Introduction:

Brief History of mobile technologies

Mobile devices have come a long way from their origins as simple tools for making voice calls. Today, they are versatile devices that allow users to create and share a wide range of content, including voice recordings, music, text messages, videos, and images. In addition to communication, mobile devices can access the internet, stream TV shows and movies, use GPS for navigation, play games, and interact with augmented reality. The capabilities of a mobile device are determined by both its network connection and the features of the device itself.

A mobile phone is a portable device that enables users to make and receive calls while on the move within a service area. Most modern mobile phones utilize cellular networks and offer a variety of services such as texting, emailing, internet browsing, wireless communication, business apps, gaming, and photography. Smartphones, on the other hand, are mobile phones with advanced computing capabilities. The first handheld mobile phone was demonstrated in 1973, and the first commercially available mobile phone was introduced in 1983.

Mobile Technology Networks and Infrastructure

Mobile phone companies like Android, Apple, Blackberry, and others provide tools called Software Development Kits (SDKs) to help developers create apps. Developers can then share their apps with the world through app stores. The first handheld mobile phone call was made by Martin Cooper of Motorola in 1973. The idea of a handheld mobile phone was first thought of in the early days of radio technology. In 1917, a Finnish inventor named Eric Tigerstedt patented a small folding phone with a thin microphone. Early versions of cell phones were used for radio communication on ships and trains. The first commercially available handheld cell phone was the Motorola DynaTAC 8000X in 1984. Japan launched the first automated cellular network in 1979.

Different mobile technologies:

The evolution of mobile communication technology has been a fascinating journey. It all began with the first-generation (1G) systems, which could handle multiple calls simultaneously but relied on analog technology. In 1991, the second-generation (2G) digital cellular technology was introduced in Finland by Radiolinja, using the GSM standard. Fast forward to 2001, and Japan's NTT DoCoMo launched the third generation (3G) on the WCDMA standard, paving the way for faster data transfer speeds and increased capacity with the introduction of 3.5G and 3G+ enhancements based on the HSPA family.

As the demand for bandwidth-intensive applications like streaming media grew, it became evident by 2009 that 3G networks would soon be overwhelmed. This led to the exploration of

data-optimized fourth-generation technologies, promising significant speed improvements over existing 3G technologies. The first commercially available 4G technologies were the WiMAX standard in North America by Sprint and the LTE standard in Scandinavia by TeliaSonera.

Looking back, mobile communication has come a long way since the days of MTS in North America and the introduction of the Improves Mobile Telephone Service (IMTS) by AT&T in 1965. The advancements in technology have revolutionized the way we communicate, from user dialing to the removal of operator forwarding, and the utilization of additional radio channels to expand subscriber capacity and coverage.

In 1960, Sweden introduced the world's first fully automated mobile telephone system, known as Mobile Telephone system A (MTA), which allowed for automated connections from rotary handsets within cars. This system, although requiring operator assistance for call forwarding, marked a significant step towards the mobile communication systems we rely on today. And let's not forget the groundbreaking moment when Dr. Martin Cooper, a Motorola researcher and executive, made the first phone call from a handheld mobile phone on April 3, 1973, setting the stage for the mobile revolution that followed.

Analog Cellular Networks or "1G"

The first generation of cellular networks laid the foundation for the modern networks we rely on today. By utilizing multiple cell tower sites connected through a network, users were able to travel and seamlessly switch between cell towers during calls. This groundbreaking advancement, known as the Analog Mobile Phone System (AMPS), was developed by AT&T and marked a significant shift in communication technology. The initial proposal for AMPS was submitted by AT&T in 1971, and after 11 years of review, the FCC finally approved their request. This approval granted AT&T the 824-894MHz range to operate the AMPS system, leading to the establishment of the first cellular network in Chicago in 1977.

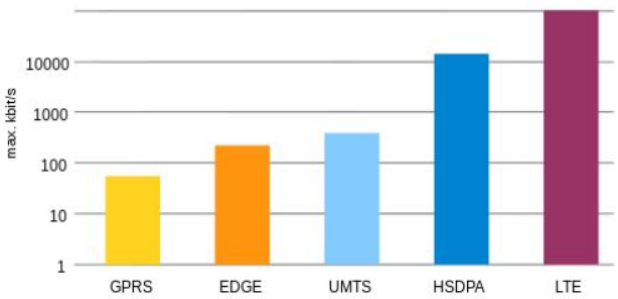
Digital Cellular Networks or "2G"

In the 1990s, the European GSM standard and the North American CDMA standard were introduced, leading to the expansion of cell tower sites and advancements in battery and internal components, resulting in smaller mobile devices. 2G technology also brought about the introduction of SMS messaging, with the first computer-generated SMS sent in the UK in 1992 and the first person-to-person SMS in Finland a year later using GSM technology. The

late 1990s saw the emergence of pre-paid mobile phones and plans, further popularizing SMS across all age groups. Additionally, 2G technology enabled the introduction of download services, allowing users to download ringtones for the first time

Mobile Broadband or “3G”

In 1999, NTT DoCoMo introduced the first mobile Internet service in Japan using existing 2G technologies, which was later replaced by the world's first 3G network launched in October 2001. Following this, many countries, including South Korea, the US, the UK, and Italy, adopted 3G networks in the early 2000s. While 3G was being developed, some "2.5G" services emerged to enhance older technologies, but they did not match the speed of 3G technologies like GPRS and EDGE. The advent of 3G revolutionized the mobile phone industry, enabling widespread mobile Internet access and transmission services like TV and radio for the first time. This led to a surge in smartphone usage as handset manufacturers embraced the technology. By 2005, 3G had evolved further, giving rise to terms like "3.5G," "turbo 3G," and "3G+" with technologies such as HSPDA, HSPA, and HSPA+.



Native IP or “4G”:

LTE, or Long-Term Evolution, has indeed become a widely adopted technology in North America due to its high data speeds and reliability. It has surpassed WiMAX, which was offered by Sprint in the US but did not gain as much traction. However, it is important to note that LTE availability varies by region, and in some areas like Australia, LTE may not be as prevalent.

With the introduction of 4G technology, mobile Internet has made significant advancements by transitioning to native IP networks. This has brought mobile Internet connections closer to wired home Internet connections in terms of speed and reliability. As a result, users can now enjoy faster data speeds, improved network coverage, and a more seamless online experience on their mobile devices. This transition has also paved the way for the development of new technologies and services that rely on high-speed mobile Internet connections.

Key Mobile App Development Services: Exploring the Key Components

Mobile app development involves a variety of tasks and processes. Let's take a closer look at the essential components of these services:

1. **Idea Generation and Conceptualization**: Every mobile app begins with a great idea. This phase includes brainstorming, market research, and competitor analysis to refine the concept into a viable product.

2. **Market Research:** Understanding the target audience, their preferences, and market trends is crucial. Market research guides the app's design and functionality.

3**. Design and User Interface (UI/UX) Development**: Creating a visually appealing and user-friendly interface is essential. UI/UX design focuses on enhancing the overall user experience and usability of the app.

4. **Coding and Development**: The core of mobile app development lies in coding.Developers write the software code that brings the app to life.

5. **Testing and Quality Assurance (QA**): Thorough testing is vital to identify and resolve any bugs or issues. Quality assurance ensures the app functions seamlessly across different devices and platforms.

6**. Deployment and Launch**: Once the app is ready, it is deployed to app stores like the Apple App Store or Google Play Store, making it accessible to the public.

7**. Maintenance and Updates**: Continuous updates are necessary to keep the app relevant and operational. This includes bug fixes, feature additions, and ensuring compatibility with the latest operating systems.

8. **App Marketing and Promotion**: Developing an app is just the beginning. Effective marketing and promotion are essential for reaching the target audience and achieving success.

Approaches to Mobile App Development:

Mobile app development can be categorized into three main approaches: native app development, web app development, and hybrid app development.

- **Native App Development**: Developed for specific platforms like iOS or Android, native apps offer high performance and utilize device-specific features but require separate development for each platform.

- **Web App Development**: Accessible through web browsers on mobile devices, web apps are platform-independent but may have limitations in performance and access to device features.

- **Hybrid App Development**: Combining elements of native and web apps, hybrid apps are developed using web technologies and can be deployed on multiple platforms.

The Mobile Ecosystem

Mobile Ecosystem:

Mobile Ecosystem is collection of multiple devices (mobile phones, Tablet, Phablet etc), software (operating system, development tools, testing tools etc.), companies (device manufacturers, carrier, apps stores, development/testing companies, etc.) etc., and the process by which data (sms, bank transactions etc.), is transferred/shared by a user from one device to another device or by the device itself based on some programs (Birthday, Wedding Messages, calendar).

Data (Text, MultiMedia, VOICE) sharing can be done between devices of the same operating system or different operating systems. Examples: IPhone (IOS) to Windows Phone or IPhone(IOS) to Nexus(Android) or Motorola(Android) to Nexus (Android).

Data can be also shared between multiple devices with the same operating system of the same manufacturer. Example: Apples: IOS: Iphone, Ipad, to Ipod, TV, Laptops.

Process:

- Mobile is manufactured with necessary software and applications.
- Users buy phones and subscribe to plans with carriers. If needed, buys/uploads applications for the device.
- From time to time, new applications or features are uploaded or upgraded in the device as and when the need arises.

Mobile Manufacturers:

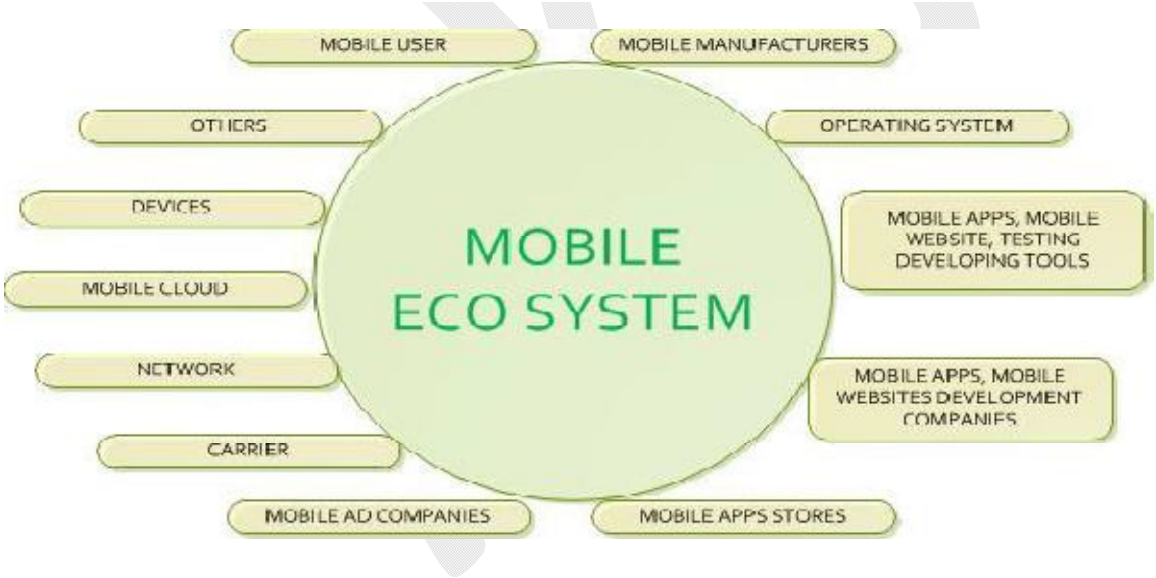
They manufacture mobiles.

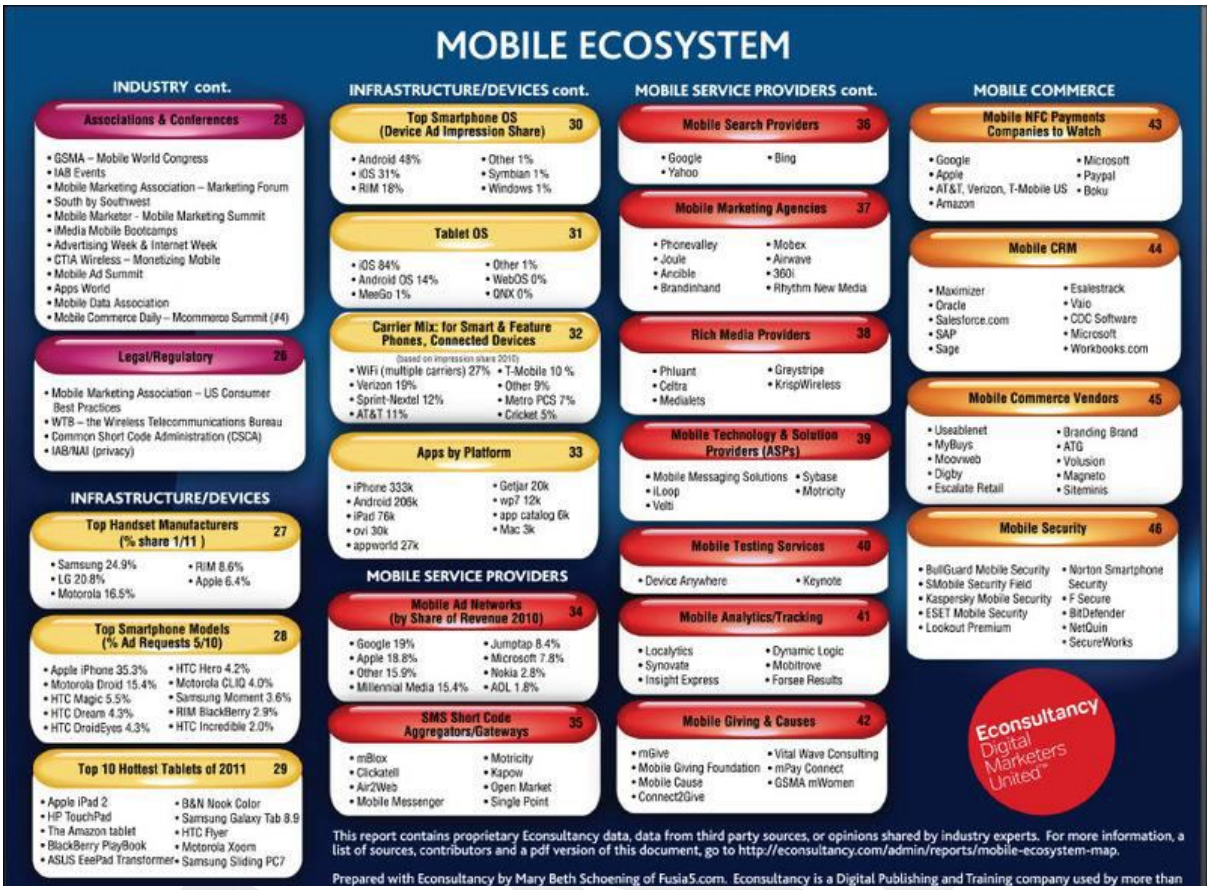
- Example: Samsung, BlackBerry, Sony, Nokia, Motorola, Windows Phone, Nexus

Operating System:

This is the important component of a Mobile, which controls/operates all applications that are residing on the mobile phone. Android is open source and IOS is a closed source.

- Example: IOS, Android, BlackBerry OS, Symbian, Bada etc.




MOBILE ECOSYSTEM
INDUSTRY cont.
Associations & Conferences 25
• GSMA – Mobile World Congress
• IAB Events
• Mobile Marketing Association – Marketing Forum
• South by Southwest
• Mobile Marketer - Mobile Marketing Summit
• iMedia Mobile Bootcamps
• Advertising Week & Internet Week
• CTIA Wireless – Monetizing Mobile
• Mobile Ad Summit
• Apps World
• Mobile Data Association
• Mobile Commerce Daily – Mcommerce Summit (#4)
Legal/Regulatory 26
• Mobile Marketing Association – US Consumer Best Practices
• WTB – the Wireless Telecommunications Bureau
• Common Short Code Administration (CSCA)
• IAB/NAI (privacy)
INFRASTRUCTURE/DEVICES
Top Handset Manufacturers (% share 1/11) 27
• Samsung 24.9%
• LG 20.8%
• Motorola 16.5%
• RIM 8.6%
• Apple 6.4%
Top Smartphone Models (% Ad Requests 5/10) 28
• Apple iPhone 35.3%
• Motorola Droid 15.4%
• HTC Magic 5.5%
• HTC Dream 4.3%
• HTC DroidEyes 4.3%
• HTC Hero 4.2%
• Motorola CLIQ 4.0%
• Samsung Moment 3.6%
• RIM BlackBerry 2.9%
• HTC Incredible 2.0%
Top 10 Hottest Tablets of 2011 29
• Apple iPad 2
• HP TouchPad
• The Amazon tablet
• BlackBerry PlayBook
• ASUS EeePad Transformer
• B&N Nook Color
• Samsung Galaxy Tab 8.9
• HTC Flyer
• Motorola Xoom
• Samsung Sliding PC7
INFRASTRUCTURE/DEVICES cont.
Top Smartphone OS (Device Ad Impression Share) 30
• Android 48%
• iOS 31%
• RIM 18%
• Other 1%
• Symbian 1%
• Windows 1%
Tablet OS 31
• iOS 84%
• Android OS 14%
• MeeGo 1%
• Other 1%
• WebOS 0%
• QNX 0%
Carrier Mix: for Smart & Feature Phones, Connected Devices 32
(based on impression share 2010)
• WiFi (multiple carriers) 27%
• Verizon 19%
• Sprint-Nextel 12%
• AT&T 11%
• T-Mobile 10 %
• Other 9%
• Metro PCS 7%
• Cricket 5%
Apps by Platform 33
• iPhone 333k
• Android 206k
• iPad 76k
• ovi 30k
• appworld 27k
• Getjar 20k
• wp7 12k
• app catalog 6k
• Mac 3k
MOBILE SERVICE PROVIDERS
Mobile Ad Networks (by Share of Revenue 2010) 34
• Google 19%
• Apple 18.8%
• Other 15.9%
• Millennial Media 15.4%
• Jumptap 8.4%
• Microsoft 7.8%
• Nokia 2.8%
• AOL 1.8%
SMS Short Code Aggregators/Gateways 35
• mBlox
• Clickatell
• Air2Web
• Mobile Messenger
• Motricity
• Kapow
• Open Market
• Single Point
MOBILE SERVICE PROVIDERS cont.
Mobile Search Providers 36
• Google
• Yahoo
• Bing
Mobile Marketing Agencies 37
• Phonevalley
• Joule
• Ancible
• Brandinhand
• Mobex
• Airwave
• 360i
• Rhythm New Media
Rich Media Providers 38
• Phluant
• Celtra
• Medialets
• Greystripe
• KrispWireless
Mobile Technology & Solution Providers (ASPs) 39
• Mobile Messaging Solutions
• iLoop
• Velti
• Sybase
• Motricity
Mobile Testing Services 40
• Device Anywhere
• Keynote
Mobile Analytics/Tracking 41
• Localytics
• Synovate
• Insight Express
• Dynamic Logic
• Mobitrove
• Forsee Results
Mobile Giving & Causes 42
• mGive
• Mobile Giving Foundation
• Mobile Cause
• Connect2Give
• Vital Wave Consulting
• mPay Connect
• GSMA mWomen
MOBILE COMMERCE
Mobile NFC Payments Companies to Watch 43
• Google
• Apple
• AT&T, Verizon, T-Mobile US
• Amazon
• Microsoft
• Paypal
• Boku
Mobile CRM 44
• Maximizer
• Oracle
• Salesforce.com
• SAP
• Sage
• Esalestrack
• Vaio
• CDC Software
• Microsoft
• Workbooks.com
Mobile Commerce Vendors 45
• Useablenet
• MyBuys
• Moovweb
• Digby
• Escalate Retail
• Branding Brand
• ATG
• Volusion
• Magneto
• Siteminis
Mobile Security 46
• BullGuard Mobile Security
• SMobile Security Field
• Kaspersky Mobile Security
• ESET Mobile Security
• Lookout Premium
• Norton Smartphone Security
• F Secure
• BitDefender
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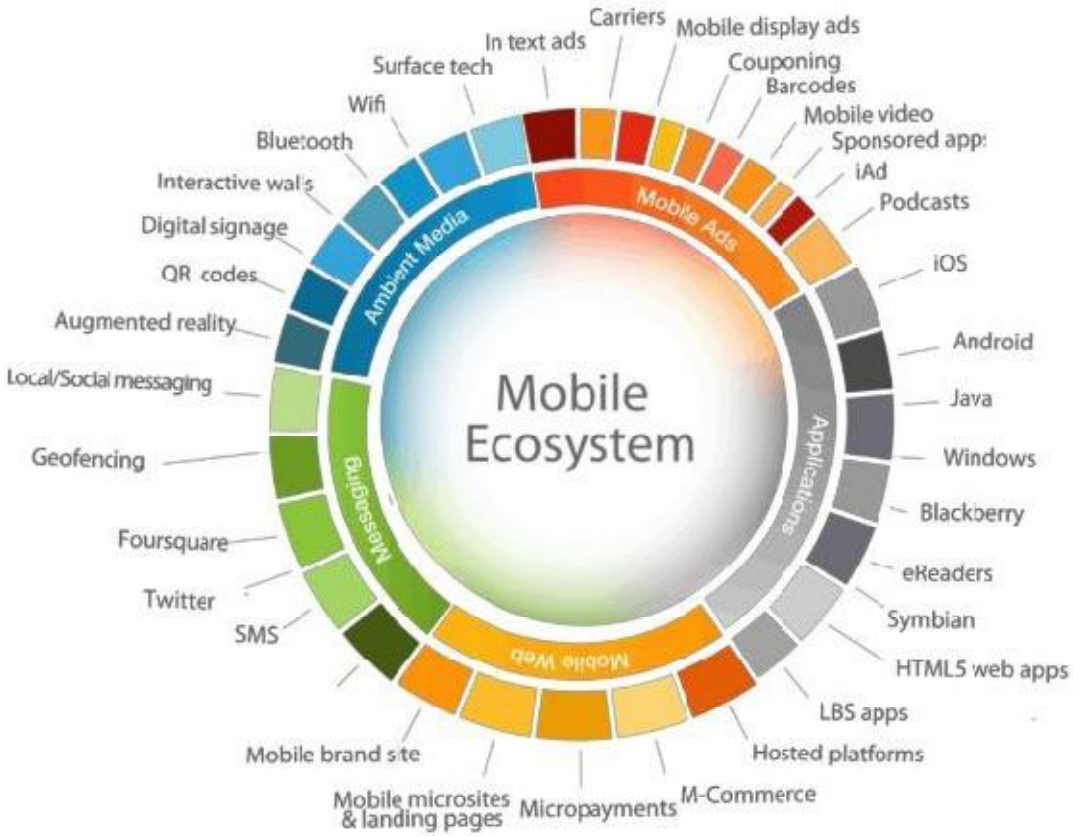

Mobile Ecosystem
Ambient Media
Mobile Ads
Applications
Mobile Web
Messaging
Carriers
Mobile display ads
In text ads
Couponing
Surface tech
Barcodes
Wifi
Mobile video
Bluetooth
Sponsored apps
Interactive walls
iAd
Digital signage
Podcasts
QR codes
iOS
Augmented reality
Android
Local/Social messaging
Java
Geofencing
Windows
Blackberry
Foursquare
eReaders
Twitter
Symbian
SMS
HTML5 web apps
LBS apps
Hosted platforms
Mobile brand site
M-Commerce
Mobile microsites & landing pages
Micropayments

https://www.tutorialspoint.com/android/android_hello_world_example.htm

Mobile Apps Development Tools:

- Android Applications are developed with Eclipse, Intellij Idea etc.
- BlackBerry Applications are developed with Eclipse etc.
- IOS Applications are developed with XCode, MonoDevelop, AppCode etc.
- Windows Phone Applications are developed with Microsoft Visual Studio etc.

Please go to relevant websites to get more information on each Tool.

Mobile Website Development Tools:

- HTML5, CSS3, JavaScript etc. are used to create mobile websites.

Mobile Apps Testing Tools:

A. Emulators:

Actual device (mobile) operations and functions are simulated on to the computer. Instead of buying several devices (Motorola, Samsung, Micromax etc), we can use emulators for functional testing. Network Connectivity, resolution testing etc cannot be tested 100% with emulators. So for testing to be 100% perfect, devices are needed and again buying several devices will be very costly. For this, you can go to Mobile Cloud environment companies and rent those mobile phone.

B. Mobile Cloud:

Companies rent mobiles and other devices virtually at hourly or weekly basis or monthly basis etc. Applications can be tested by subscribing to those companies.

Example:

- DeviceAnywhere (http://www.deviceanywhere.com/mobile-application-testing-overview.html)
- Perfecto Mobile: www.perfectomobile.com

C. Mobile Testing Tools:

Jamo Solutions, Perfecto Mobile, Device Anywhere Pro.

Mobile Stores:

Application created can be uploaded in stores after getting approval from those stores and applications can be sold. Applications can also be downloaded at free of cost or on paid basis.

- Examples: play.google.com, store.apple.com

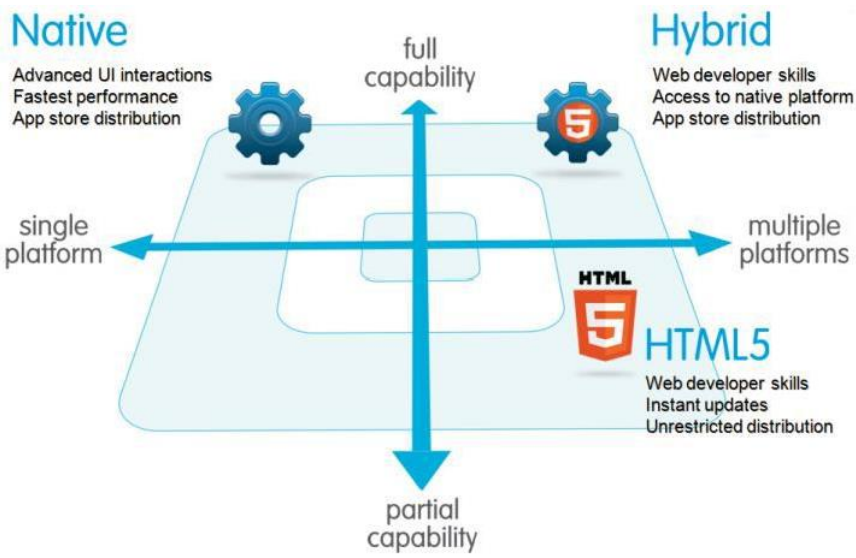
Mobile Ad Companies:

They display advertisements on the mobiles. Example: Google's AdMob.

Types of Mobile Application:

There are three main types of mobile applications that can be built using Mobile SDK:

1. Native apps: These are specific to a particular mobile platform (iOS or Android) and are developed using the tools and languages supported by that platform (e.g., Xcode and



Native Mobile Applications

In a nutshell, native apps provide the best usability, the best features, and the best overall mobile experience. There are some things you only get with native apps:

- **Multi touch** – double taps, pinch–spread, and other compound UI gestures
- **Fast graphics API** – the native platform gives you the fastest graphics, which may not be a big deal if you're showing a static screen with only a few elements, or a very big deal if you're using a lot of data and require a fast refresh.
- **Fluid animation** – related to the fast graphics API is the ability to have fluid animation. This is especially important in gaming, highly interactive reporting, or intensely computational algorithms for transforming photos and sounds.
- Built–**in components** – The camera, address book, geolocation, and other features native to the device can be seamlessly integrated into mobile apps. Another important built–in components is encrypted storage, but more about that later.
- **Ease of use** – The native platform is what people are accustomed to, and so when you add that familiarity with all of the native features they expect, you have an app that's just plain easier to use.
- Documentation – There are over 2500 books alone for iOS and Android development, with many more articles, blog posts, and detailed technical threads on sites like StackOverflow.

Native apps are usually developed using an Integrated Development Environment (IDE). IDEs provide tools for building debugging, project management, version control, and other tools professional developers need. While iOS and Android apps are developed using different IDEs

and languages, there's a lot of parity in the development environments, and there's not much reason to delve into the differences. Simply put, you use the tools required by the device.

You need these tools because native apps are more difficult to develop. Likewise, the level of experience required is higher than other development scenarios, you don't just cut and paste Objective–C and expect it to work. Indeed, the technological know–how of your development team is an important consideration. If you're a professional developer, you don't have to be sold on proven APIs and frameworks, painless special effects through established components, or the benefits of having your code all in one place.

HTML5 Mobile Applications

An HTML5 mobile app is basically a web page, or series of web pages, that are designed to work on a tiny screen. As such, HTML5 apps are device agnostic and can be opened with any modern mobile browser. And because your content is on the web, it's searchable, which can be a huge benefit depending on the app (shopping, for example).

An important part of the "write–once–run–anywhere" HTML5 methodology is that distribution and support is much easier than for native apps. For a native app, there are longer development and testing cycles, after which the consumer typically must log into a store and download a new version to get the latest fix.

In the last year, HTML5 has emerged as a very popular way for building mobile applications. Multiple UI frameworks are available for solving some of the most complex problems that no developer wants to reinvent. iScroll does a phenomenal job of emulating momentum style scrolling. JQuery Mobile and Sencha Touch provide elegant mobile components, with hundreds if not thousands of plugins that offer everything from carousels to super elaborate controls.

So if HTML5 apps are easier to develop, easier to support, and can reach the widest range of devices. The latest batch of browsers support hardware accelerated CSS3 animation properties, providing smooth motion for sliding panels as well transitions between screens, but even that can't match the power and flexibility of native apps. Today, it's simply not possible to capture multi–touch input events (determining when more than one finger is on

the screen) or create path–style elegance with spinout buttons and photos that hover, then drop into the right place.

Hybrid Mobile Applications

Hybrid development combines the best (or worst) of both the native and HTML5 worlds. We define hybrid as a web app, primarily built using HTML5 and JavaScript, that is then wrapped inside a thin native container that provides access to native platform features. PhoneGap is an example of the most popular container for creating hybrid mobile apps.

For the most part, hybrid apps provide the best of both worlds. Existing web developers that have become gurus at optimizing JavaScript, pushing CSS to create beautiful layouts, and writing compliant HTML code that works on any platform can now create sophisticated mobile applications that don't sacrifice the cool native capabilities. In certain circumstances, native developers can write plugins for tasks like image processing, but in cases like this, the devil is in the details.

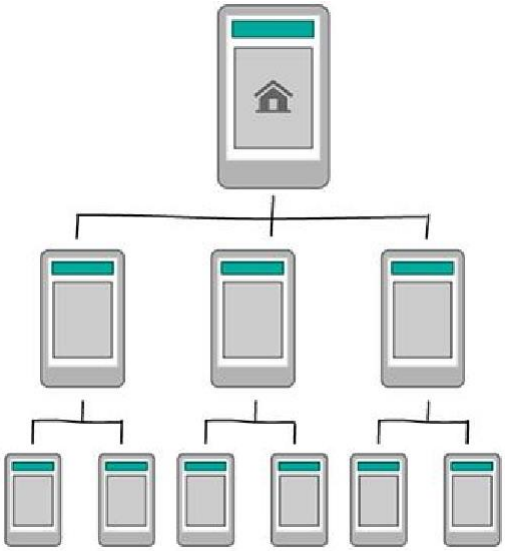
Native apps are installed on the device, while HTML5 apps reside on a Web server.

	Native	HTML5	Hybrid
App Features			
Graphics	Native APIs	HTML, Canvas, SVG	HTML, Canvas, SVG
Performance	Fast	Slow	Slow
Native look and feel	Native	Emulated	Emulated
Distribution	Appstore	Web	Appstore
Device Access			
Camera	Yes	No	Yes
Notifications	Yes	No	Yes
Contacts, calendar	Yes	No	Yes
Offline storage	Secure file storage	Shared SQL	Secure file system, shared SQL
Geolocation	Yes	Yes	Yes
Gestures			
Swipe	Yes	Yes	Yes
Pinch, spread	Yes	No	Yes
Connectivity	Online and offline	Mostly online	Online and offline
Development skills	ObjectiveC, Java	HTML5, CSS, Javascript	HTML5, CSS, Javascript

Mobile Information Architecture

Mobile devices have their own set of Information Architecture patterns, too. While the structure of a responsive site may follow more "standard" patterns, native apps, for example, often employ navigational structures that are tab–based. Again, there's no "right "way to architect a mobile site or application. Instead, let's take a look at some of the most popular patterns: Hierarchy, Hub & spoke, Nested doll, Tabbed view, Bento box and Filtered view:

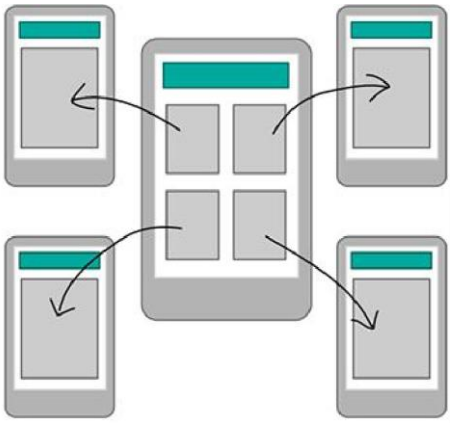
Hierarchy



The hierarchy pattern is a standard site structure with an index page and a series of sub pages. If you are designing a responsive site you may be restricted to this, however introducing additional patterns could allow you to tailor the experience for mobile.

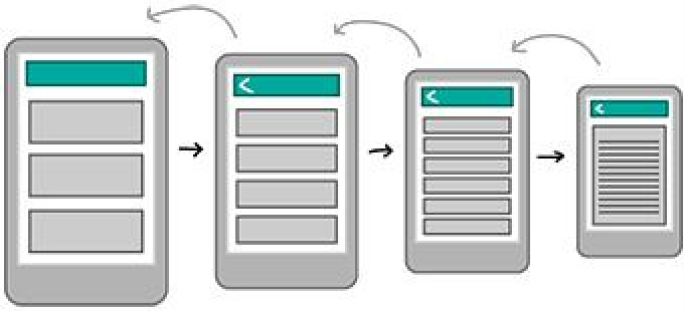
Luke Wroblewski's Mobile First approach helps us focus on the important stuff first: features and user journeys that will help us create great user experiences.

Hub & spoke



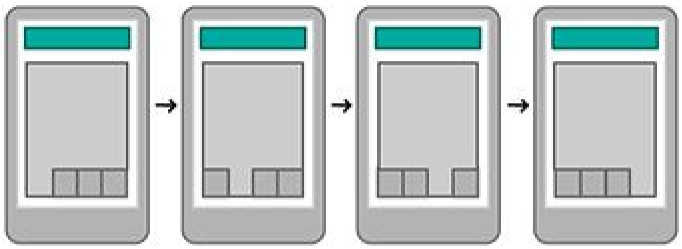
A hub and spoke pattern gives you a central index from which users will navigate out. It's the default pattern on Apple's iPhone. Users can't navigate between spokes but must return to the hub, instead. This has historically been used on desktop where a workflow is restricted (generally due to technical restrictions such as a form or purchasing process) however this is becoming more prevalent within the mobile landscape due to users being focused on one task, as well as the form factor of the device, making a global navigation more difficult to use.

Nested doll



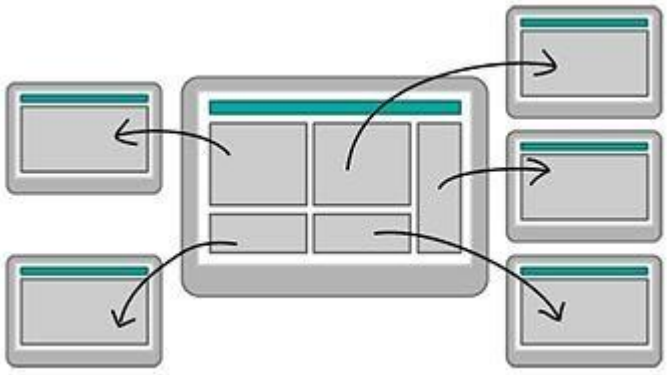
The nested doll pattern leads users in a linear fashion to more detailed content. When users are in difficult conditions this is a quick and easy method of navigation. It also gives the user a strong sense of where they are in the structure of the content due to the perception of moving forward and then back.

Tabbed view



This is a pattern that regular app users will be familiar with. It's a collection of sections tied together by a toolbar menu. This allows the user to quickly scan and understand the complete functionality of the app when it's first opened.

Bento Box/Dashboard

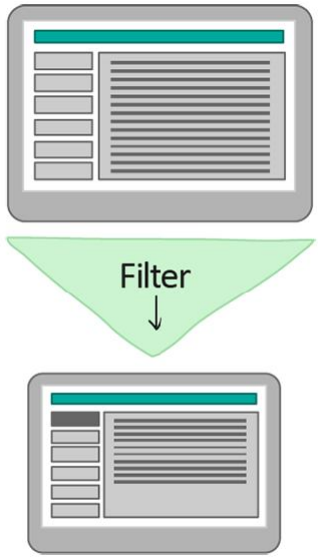


The bento box or dashboard pattern brings more detailed content directly to the index screen by using components to display portions of related tools or content. This pattern is more suited to tablet than mobile due to its complexity. It can be really powerful as it allows the user to comprehend key information at a glance, but does heavily rely on having a well–designed interface with information presented clearly.

Good for

Multi–functional tools and content–based tablet apps that have a similar theme.

Filtered view



Finally, a filtered view pattern allows the user to navigate within a set of data by selecting filter options to create an alternative view. Filtering, as well as using faceted search methods, can be an excellent way to allow users to explore content in a way that suits them.

Good for

Apps or sites with large quantities of content, such as articles, images and videos.

Uses of mobile phones

Digital camera: Point–and–click! Phones capture pictures and let us save them for posterity or transfer them to others and to computers.

Audio recorder: Mobile phones can be used to record conversations or even brief notes to oneself.

Video recorder: Phones are becoming video cameras also –– some of the newest cellphones can record an hour or more of video.

Multimedia messaging: Everything recorded can be shared with others by using MMS.

Email client: The phone can be used to connect to any POP or IMAP server and allow receiving and sending email. While most phones may not have the ease of use that a Blackberry has with email, contacts and calendar, the fact that it is on the phone itself and that there is no need for a separate device can be a big help (along with the lower total cost of ownership).

Web client: Phones can also browse websites, via a WAP and/or HTML browser. Most web sites may not look great on the small screen, but it is still possible to connect to any web site.

Gaming platform: Mobile games have become big business in the past couple years as people seek entertainment in the free time that they have on the device that they always carry with them.

Documents viewer: It is increasingly possible to view documents on the cell phone, in the popular MS–Office file formats.

Music player: The next big thing in 2005 is reckoned to be the combining of music capabilities on the mobile phone. While phones can play MP3s, it will soon also be possible to have music streamed from the Internet. Motorola is expected to introduce a phone this year that marries the mobile with Apple's iPod.

TV: In India, some operators have been promoting many TV channels on the cell phone over next–generation networks like EDGE.

Wallet: The phone can also be used to pay for purchases like a credit or debit card. There is already a billing relationship that exists between the subscriber and the operator, and that can be used to make payments to merchants.

Bar–**code readers:** Phones will also be able to read bar codes and that can have very interesting applications in commerce.

Introduction to Android

Android is a software package and linux based operating system for mobile devices such as tablet computers and smart phones released first version in 2007. It is developed by Google and later the OHA (Open Handset Alliance). Android is a complete set of software for mobile devices such as tablet computers, notebooks, smart phones, electronic book readers, set-top boxes etc. It contains a linux-**based Operating** System, middleware and **key mobile** applications. It can be thought of as a mobile operating system. But it is not limited to mobile only. It is currently used in various devices such as mobiles, tablets, televisions etc.

Java language is mainly used to write the android code even though other languages can be used. The goal of android project is to create a successful real-world product that improves the mobile experience for end users. There are many code names of android such as Lollipop, Kitkat, Jelly Bean, Ice cream Sandwich, Froyo, Ecliar, Donut etc which is covered in next page.

Features of Android

After learning what is android, let's see the features of android. The important features of android are given below:

1) It is open-source.
2) Anyone can customize the Android Platform.
3) There are a lot of mobile applications that can be chosen by the consumer.
4) It provides many interesting features like weather details, opening screen, live RSS (Really Simple Syndication) feeds etc.

It provides support for messaging services(SMS and MMS), web browser, storage (SQLite), connectivity (GSM, CDMA, Blue Tooth, Wi-Fi etc.), media, handset layout etc.

Android is a powerful operating system competing with Apple 4GS and supports great features. Few of them are listed below:

Feature	Description
Beautiful UI	Android OS basic screen provides a beautiful and intuitive user interface.
Connectivity	GSM/EDGE, IDEN, CDMA, EV-DO, UMTS, Bluetooth, Wi-Fi, LTE, NFC and WiMAX.
Storage	SQLite, a lightweight relational database, is used for data storage purposes.

Media support	H.263, H.264, MPEG-4 SP, AMR, AMR-WB, AAC, HE-AAC, AAC 5.1, MP3, MIDI, Ogg Vorbis, WAV, JPEG, PNG, GIF, and BMP

Messaging	SMS and MMS
Web browser	Based on the open-source WebKit layout engine, coupled with Chrome's V8 JavaScript engine supporting HTML5 and CSS3.
Multi-touch	Android has native support for multi-touch which was initially made available in handsets such as the HTC Hero.
Multi-tasking	User can jump from one task to another and same time various application can run simultaneously.
Resizable widgets	Widgets are resizable, so users can expand them to show more content or shrink them to save space
Multi-Language	Supports single direction and bi-directional text.
GCM	Google Cloud Messaging (GCM) is a service that lets developers send short message data to their users on Android devices,
Wi-Fi Direct	A technology that lets apps discover and pair directly, over a high-bandwidth peer-to-peer connection.
Android Beam	A popular NFC-based technology that lets users instantly share, just by touching two NFC-enabled phones together.

Android Applications

Android applications are usually developed in the Java language using the Android Software Development Kit.

Once developed, Android applications can be packaged easily and sold out either through a store such as **Google Play**, SlideME, **Opera Mobile Store**, Mobango, F-droid and the **Amazon Appstore**.

Android powers hundreds of millions of mobile devices in more than 190 countries around the world. It's the largest installed base of any mobile platform and growing fast. Every day more than 1 million new Android devices are activated worldwide.

Categories of Android applications

There are many android applications in the market. The top categories are:

- Entertainment
- Tools
- Communication
- Productivity
- Personalization
- Music and Audio

- Social
- Media and Video
- Travel and Local etc.

Versions of Android

The code names of android ranges from A to L currently, such as Aestro, Blender, Cupcake, Donut, Eclair, Froyo, Gingerbread, Honeycomb, Ice Cream Sandwitch, Jelly Bean, KitKat and Lollipop. Let's understand the android history in a sequence.

What is API (Application Programming Interface) level?

API Level is an integer value that uniquely identifies the framework API revision offered by a version of the Android platform.

Platform Version	API	VERSION_CODE
Android 5.1	22	LOLLIPOP_MR1
Android 5.0	21	LOLLIPOP

Android 4.4W	20	KITKAT_WATCH
Android 4.4	19	KITKAT
Android 4.3	18	JELLY_BEAN_MR2
Android 4.2, 4.2.2	17	JELLY_BEAN_MR1
Android 4.1, 4.1.1	16	JELLY_BEAN
Android 4.0.3,	15	ICE_CREAM_SANDWICH_MR1
Android 4.0, 4.0.1,	14	ICE_CREAM_SANDWICH
Android 3.2	13	HONEYCOMB_MR2
Android 3.1.x	12	HONEYCOMB_MR1
Android 3.0.x	11	HONEYCOMB
Android 2.3.4	10	GINGERBREAD_MR1
Android 2.3.2	9	GINGERBREAD
Android 2.2.x	8	FROYO
Android 2.1.x	7	ECLAIR_MR1
Android 2.0.1	6	ECLAIR_0_1
Android 2.0	5	ECLAIR
Android 1.6	4	DONUT
Android 1.5	3	CUPCAKE
Android 1.1	2	BASE_1_1
Android 1.0	1	BASE

Android IDEs

There are so many sophisticated Technologies are available to develop android applications, the familiar technologies, which are predominantly using tools as follows

- Android Studio
- Eclipse IDE