CUI Abbottabad

Department of Computer Science

Course Title: **Mobile Application Development**

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Agenda

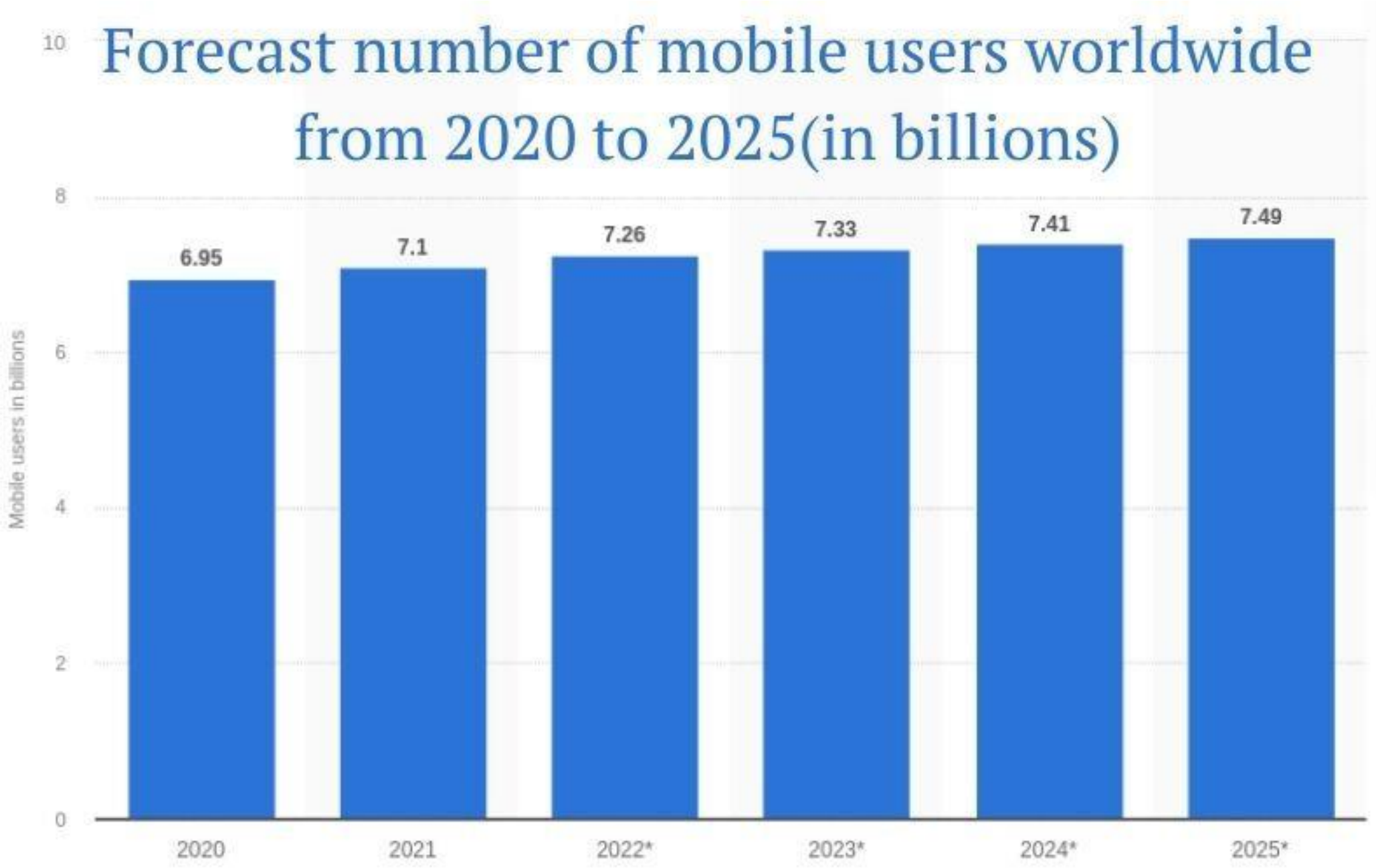
- Importance of Mobile Applications
- Growth of Mobile Devices & Users Mobile Platforms.
- Client-Side Technologies
- Mobile Application Development Technologies
- Hybrid Mobile Application Development

Introduction

- Mobile application development is a set of processes and activities involved in writing software for mobile devices.
- Mobile app building embodies developing applications for a whole range of devices: tablets, smart watches, phones, TV, and any other portable device.
- Even web developers have to think about the mobile availability of their systems and make sure that their web pages look good on mobile devices.
- Today, mobile app development is essential for an online business.

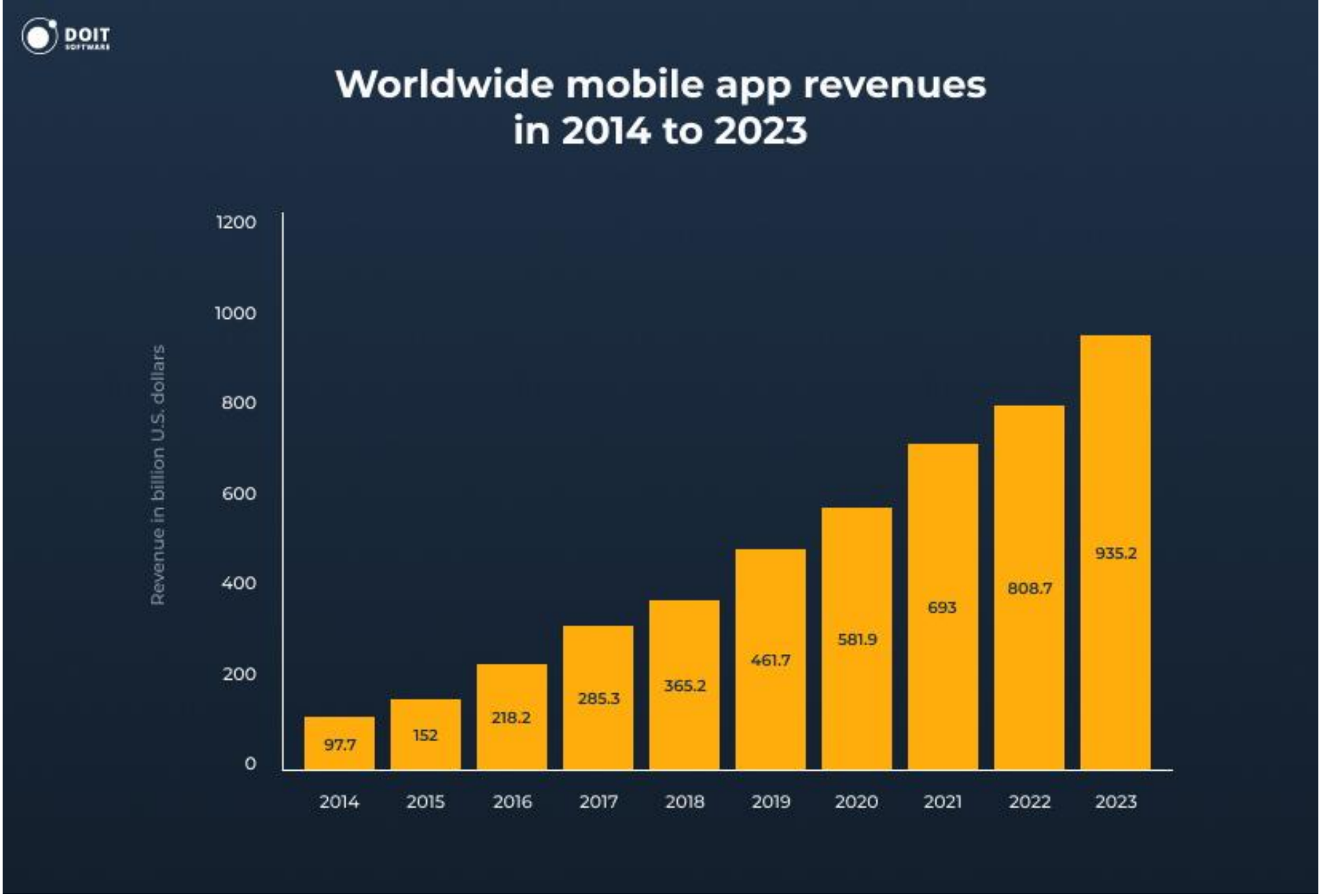
- Mobile apps have transformed the way we perform business.
- Such apps have eased the customers to get business details faster and simultaneously stay connected and updated with their favorite brands and offers.
- Apps are important for expanding the business reach while delivering related and massive exposure to the brand.

- In 2020, approximately 3.5 billion people worldwide owned a smartphone.
- Mobile app downloads will likely reach 258 billion in 2021, which is about a 45% increase since 2017.
- As mobile apps usage is increasing, in 2021, the industry is expecting to generate approximately $156 billion, and more through customer app spend.
- A mobile app has become a necessity for every business, whether a startup or a well-recognized brand.
- It is the best way to stay ahead of the curve.
- Being a business owner, you should prefer developing an app and reap its benefits.



Source: Statista

- After hitting the $581.9 billion mark in revenue in 2020, according to Statista, the worldwide mobile applications revenue in 2022 is going to reach a new milestone – $808.7 billion.


DOIT
Worldwide mobile app revenues in 2014 to 2023
Revenue in billion U.S. dollars
1200
1000
800
600
400
200
0
97.7
152
218.2
285.3
365.2
461.7
581.9
693
808.7
935.2
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023

Top Benefits of Mobile Apps Development for Businesses

- **Reach Global Audience:** Mobile apps help businesses reach a vast target audience and promote building an efficient app marketing strategy.
- **Increase Accessibility:** Besides, mobile apps help in enhancing business accessibility. It equally facilitates businesses to develop a robust relationship with customers, permitting strong customer loyalty and a genuine customer base.
- Mobile apps permit the users to have functional access to products, information, process, and services that they would demand in real-time.

Top Benefits of Mobile Apps Development for Businesses

- It enables the business to send notifications about changes in products and services or something new. Even without the internet, the apps perform simple functions. So, apps increase the accessibility of enterprises effectively.
- **Promotes Brand Recognition**
- Brand awareness is important when the top position is an ultimate goal of a business. By developing a mobile app, companies can quickly provide quality services to their clients.

Top Benefits of Mobile Apps Development for Businesses

- **Increase Sell-Through**
- Stats say customers spend more time on the company's mobile apps instead of on the company's mobile site. Mobile app development can help brands in attracting new customers and attain success.
- **Reduce On-Premise Cost**
- Mobile apps transform the retail experience, facilitating retailers to meet customer expectations by delivering a unique customer experience. Most businesses are developed and based on mobile apps. This assists in reducing the overhead expenses associated with a brick-and-mortar store development.

Top Benefits of Mobile Apps Development for Businesses

- **Social Media Integration**
- By integrating social media icons into your mobile apps, the users can share their feedback over various social media platforms. This way, a mobile app is also considered an effective marketing tool for businesses.

Top Benefits of Mobile Apps Development for Businesses

- **Unique Payment & Services**
- Mobile apps are equipped with distinct features that match varied industries. For example, if you are from the service industry, like healthcare, etc., your app would be best for your target customers to book an appointment.

- Nowadays, mobile payment is chosen to make payments. Businesses can integrate the payment options into their app to allow the users to receive direct payments via debit and credit cards. Such types of payment platforms are fast, user-friendly, and secure.

Top Benefits of Mobile Apps Development for Businesses

- **Marketing On the Go**
- Mobile apps support the on-the-go marketing of businesses with their user-friendly and intuitive support. An app well-equipped with various functions delivers unique value propositions to firms.

Top Benefits of Mobile Apps Development for Businesses

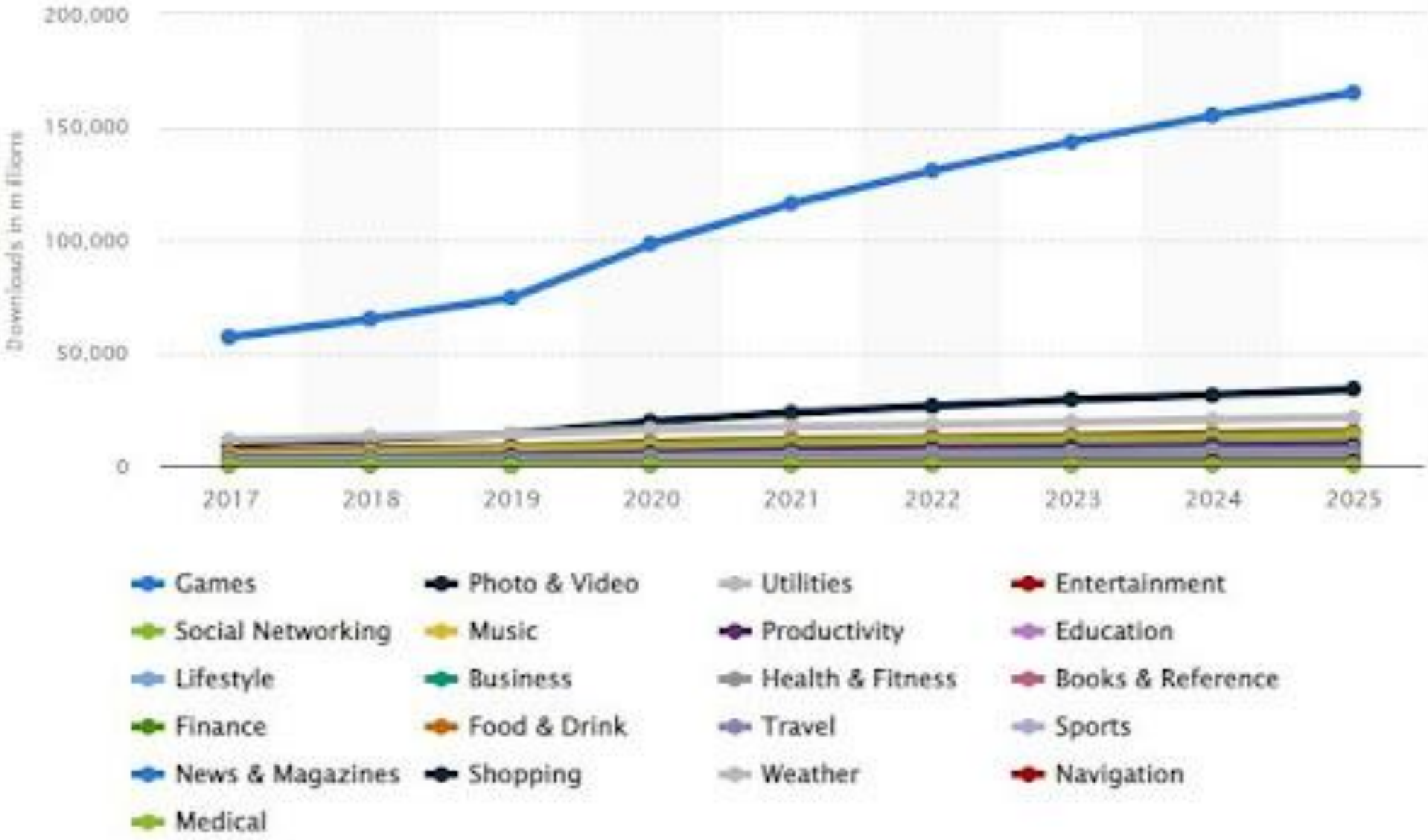
- **Increase Customer Engagement**
- Mobile apps assist the brands in developing a direct marketing channel between them and their customers, permitting effective and direct communication. With an app, you can send in-app and push notifications to as many customers as you want. The notifications holding related and essential information attach with the customers and encourage them to become loyal to your brand.

Top Benefits of Mobile Apps Development for Businesses

- **Saves Time**
- Mobile apps ease the life of the customers by offering them one-touch access and a simple purchasing process. They get the information of products and services quickly that saves their time.
- **Allow Staying Ahead of The Curve**
- An enterprise can stand uniquely in the crowd with a significant profit from potent clients with a mobile app. The apps will enable you to surprise your customers with distinctive approaches.

Top Benefits of Mobile Apps Development for Businesses

- **Scheduling**
- With the mobile apps, enterprises can easily make and schedule their appointments, which needed extra personnel earlier. Moreover, the app notifies the enterprises immediately, decreases the chances of errors, and handles the tasks automatically.


200,000
150,000
100,000
50,000
0
2017
2018
2019
2020
2021
2022
2023
2024
2025
Games
Photo & Video
Utilities
Entertainment
Social Networking
Music
Productivity
Education
Lifestyle
Business
Health & Fitness
Books & Reference
Finance
Food & Drink
Travel
Sports
News & Magazines
Shopping
Weather
Navigation
Medical

Impact of Mobile App on an organization:

- **Positive**
- Effective management of internal and external communication of the organization.
- Greater customer acquisition
- Provide immediate answers to requests made in this way.
- They allow managing requests and claims without having to go to an office.
- They are distributed through the App Store.
- They generate new channels of communication with customers or users.

Impact of Mobile App on an organization:

- **Negative:**
- Many Apps invade the privacy of people when requesting access to the person's location and their photos.
- Depending on the characteristics of your Hardware you will have certain restrictions.
- Depending on the type of development you want to make these applications can be expensive.

Types of App according to its development

- **Native:**
- These are applications that are designed and programmed specifically for each platform, in the language used by the Android SDK for Android or with Objective C or Swift for iOS, or C# for Windows Phone.
- They cannot be used on other mobile platforms.
- May not need internet to work
- Lead time and approval process for deployment of latest versions / new updates.

Native Apps

Works Best For	• Performance-intensive applications • Disconnected or offline apps • Games, or apps with rich visuals • Apps requiring heavy interaction with local data or hardware APIs (camera, GPS, etc.) • Apps running in the background or requiring background processes • Apps targeting a single platform
Advantages	• Absolute best performance and rich UX/UI experience, no visual lag or slowness • Full access to hardware capabilities and APIs • Marketing boost from app store distribution • Apps can be tailored to take advantage of platform-specific UI paradigms • Most mature, well-documented, and vendor-supported development option
Disadvantages	• Has to be re-written for each mobile platform • App store approval (usually) mandatory • Native app development skills harder to find than web development skills • Platform vendors take a cut of in-app purchases • Generally the most expensive option • Deployment and updates are slower, more difficult

Types of App according to its development

- **Mobile web apps:**
- Can be easily used in different platforms without the need to develop a different code for each particular case.
- Do not need to be installed in the device they are displayed using the phone's browser and they are always linked to the latest version.
- Less access to device features and APIs than a native app
- Built using HTML, JavaScript, and CSS - and they may or may not make use of HTML5 (for advanced interactions) or a javascript framework that eases mobile web development, such as jQuery Mobile or Sencha Touch.
- To function they depend exclusively on the use of the internet.

Mobile Web Apps

Works Best For

- Apps with basic user interfaces and functionality
- Business apps
- Content apps
- Apps targeting multiple platforms
- Apps that don't need to store a lot of data offline
- Mobile versions of web sites

Advantages

- Deployment and updates are simple and instantaneous
- App doesn't need re-written for each platform
- No revenue cuts taken by platform vendors
- Web development skills easier to find than native development skills
- Web-based app content can be updated much more easily
- Available via search engines

Disadvantages

- Not available in app stores
- Not "installable"– must be accessed via mobile web browser
- Limited offline / disconnected capabilities
- Performance, while improving, cannot currently match native performance
- UI is lowest common denominator between platforms
- More limited access to hardware APIs and capabilities

Types of App according to its development

- **Hybrids:**
- They are a combination between native and web.
- Largely based on web technology (i.e. HTML/ CSS/ JavaScript) running within a native app, mimicking the look and feel of a native app.
- Once completed are compiled or packaged, this type allows applications for Android, iOS with the same code.
- There are tools or platforms that they allow to develop on them such as Ionic, Appcelerator and React Native among others.

Hybrid Apps

Works Best For

- Apps with basic user interfaces and functionality
- Business apps
- Content apps
- Wrappers around mobile web apps
- Apps targeting multiple platforms
- Apps that won't be judged on UI speed/smoothness/performance

Advantages

- "Write once, run anywhere" – app doesn't need re-written for each platform
- Web development skills easier to find than native development skills
- Able to access most hardware capabilities and APIs
- Apps still distributable via app stores
- Web-based app content can be updated more easily

Disadvantages

- UI is lowest common denominator between platforms
- "Write once, debug everywhere" – still need to spend time ironing out platform idiosyncrasies
- Performance varies between mobile platforms
- App store approval still mandatory
- Platform vendors still take a cut of revenue
- Deployment and updates of the app itself (via app stores) is still slow and difficult

Client Architecture Options

	Native Apps	Hybrid Apps	Mobile Web Apps
UI Performance	High	Medium	Low
App Store Distribution	Yes	Yes	No
Updates & Deployment	App Store	App Store	Low Friction
Developer Availability	Low	Medium	High
Cross-Platform	No	Yes	Yes
Device Capability Access	High	Medium	Low
Offline Capabilities	High	Medium	Medium
Cost & Timeline	High	Medium	Low

Major programming languages used to develop mobile apps today

- **Swift:**
- If you are building something specific to Apple OS (native to Apple), Swift is the language to seek. Swift is a popular iOS application development language that offers advanced features with minimal coding that can be easily maintained. Swift is a powerful and intuitive language loved by Apple developers who use it for macOS, iOS, watchOS, tvOS, and so on.

Major programming languages used to develop mobile apps today

- **C++:**
- C++ forms the simplistic base for most of the programming languages and possesses the power to create dynamic technology apps. C++ is highly sought after today to develop multi-platform apps. You can write code in C++ to develop the application once and use it on different platforms (Android, iOS, and Windows) without sacrificing the app's performance or security. The simple and effective compiler-based approach makes it a versatile tool that can be used for multiple platforms. Its sister language, Objective-C, was earlier used for app development in Apple systems, prior to the introduction of Swift in 2014.

Major programming languages used to develop mobile apps today

- **Java:**
- Since the introduction of Android in 2008, this object-oriented programming language has been the popular and official language for Android mobile app development. An extremely versatile language, Java helps keep your app flexible, modular, and extensible. Java is easy to handle and many open source libraries are made available for users to choose from.

Frameworks used to develop mobile apps

- **Flutter**
- Flutter is the new trending cross-platform mobile application development technology in town. It uses “Dart” as a programming language instead of JavaScript which facilitates rapid and effective analysis, fabricates UIs, includes highlights and fixes bugs in milliseconds. The open source cross-platform SDK by Google extends a wide range of plugins backed by Google and allows mobile apps to be built for both Android and Apple iOS platforms

Frameworks used to develop mobile apps

- **Xamarin**
- This cross-platform framework with coding advantages of C# uses single code across iOS, Android, Windows, and other platforms.
- With the benefits of code sharing, Xamarin builds applications that render exact native app experience. It is the most time and cost saving framework for mobile app development.
- Xamarin allows you to deliver native Android, iOS, and Windows apps with a single shared .NET code base. The framework offers access to the full spectrum of functionality exposed by the underlying platform and device, including platform-specific capabilities.

Frameworks used to develop mobile apps

- **React Native**
- This JavaScript open-source framework has become the most preferred native mobile app development technology. It offers ample support to IDEs and other mobile app development tools and enables the development of native apps for iOS and Android platforms.
- ReactNative framework allows to build native mobile apps with JavaScript, using the same design as React.
- Apps built using React Native are real mobile apps, that cannot be distinguished from an app built using Objective-C or Java or Swift.

React Native

- Launched in 2015, React Native is an open-source mobile app framework designed by Facebook. What makes it so great for cross-platform development? Using native components from API, React Native ensures a native-like feel and excellent performance and stability. This framework that uses JavaScript as an app development language comes with a number of benefits:
- **01: Live-tracking**
- The so-called Hot Reload feature allows developers to see changes in the app right after writing code. The real-time updates enable automatic refresh of the application and its interface.

- **02: Third-party plugins**
- Many developers point out this feature of React Native as superior since it allows them to utilize third-party plugins. Unlike most languages that do not permit plugins, React Native provides a higher grade of flexibility and customizability.
- **03: Shorter time-to-market**
- React Native highlights errors on the go, decreases debugging time, provides pre-built components, and allows the reuse of up to 90% of the code, all contributing to shorter development and launch time.

- **04: Modular architecture**
- Modular programming allows separating different functionalities into blocks, or modules, whereby every block contains all the data to execute a certain function of the app. On top of that, React Native provides flexible and optimized coding flow due to its declarative coding feature.

Cross-platform mobile frameworks used by software developers worldwide in 2019 and 2020