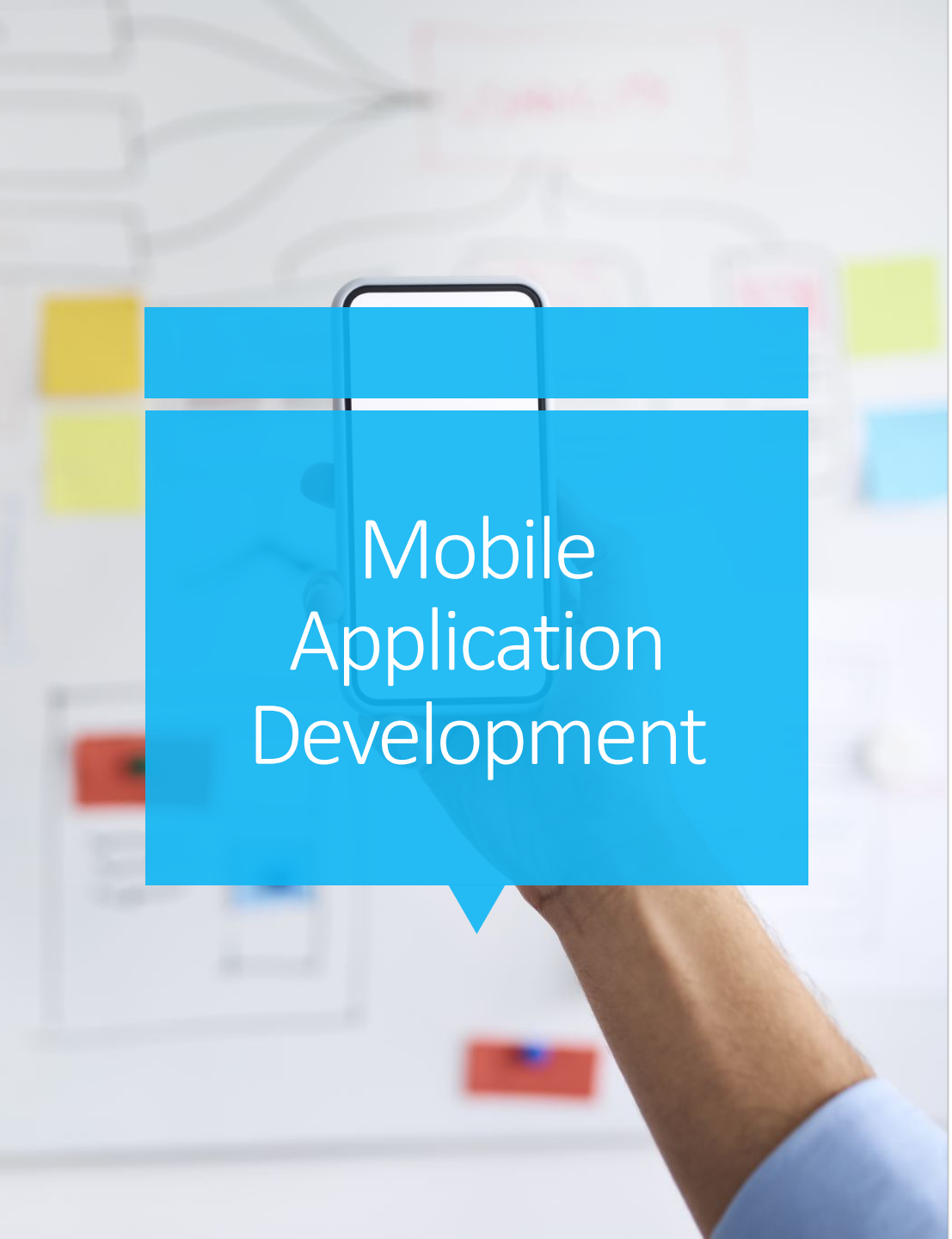
Mobile Application Development

BCA-V

Unit-I



Mobile Application Development

- Mobile application development is the process of creating software applications specifically designed to run on mobile devices such as smartphones and tablets. These applications, commonly known as mobile apps, cater to various user needs and are developed to function on specific mobile operating systems like Android or iOS.
- Mobile app development encompasses a wide range of activities, including idea conceptualization, design, programming, testing, and deployment. It involves using programming languages, software development kits (SDKs), and various tools to build interactive and functional applications.
- The main goal of mobile app development is to provide users with a seamless and intuitive experience while accessing services, information, or entertainment through their mobile devices. These apps can serve a variety of purposes, such as social networking, productivity, gaming, e-commerce, education, and more.
- Given the diversity of mobile devices and platforms, developers must consider factors like screen sizes, hardware capabilities, and operating system requirements when building mobile apps. The development process often involves collaboration between developers, designers, and other stakeholders to ensure the final product meets user expectations and provides a positive user experience.
- With the increasing popularity of smartphones and the rapid growth of the mobile market, mobile application development has become a crucial aspect of modern software development, enabling businesses and individuals to reach and engage with their target audience effectively in the digital age.

Importance of mobile apps in today's digital world.

Mobile apps have become integral to the functioning of today's digital world and have significantly impacted various aspects of our lives. Here are some key reasons highlighting the importance of mobile apps in today's digital landscape:

1. Ubiquitous Access to Information and Services: Mobile apps allow users to access a wide range of information and services at their fingertips. Whether it's checking the weather, managing finances, or booking a ride, mobile apps provide instant access to essential data and functionalities.

2. Enhanced User Engagement: Mobile apps offer a more interactive and engaging experience compared to websites. They leverage device-specific features like push notifications, camera, GPS, and touch gestures to create immersive user experiences, leading to increased user retention and loyalty.

3. Business Growth and Market Reach: For businesses, mobile apps provide an excellent platform to expand their market reach and connect with a global audience. Apps can attract new customers, boost sales, and build brand loyalty through personalized offers and in-app promotions.

4. Convenience and Time-saving: Mobile apps streamline processes and eliminate the need for multiple steps, making tasks quicker and more efficient. For example, mobile banking apps allow users to manage their finances on the go, saving time and effort compared to traditional banking methods.

5. Social Connectivity: Social media apps have revolutionized the way people connect and communicate. They enable real-time interactions, instant sharing of content, and foster virtual communities, bridging gaps between individuals and cultures.

Importance of mobile apps in today's digital world.

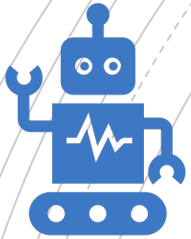
6. Entertainment and Content Consumption: Mobile apps offer a plethora of entertainment options, from streaming videos and music to playing games. They have transformed how people consume content, making it easily accessible anytime, anywhere.

7. Digital Transformation in Industries: Mobile apps have played a significant role in digital transformation across various industries, such as healthcare, education, e-commerce, and transportation. They optimize processes, improve efficiency, and enhance customer experiences.

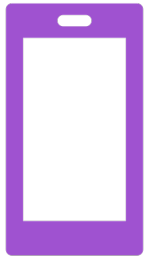
8. IoT and Smart Devices Integration: Mobile apps act as a central hub for controlling smart devices and the Internet of Things (IoT) ecosystem. They enable users to manage smart homes, wearable devices, and other connected gadgets seamlessly.

9. Data Collection and Personalization: Mobile apps collect user data (with consent) that helps businesses understand user behavior and preferences better. This data-driven approach allows for personalized recommendations and targeted marketing strategies.

10. Innovation and Technological Advancements: Mobile app development drives continuous innovation, pushing the boundaries of what mobile devices can achieve.



Android



iOS

Cross-platform (React Native, Flutter, Xamarin)

Major Mobile App Development Platforms

Android

- Android is an open-source mobile operating system developed by Google.
- It is the most widely used mobile platform globally, powering a large majority of smartphones and tablets.
- Android apps are primarily developed using Java or Kotlin programming languages.
- The official integrated development environment (IDE) for Android app development is Android Studio.
- Android offers a vast user base, diverse device options, and access to various Google services and APIs.

iOS

iOS is the mobile operating system developed by Apple for its devices, including iPhones and iPads.

iOS apps are exclusively developed using Swift or Objective-C programming languages.

The official IDE for iOS app development is Xcode.

Apple's App Store is the only platform for distributing iOS apps.

iOS devices are known for their strong security measures and uniformity in hardware specifications.

- Cross-platform development allows developers to create apps that can run on multiple platforms, such as Android and iOS, with a single codebase.
- Popular cross-platform frameworks include React Native, Flutter, and Xamarin.
- React Native: Developed by Facebook, it uses JavaScript and React to build native-like apps for both Android and iOS.
- Flutter: Developed by Google, it uses Dart programming language to create high-performance, visually rich apps for multiple platforms.
- Xamarin: Owned by Microsoft, it allows developers to use C# and .NET to build cross-platform apps for Android, iOS, and other platforms.

Cross-platform

Native Vs. Cross-Platform Development

ASPECT	NATIVE DEVELOPMENT	CROSS-PLATFORM DEVELOPMENT
Definition	Building applications for a specific platform (e.g., iOS, Android) using platform-specific tools and languages.	Building applications that can run on multiple platforms (e.g., iOS, Android, Windows) using a single codebase and tools.
Development Language	Uses platform-specific programming languages and development environments (e.g., Swift/Objective-C for iOS, Java/Kotlin for Android).	Typically uses a single programming language that is cross-platform compatible (e.g., JavaScript, C#, or Dart).
Code Reusability	Limited code reusability across different platforms; separate codebases are required for each platform.	High code reusability; the majority of code can be shared across different platforms, reducing development time.
Performance	Can achieve the best performance and optimization as it directly utilizes platform-specific features and APIs.	May have slightly lower performance due to abstraction layers used to interface with different platforms. However, the performance gap has been narrowing with advancements in cross-platform frameworks.
Development Time	Development time may increase when targeting multiple platforms since separate development is needed for each platform.	Faster development time as a single codebase can be used to deploy the app on multiple platforms simultaneously.
User Experience	Offers a consistent and seamless user experience with platform-specific UI/UX components.	Can sometimes have minor inconsistencies in UI/UX due to the need to abstract platform-specific elements. However, modern cross-platform frameworks have improved in this aspect.
Access to Native Features	Direct access to all native features and APIs provided by the platform.	Access to a wide range of native features and APIs, but some advanced or niche features may require custom plugin development or native code integration.
Development Cost	Potentially higher development cost, as multiple development teams may be needed for each platform.	Generally lower development cost as a single team can manage multiple platforms using a shared codebase.
Popular Frameworks	iOS: Swift, Objective-C, Android: Java, Kotlin	React Native, Flutter, Xamarin, Unity, Cordova, etc.

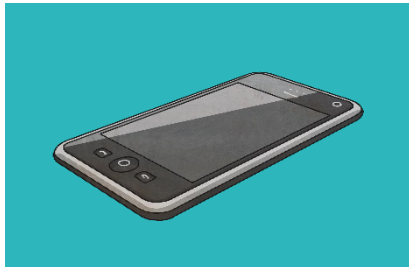
Types of Mobile Applications

Native apps are built for a specific operating system. A native app developed for iOS operating system won't work on Android devices and vice-versa. If an app is developed for iOS, it will remain exclusive to that operating system. Softwares' used to develop native apps generally would be Objective-C or Swift for iOS, Java and ADT for Android operating system and .NET(C#) for Windows operating system.

Mobile web apps are the web applications to render/deliver pages on web browsers running in mobile devices. Since these apps target browsers, they work on different mobile operating systems. You can view a mobile web app on Android, iOS or Windows tablets and phone devices. They also work on PC web browsers. Softwares' used to develop these applications are generally HTML, CSS, JavaScript, JQuery.

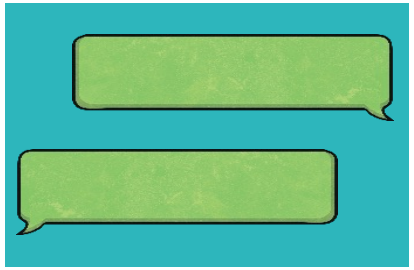
Hybrid apps are a mixture of both native and mobile web apps. This type of application has cross-platform compatibility but can still access phone's hardware. Softwares used to develop these apps are generally HTML, CSS, Javascript, JQuery, Mobile Javascript frameworks, Cordova/PhoneGap etc.

What Can You Use a Mobile Phone for Now?

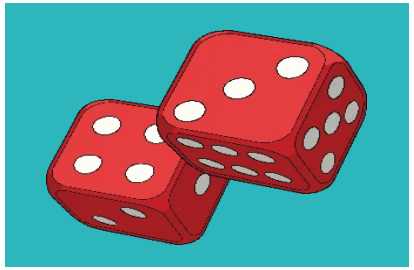


phone calls

email



social media



games

online shopping

taking photographs

Internet

calculator

weather apps

maps

And so much more!

The History of Mobile Phones

When do you think mobile phones were invented? Would you like to have a guess?

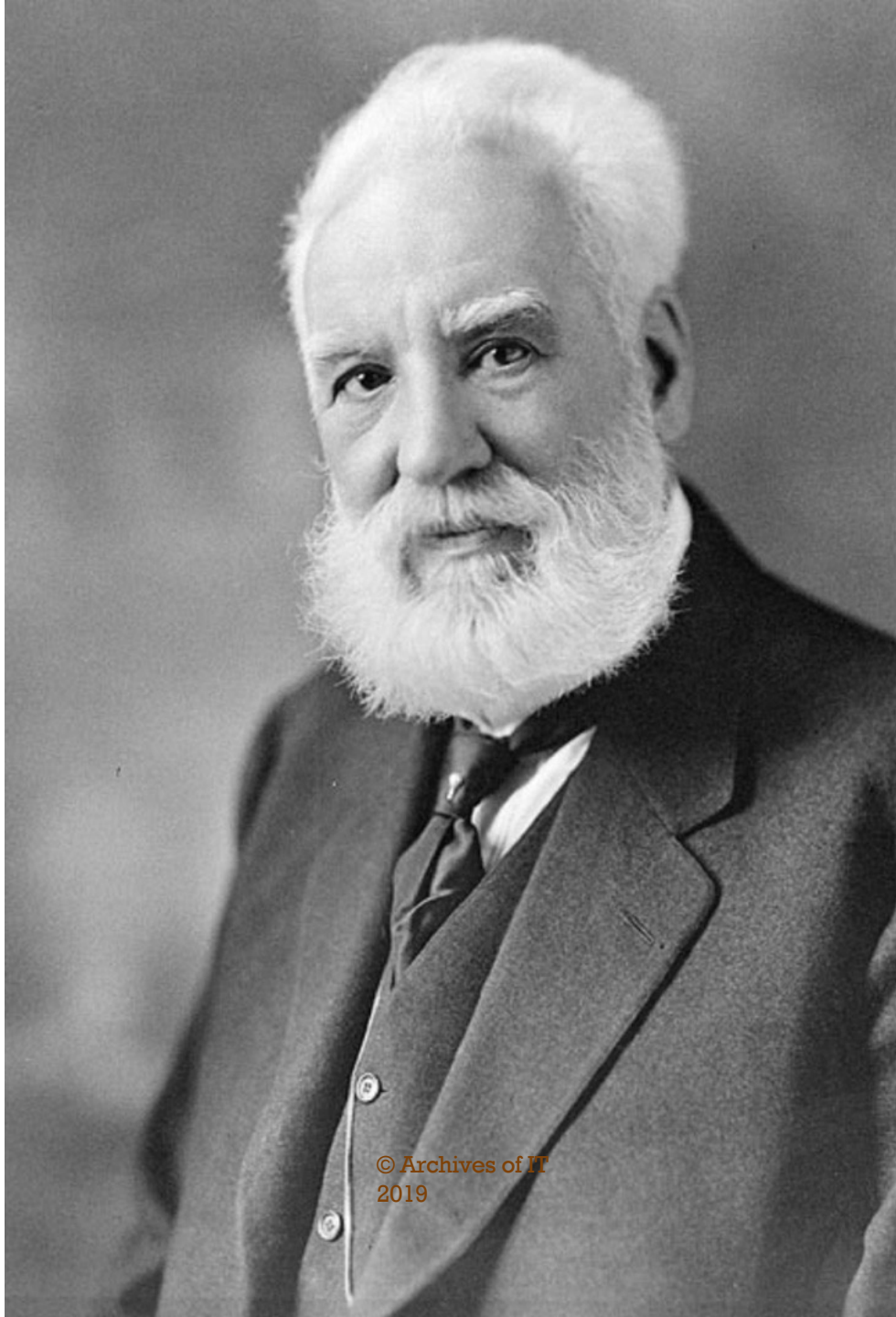
It all started with telephones connected by wires and a Scottish engineer living in America.

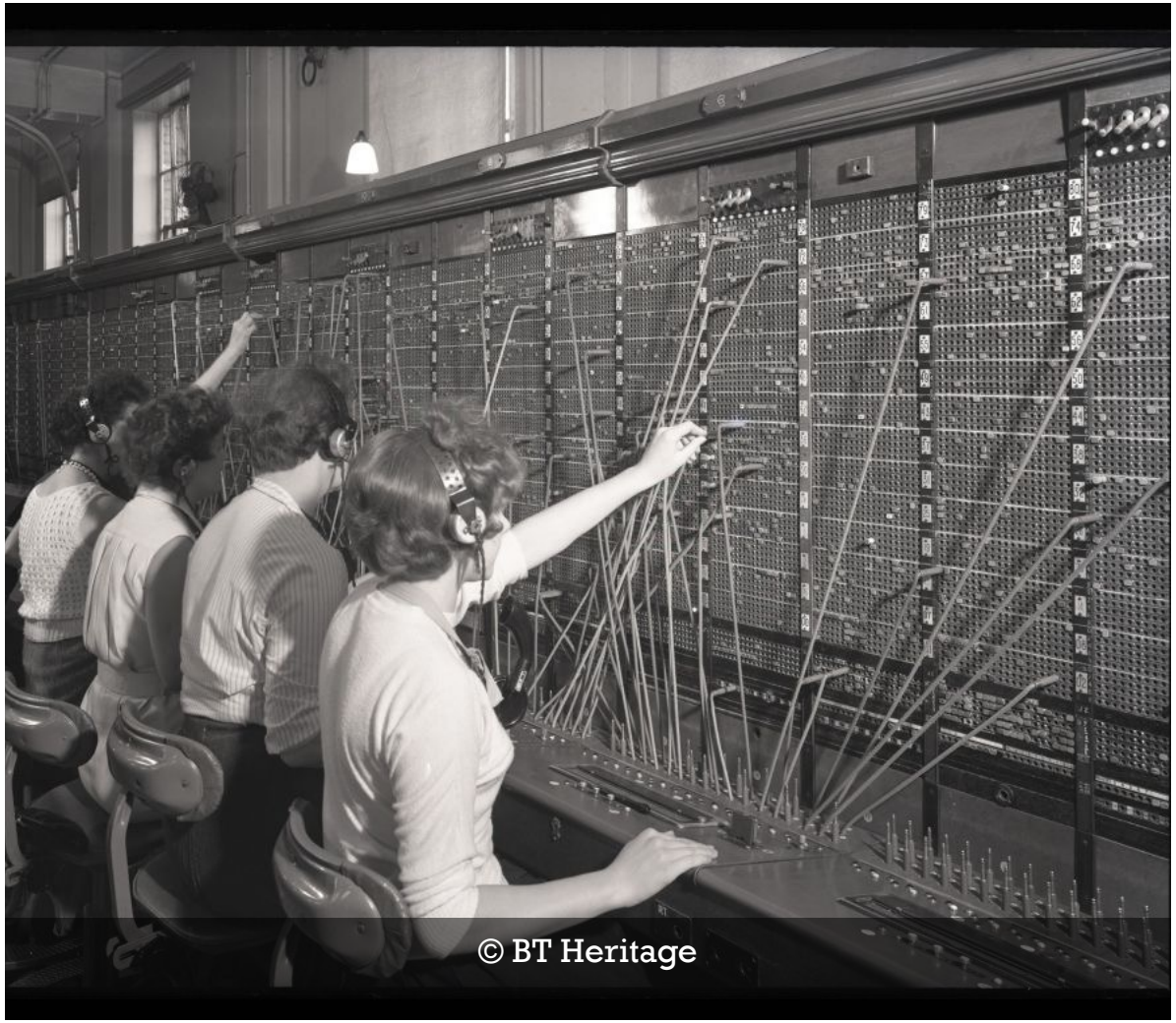
We start with the invention of telephones

The telephone was invented in 1876 by Alexander Graham Bell, a Scottish inventor and engineer who was working in America.

The first words he said on the telephone were "Mister Watson come here, I want to see you!"

Early telephones were connected with wires. Today we call these fixed or landline telephones.





Telephone switchboards

- Every early phone call was put through by hand!
- The telephone operators you can see in this photo spoke to each person who wanted to make a call and then connected them to the person they wanted to speak to.
- Today all telephone calls are connected automatically.

Telephones without wires

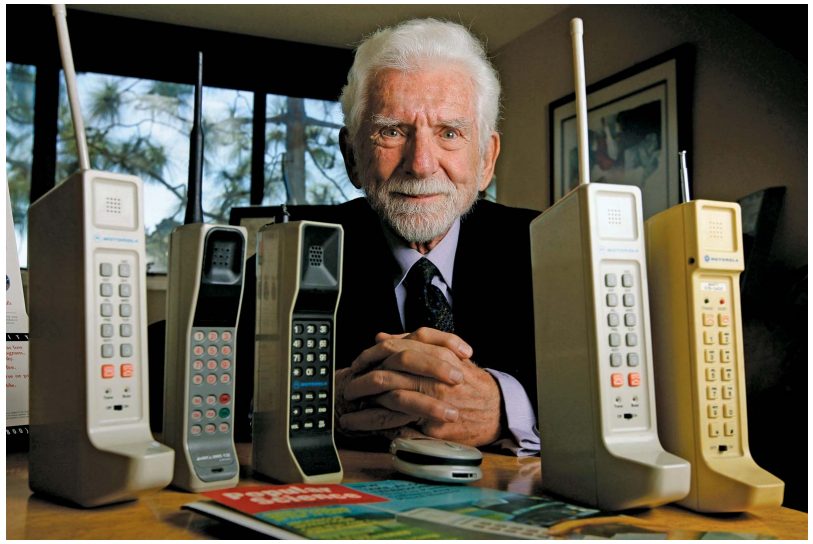
Engineers discovered that telephones could also work using invisible radio waves instead of wires or string, just like a portable radio.

Car Phones

- People want to be able to talk to each other when they are away from their homes and offices.
- The earliest mobile phone services were built into cars, but they weren't very easy to use.
- To make a call you first had to speak to a telephone operator who put the call through for you.
- Only a few people could make calls at the same time.

The Handheld Mobile Phone

- In 1973 an American engineer called Marty Cooper invented the first mobile phone that you could hold in your hand.
- This phone was very heavy and large. It was nicknamed "the brick" and weighed 1.1 kg and measured 23cm x 13cm x 4.5cm.
- The networks were analog, providing basic voice calling capabilities.
- You could only use the phone for 35 minutes and it took 10 hours to recharge!



How heavy and large were the first mobile phones?

- Can you find something else that weighs about 1 Kg? Lift it and imagine trying to use it as a phone.
- Make a box that measures 23cm x 13cm x 4.5cm and think about how you would use a phone this big.

- The handheld mobile phone had been invented but it was several years before a proper mobile phone service was launched.
- The first mobile phone service in the UK started in 1985.
- "We realised that the phone in your hand was going to be as important as the phone in your car" says John Carrington who worked on one of the first mobile phone services called Cellnet.

There's more to a mobile phone service than just the phone

- We don't just make phone calls with our mobile phones, we send text messages, use apps and access the web.
- To do all these things we need a very small computer called a microprocessor in our phones.
- The microprocessors in nearly every phone are made by a British company called ARM.
- Sophie Wilson is one of the most important computer scientists in history. She was a member of the team that designed the ARM microprocessor.

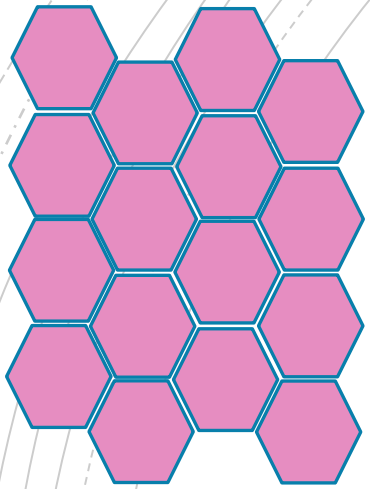
Start with a clever phone

- There are lots of different mobile phones in the shops. Good design is important because a mobile phone needs to be easy to use and good to look at.
- Jony Ive is a very famous British designer who is well known for designing the iPhone.
- What is it that people like so much about iPhones?

Add a good design

- To make our mobile phones work we need masts put up all over the country.
- These pictures shows some of the different types. Some masts are even made to look like trees!
- Mobile phones send out invisible signals to find the nearest mast. As we move around our mobile phones keep checking so that they are always linked to the closest mast.

Next we need mobile phone masts



- Imagine our whole country divided up into large pieces or "cells".
- In each cell there will be one or more mobile phone masts.
- Invisible radio waves travel to and from your mobile phone to a mast and from there on to a telephone exchange and then into a phone network.
- In the UK we have several mobile phone networks like EE, Vodafone, O2, Three and BT Mobile.

Now we need a mobile phone network

G stands for Generation

- The first mobile phone networks could only be used for making calls or sending pictures.
- The second generation networks (2G) were introduced in the 1990s.
- With 2G mobile networks mobile phones could be used to send text messages as well.

3G, 4G and Beyond

3G mobile networks were introduced in the 2000s. These networks made it possible to download information much faster and surf the web on a mobile phone.

4G networks are now being introduced in the UK. These give even faster speeds and make it possible to play complex games and watch films on a mobile phone.

Engineers are already building 5G networks!

1G
1981

2G
1992

3G
2001

4G
2011

5G
2020

History of Mobile Technologies

Generation	Time Period	Key Features
0G (Zeroth Generation)	1940s-1950s	Mobile telephony using radio signals between vehicles and base stations.
1G (First Generation)	1980s-1990s	Analog cellular networks, voice calls only, bulky devices.
2G (Second Generation)	1990s-2000s	Digital cellular networks, text messaging (SMS), limited data services.
3G (Third Generation)	Early 2000s	Faster data transfer rates, mobile internet, multimedia content, video calling.
4G (Fourth Generation)	Late 2000s	High-speed data, lower latency, video streaming, mobile gaming, advanced apps.
5G (Fifth Generation)	2010s-Present	Ultra-fast data speeds, low latency, high network capacity, IoT support.
Beyond 5G/6G	Ongoing	Under development, aims for even faster speeds, ultra-low latency, advanced applications.

And finally, we need apps

- Apps are small programs that sit on mobile phones to help us do all sorts of things:
  - Play games
  - Check the weather
  - Look at Instagram or Facebook
  - Read the latest news
  - and much more ....