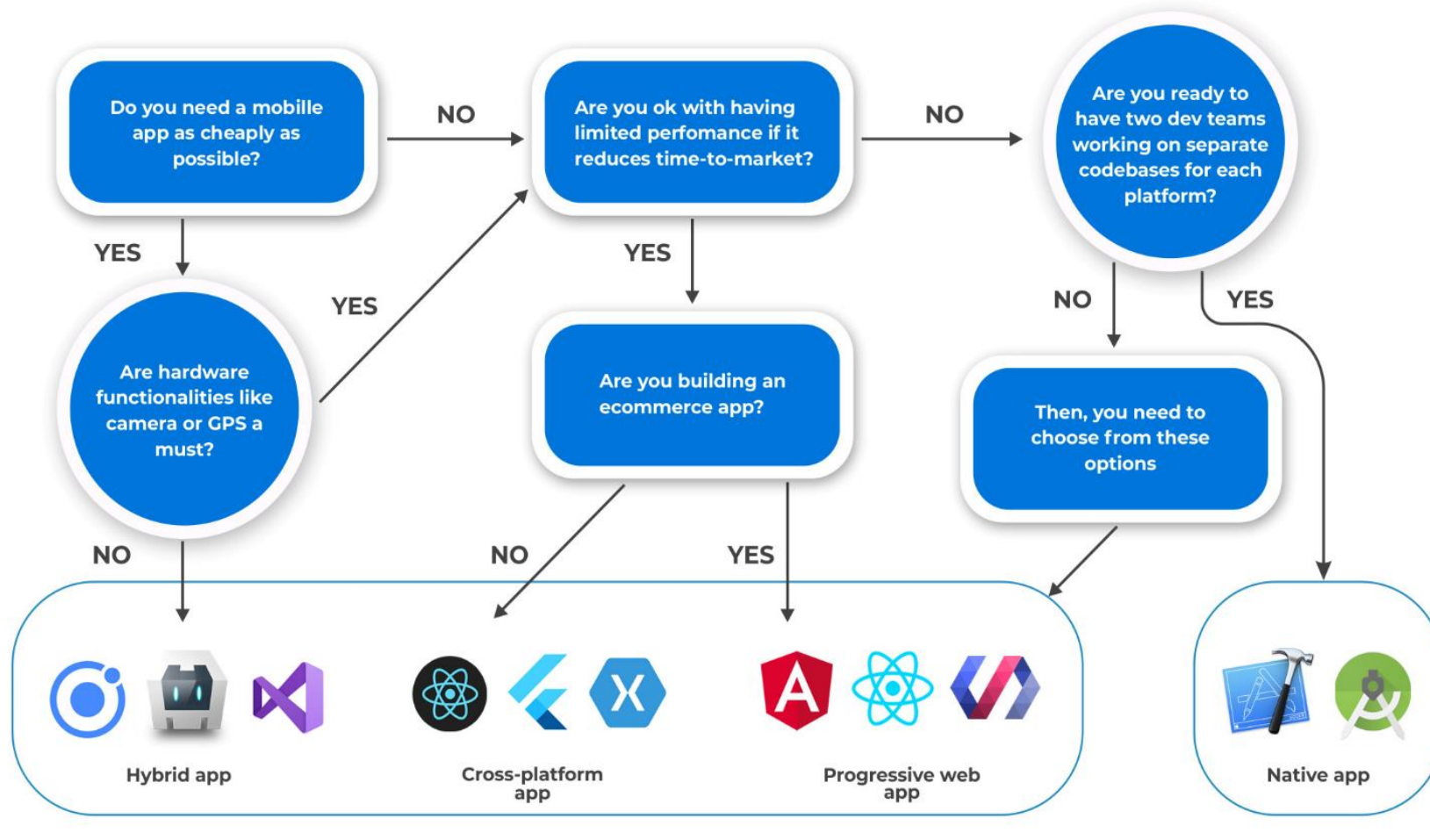
- Loss of Flexibility
- Problems in platform Integration
- Diversity in user Interaction
- Poor user experience
- Difficulty in satisfying all users

App Type	Native	Hybrid	Cross-platform
Tools	<ul style="list-style-type: none">• XCode• AppCode• Android Studio	<ul style="list-style-type: none">• Ionic• Apache Cordova• Visual Studio	<ul style="list-style-type: none">• React Native• Xamarin• Flutter
Rendering Engine	Native	Browser	Native
Libraries	Not much dependency on open-source libraries and platforms	Highly dependent on different libraries and frameworks	Highly dependent on different libraries and frameworks
Debugging	Native debugging tools	Native + web development debugging tools	Depends on the framework
Codebase	Separate codebase – one per platform	Single codebase with potential platform-specific abilities	Single codebase with potential platform-specific abilities

App Type	Native	Hybrid	Cross-platform
Pros	<ul style="list-style-type: none">• Full access to device's/ OS's features• Powerful performance• Native UI (updating along with the OS)• Efficient App Running• High-quality functionality and UX• Access to all native APIs and the platform-specific functionality	<ul style="list-style-type: none">• Lower development cost• Different OS support• Code reuse• Cost effective development• Big customization capabilities	<ul style="list-style-type: none">• Different OS support• UI performance is almost as fast as native• Code reuse• Cost-effective development
Cons	<ul style="list-style-type: none">• No multi-platform support• High dev cost if different OS support is needed• No code reuse	<ul style="list-style-type: none">• Slower performance• Limited access to OS features• No interaction with other native apps	<ul style="list-style-type: none">• *Slower performance• Limited access to OS features• Poor interaction with other native apps

Choose a Development approach for your Mobile App

CHOOSE A DEV APPROACH FOR YOUR MOBILE APP



Thank You

Mobile Application Development – IT2010

Lecture 3 - Mobile Interface Design Concepts and UI/UX Design Fundamentals

"Practice safe design: Use a concept."

*-Petrula Vrontikis-
Graphic Designer and Lynda Author*

Learning outcomes of the lecture

At the end of this Lecture students will be able to

- Define the terms UI and UX
- List the principles of user interface design
- Categorize different UI components in Android
- Recognize the importance of UI Evaluation

Mobile Interface Design

- Interface design add meaning and value to the application
- Design will become attractive if universality design principles are applied.
- Designers face thread when many requirements are unclear and uncertain.



Are the above mentioned two words express the same idea???

Mobile UX – User Experience

- Enhancing user satisfaction of an app, while involving the user's opinions and feelings *before*, *during*, and *after* their interaction with an app.
- Includes all aspects of the end-user's interaction with the company, and its products/services.

Cont'd... - Why UX in mobile?

UX of a mobile application influences how users observe it

Ex:

- Does app provides them value?
- Is the app easy to use?
- Does it help them to fulfill their goal?

Mobile UI – User Interface

- User interface is everything that the user can see and interact with
- In simply terms, “the design of the user interface is not the appearance of a product, but how it works”
- Interface design is the first thing that users will see, therefore, it directly effects the user's view

Cont'd... - Why UI in mobile?

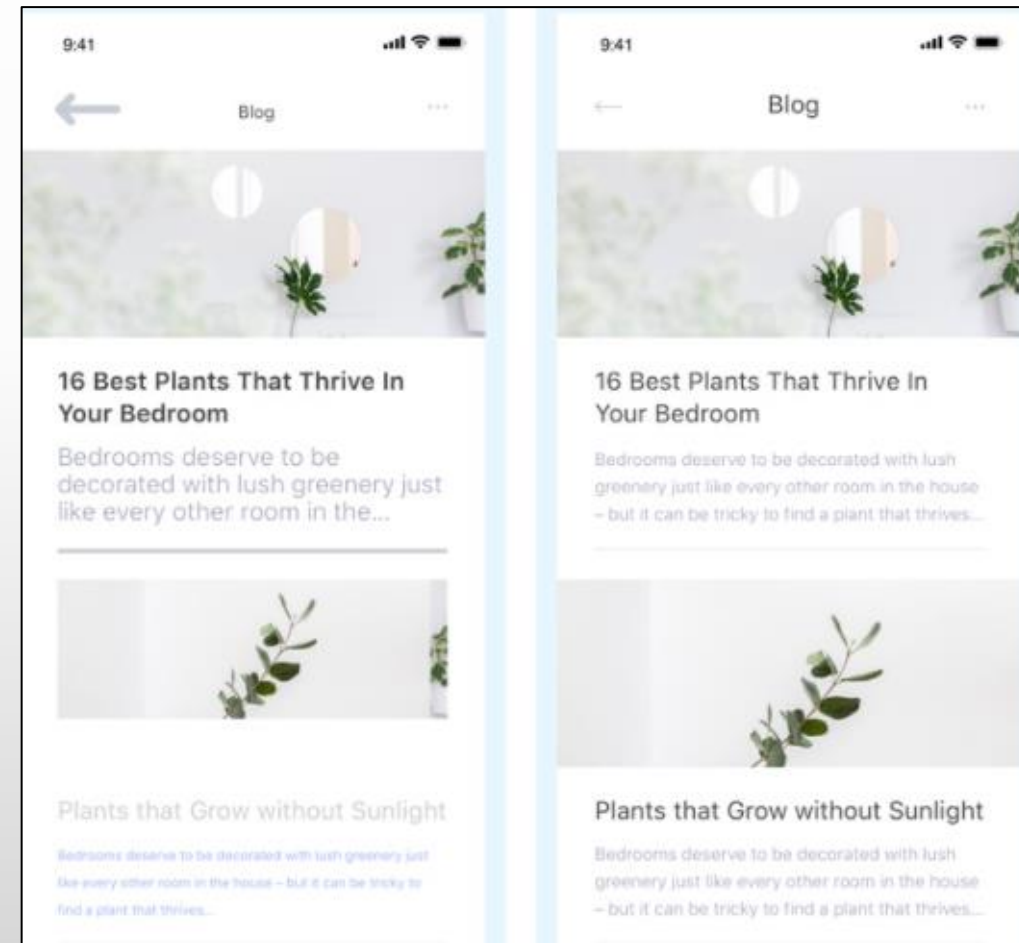
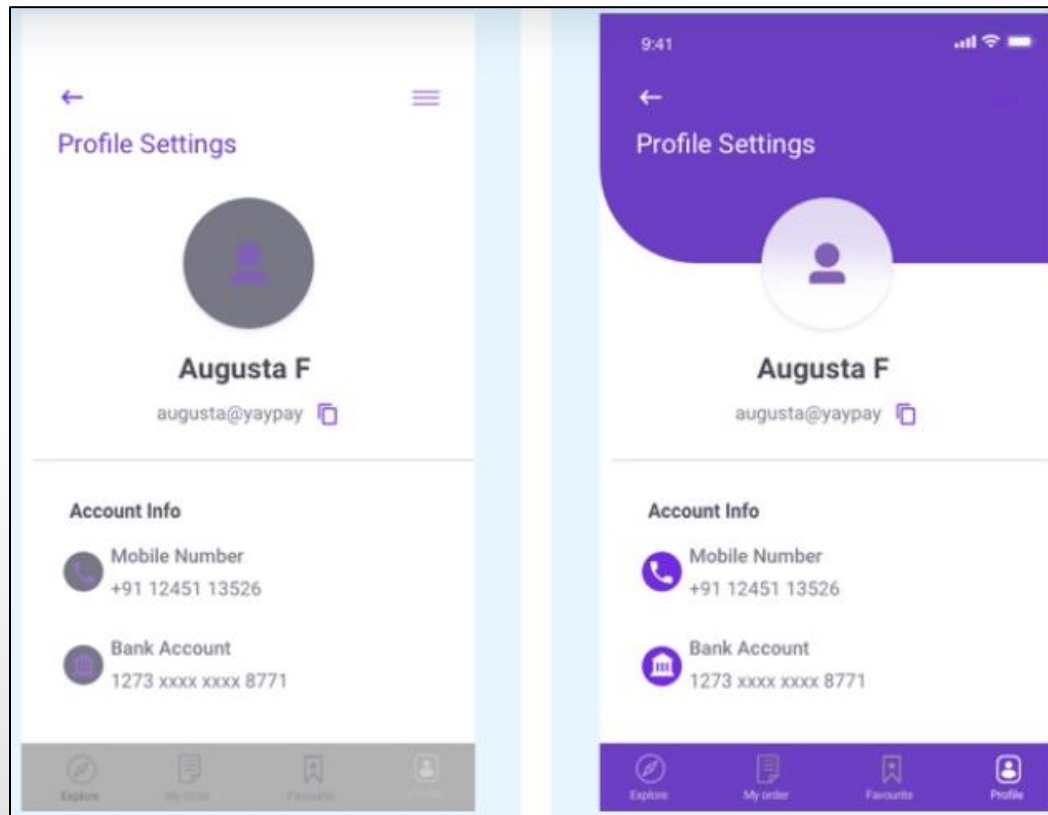
Visual elements greatly impacts an emotional connection with the user

Ex:

- Does the color attract the user?
- Are the elements are placed properly?

Principles of Mobile User Interface Design

Which one is better?



Principles of Mobile Interface Design



Mobile Mindset

- Be Focused
- Be Unique
- Be Charming
- Be Considerate



Mobile Contexts

- Bored
- Busy
- Lost

Global Guidelines

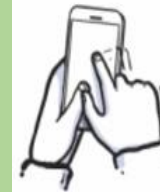
- Responsiveness
- Polish
- Thumbs
- Targets
- Contents
- Controls
- Scrolling

Principles of Mobile Interface Design

Navigation Models

- None
- Tab bar
- Drill down

SWIPE



TAP



PINCH



ZOOM



User Inputs

- Keyboard variations
- Auto correction
- Device Orientation

TILT



SHAKE



MULTI TOUCH



Gestures

- Invisible
- Two hands
- Nice to have
- No replacement

Principles of Mobile Interface Design

Orientation

Communication

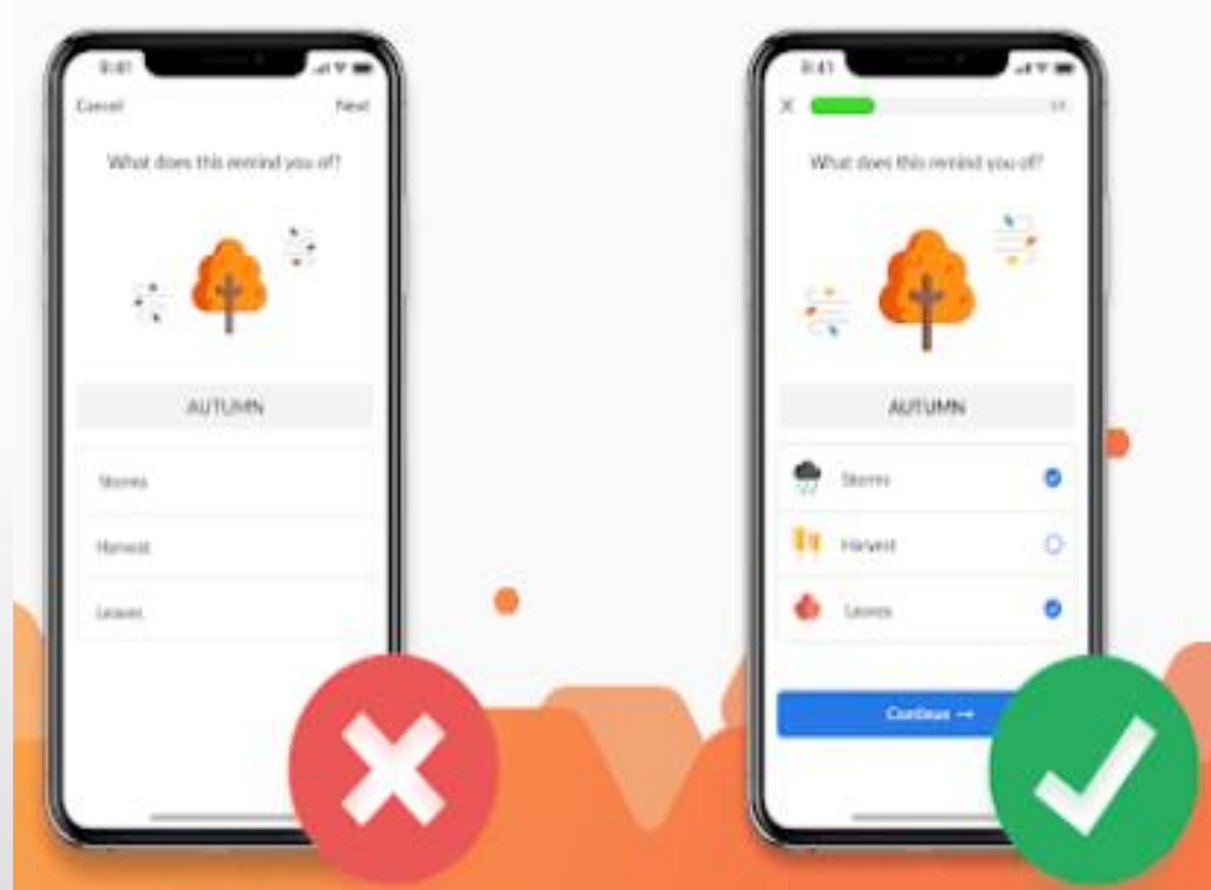
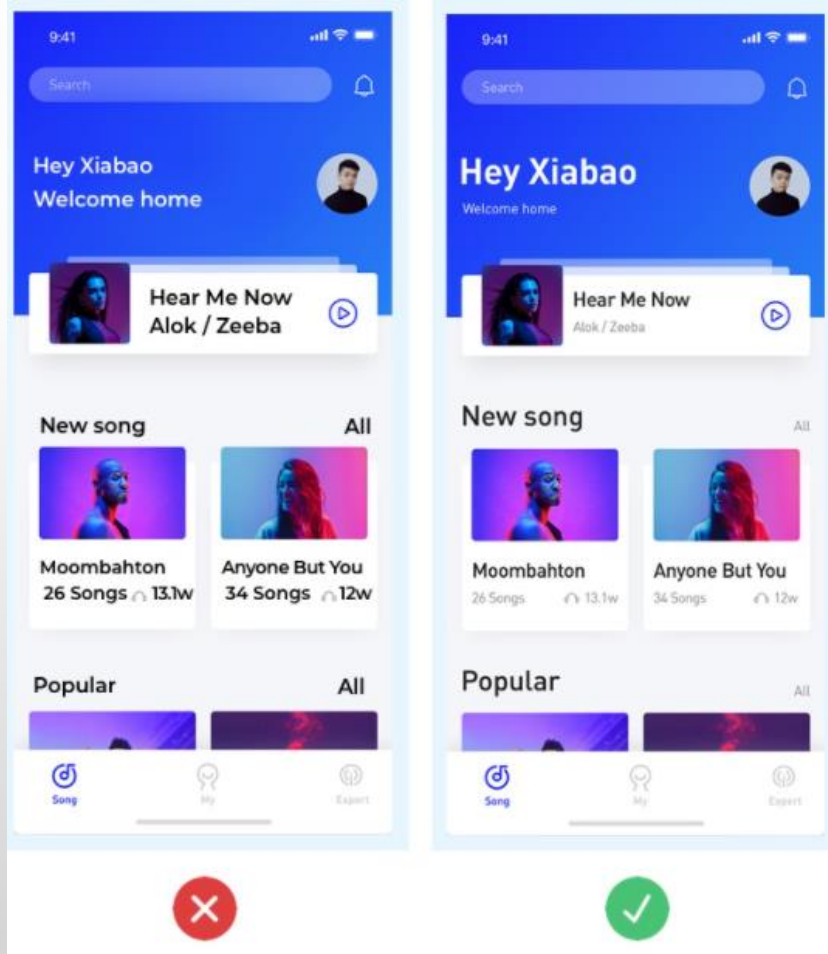
- Provide feedback
- Model alerts
- Confirmations

Launching

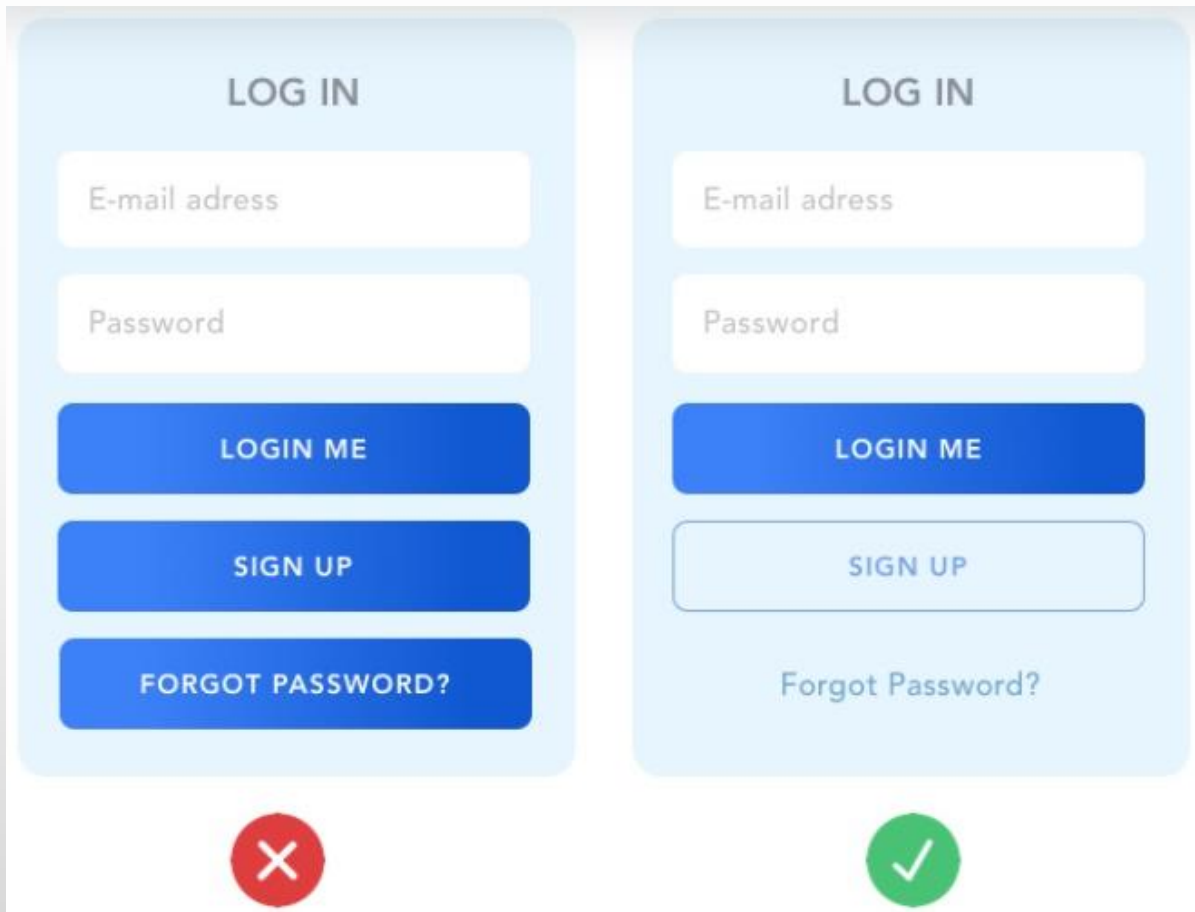
First Impressions

- Icon
- First Launch

Text Hierarchy



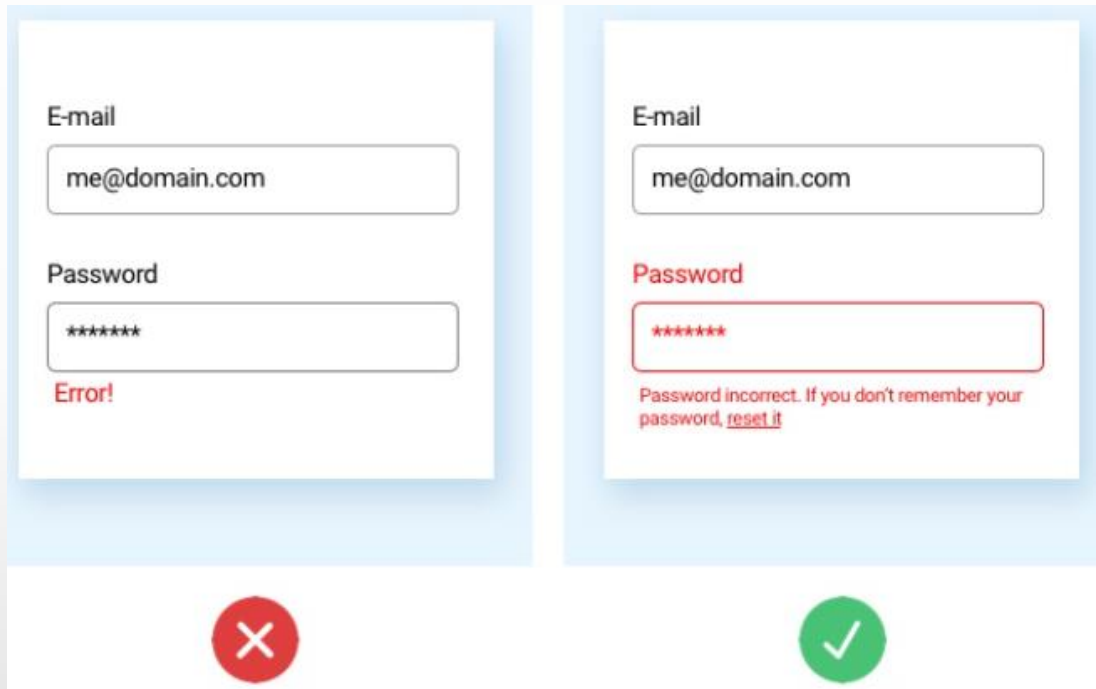
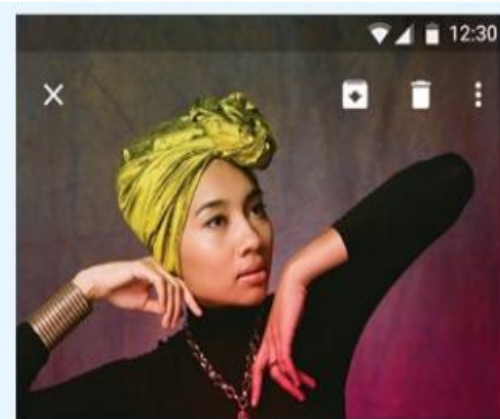
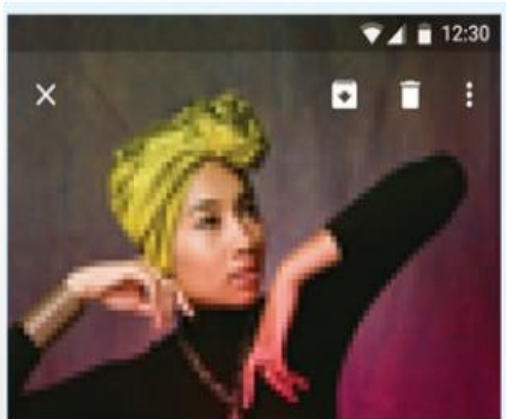
Attractive



The image compares two mobile app login form designs. Both forms have a light blue background and the title 'LOG IN' at the top. They both include input fields for 'E-mail address' and 'Password'. Below the inputs, the left form features three stacked blue buttons: 'LOGIN ME', 'SIGN UP', and 'FORGOT PASSWORD?'. The right form features a blue 'LOGIN ME' button, a light blue 'SIGN UP' button, and a light blue 'Forgot Password?' link. A red circle with a white 'X' is positioned below the left form, and a green circle with a white checkmark is positioned below the right form.

- Little distinction between primary and secondary buttons.
 - ✓ Different visual weight
 - ✓ Strong colors

Low quality images



The image shows two side-by-side login forms for comparison. Both forms have an 'E-mail' field with the text 'me@domain.com' and a 'Password' field with the text '*****'. The left form, marked with a red 'X' below it, shows an 'Error!' message in red text below the password field. The right form, marked with a green checkmark below it, shows a more detailed error message in red text: 'Password incorrect. If you don't remember your password, [reset it](#)'.

Confusing forms

Cont'd...

Principles of Mobile Interface Design:

Reference: <https://www.youtube.com/watch?v=XS0Qd7hLPhw>

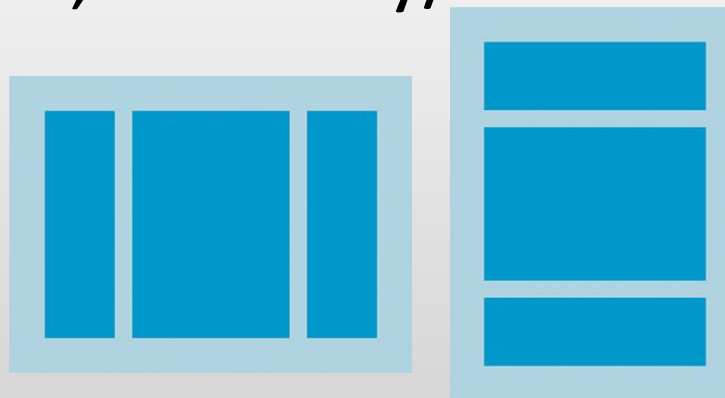
Mobile UI Components

Mobile UI components Based on Android

- Android provides a variety of pre-built UI components such as,
 - **Layouts**
 - **Notification**
 - **Menus**
 - **Dialogs**
 - **Toast**
 - and etc.
 - **Other common elements** (Buttons, Text fields and etc,)

Cont'd...

- A layout defines the structure for a user interface in your app
- **Linear Layout**
This layout aligns all children in a single direction, vertically/horizontal



Cont'd...

- **Relative Layout**
displays child views in relative positions to,
 - Sibling elements
 - Parent



Reference: <https://developer.android.com/images/ui/relativelayout.png>

Cont'd...

- **Constraint Layout**
 - This layout provide feature to position and size widgets in a flexible way
 - Works similar to relative layout but more flexible than that.

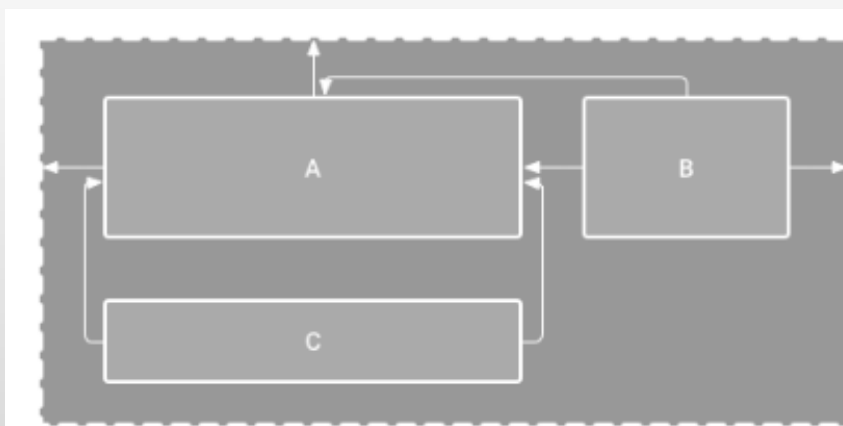


Figure 1. The editor shows view C below A, but it has no vertical constraint

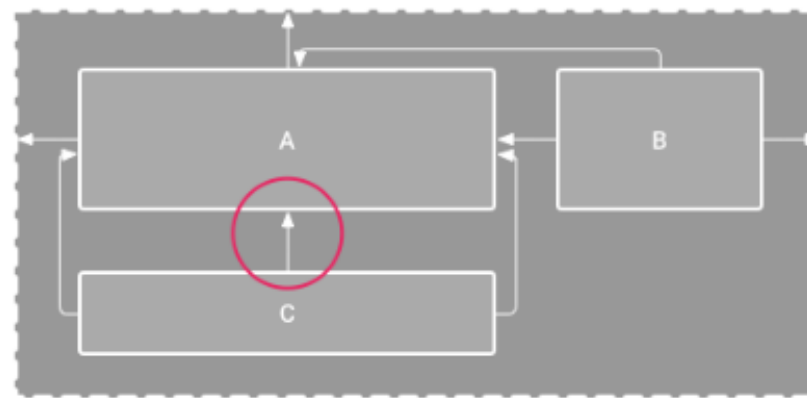


Figure 2. View C is now vertically constrained below view A

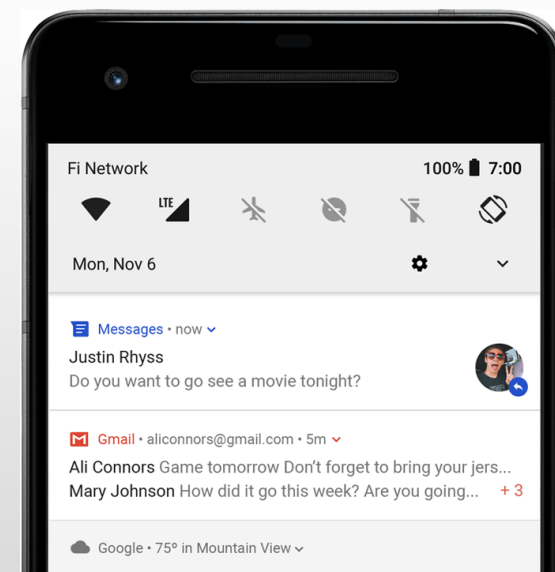
Cont'd...

Other available layouts,

- **Adapter View**
- **Grid View**
- **Table Layout**
- **Absolute Layout**
- **Frame Layout**

Cont'd... Notification

- A message displays outside the app's UI to provide the user with,
 - Reminders
 - Communication from other people
 - Timely information from the app
- Users can tap the notification to open an app/take an action directly from the notification

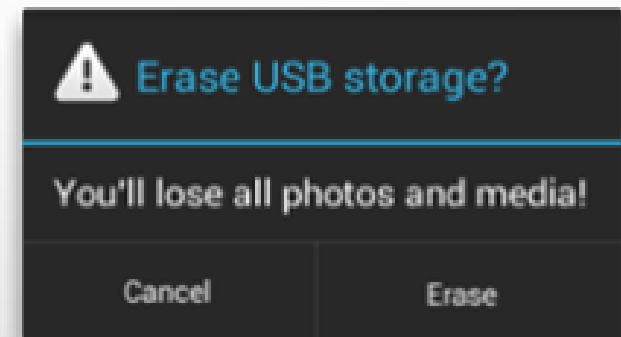


Reference:

https://developer.android.com/images/ui/notifications/notification-drawer_2x.png

Cont'd... Dialogs

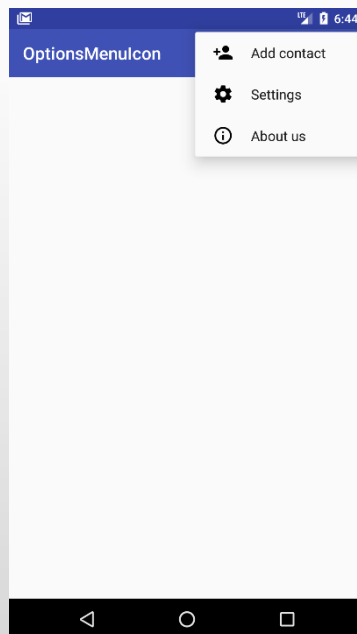
- Small window that prompts the user to make a decision before they can proceed.
- Dialog box does not fill the screen
- Consists of subclasses
 - AlertDialog
 - DatePickerDialog/TimePickerDialog



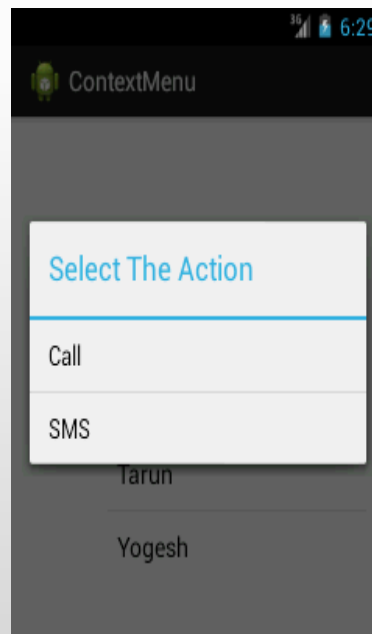
Cont'd... Menus

- This is a common component in many application, there are three standard menus,

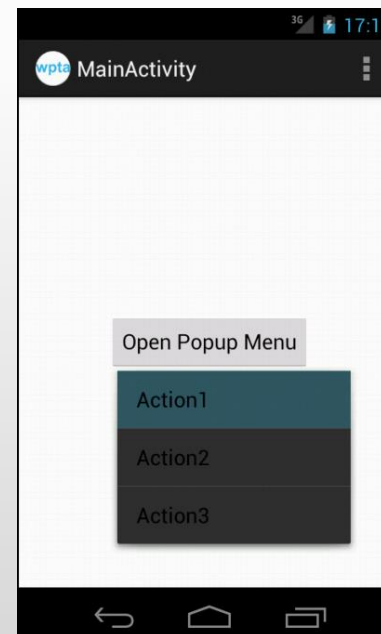
Options menu



Context menu



Popup menu



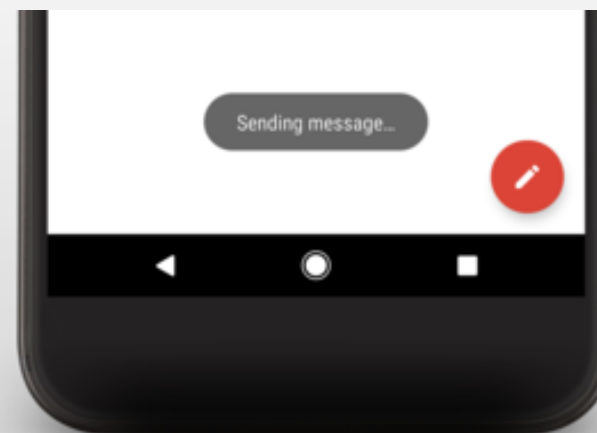
Reference:

http://wptrafficanalyzer.in/blog/wp-content/uploads/2012/07/popup_menu_demo.png

<https://www.codingdemos.com/wp-content/uploads/2017/10/Android-Options-Menu-Icon.png>

Cont'd... Toasts

- Provides simple feedback about an operation.
- Only uses the space required for the message while the current activity remains visible and interactive.
- Toasts automatically disappear after a timeout.



Reference: <https://developer.android.com/images/toast.png>

References

1. <https://clearbridgemobile.com/mobile-app-design-fundamentals-user-experience-user-interface/>
2. <https://developer.android.com>
3. <https://www.tutorialspoint.com>

Thank You