


# Mobile Programming and Multimedia

## Mobile Programming Introduction

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## Mobile users vs population

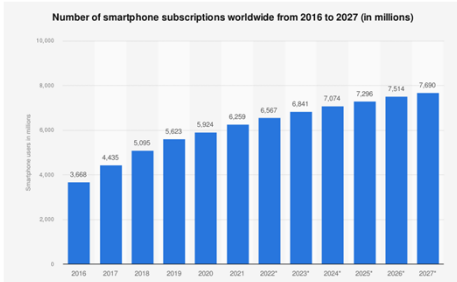
**JAN 2022** **ESSENTIAL DIGITAL HEADLINES**  
OVERVIEW OF THE ADOPTION AND USE OF CONNECTED DEVICES AND SERVICES

TOTAL POPULATION	UNIQUE MOBILE PHONE USERS	INTERNET USERS	ACTIVE SOCIAL MEDIA USERS
7.91 BILLION	5.31 BILLION	4.95 BILLION	4.62 BILLION
URBANISATION 57.0%	vs. POPULATION 67.1%	vs. POPULATION 62.5%	vs. POPULATION 58.4%

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## Diffusion

The smartphone market is enormous



Year	Subscriptions (millions)
2016	3,668
2017	4,435
2018	5,095
2019	5,623
2020	5,924
2021	6,259
2022*	6,567
2023*	6,841
2024*	7,074
2025*	7,296
2026*	7,514
2027*	7,990

Source: Statista  
10 September 2022

Additional Information:  
Worldwide, Statista, 2016 to 2021

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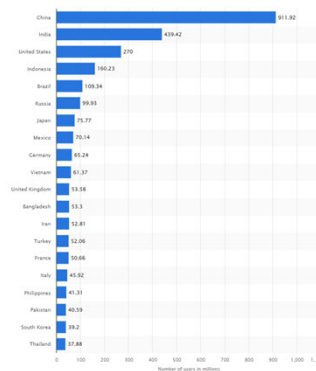
## Market

**JAN 2022** **MOBILE APP MARKET OVERVIEW: APP ANNIE**  
HEADLINES FOR MOBILE APP DOWNLOADS AND SPEND, BASED ON APP ANNIE DATA

NUMBER OF MOBILE APP DOWNLOADS	YEAR-ON-YEAR CHANGE IN MOBILE APP DOWNLOADS	CONSUMER SPEND ON MOBILE APPS (USD)	YEAR-ON-YEAR CHANGE IN CONSUMER APP SPEND	AVERAGE APP SPEND PER SMARTPHONE (USD)
230 BILLION	+5.5% +12 BILLION	\$170 BILLION	+18.8% +\$27 BILLION	\$27.16

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## Number of smartphone users in May 2021

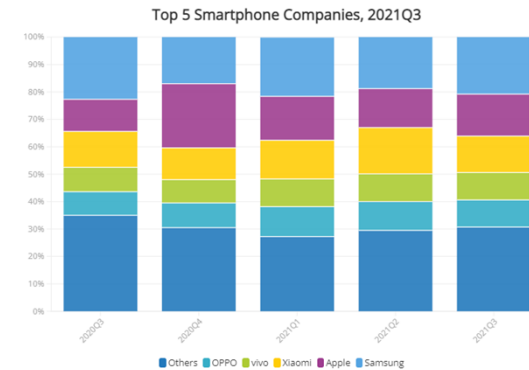


China, India, and the United States are the countries with the highest number of smartphone users.

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5

## Smartphone market



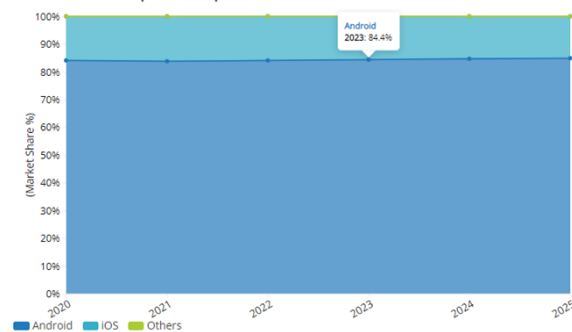
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6

## Operating Systems



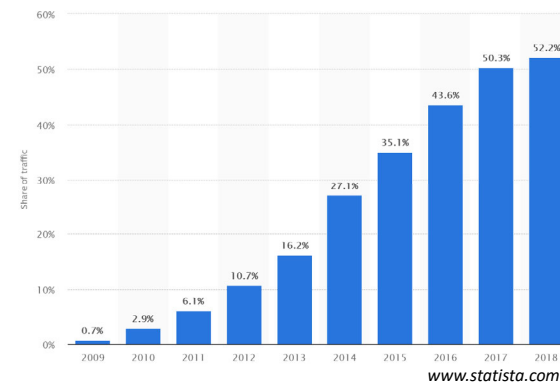
Worldwide Smartphone Shipment OS Market Share Forecast



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7

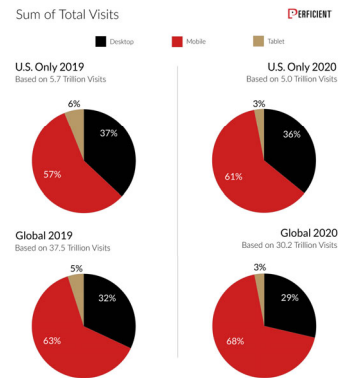
## Site visited using smartphone - 1



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8

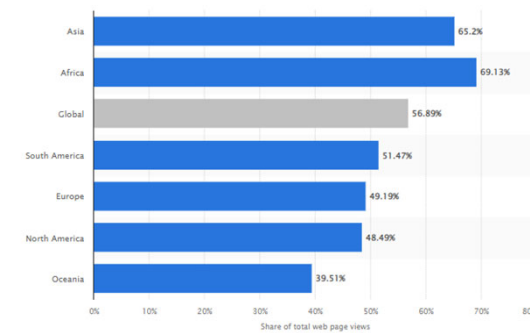
## Site visited using smartphone - 2



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9

## Site visited with smartphone/region



Details: Worldwide; StatCounter; August 2021; mobile only, excluding tablet traffic

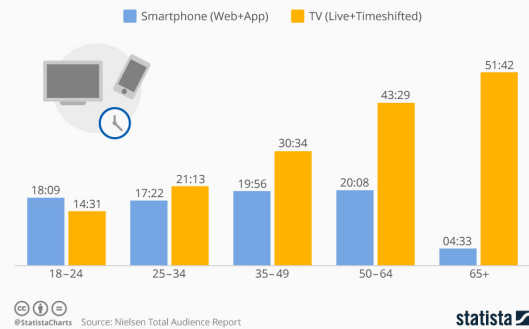
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10

## Smartphone vs TV

### Smartphones Beat TV for Young Adults in the U.S.

Average weekly smartphone and TV usage of adults in the United States in Q1 2017 (in hh:mm)

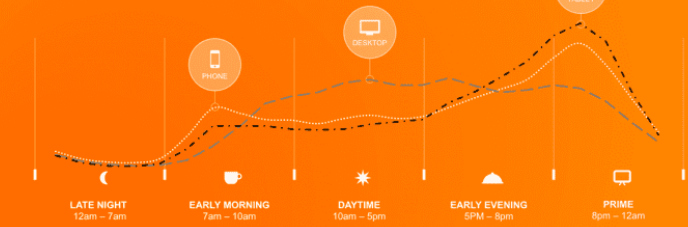


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11

## Relationship daytime-device

% of each platform's average daily impressions by hour



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12

## Italy diffusion



More than 4 billion people worldwide use smartphones, more than half of the worldwide population.

In 2018 Italy had the third place in the world, with 34 million people. Time spent on social networks every day, considering all the devices, is 1 hour and 53 minutes, and 2 hours and 20 minutes every day spent on the Internet using a smartphone

## Not only smartphones...



Mobile phones are not considered anymore as a simple device to make calls, but incorporate a lot of different features:

- Messages, calls
- Internet navigation
- Sensor data collection and usage (app for training, biking, running, etc.)
- Agenda
- Entertainment (games, music, video, reading, etc.)

All these features are provided by apps

## False myths



1. Mobile app development is not expensive
  - A bad app is worse than no app
2. Mobile app development is easy

On the contrary:

1. Mobile app development requires big teams
2. Mobile app development is **not** like winning at the lottery

## Application or responsive website?

The first step to determine if it is better to develop a mobile layout of your own website or a mobile application is to understand the differences between the two:

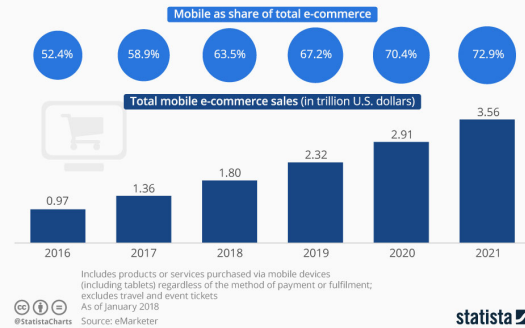
- Diversified content
- Native interface vs. Company brand
- Development time
- User interaction (ex: push notification)
- Access (icon)
- Target (loyalty vs. reach)

## E-Commerce example - 1



### Mobile E-Commerce is up and Poised for Further Growth

Estimated mobile e-commerce sales worldwide



statista

## E-commerce example - 2

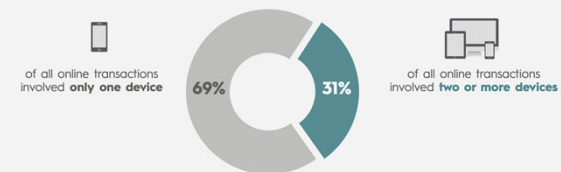


You can't afford to misunderstand 31% of buyers

Nearly one-third of all transactions involved two or more devices from the first website visit to the point of purchase.\* Without cross-device measurement, marketers risk miscalculating key metrics and ROI for one in three transactions.

### US Share of Transactions by Number of Devices Used, Q4 2016

Number of devices used from first website visit to purchase\*



7 | STATE OF CROSS-DEVICE COMMERCE H2 2016

Source: Criteo dataset Q4 2016, US, all categories, excluding apps \*30-day period

criteo

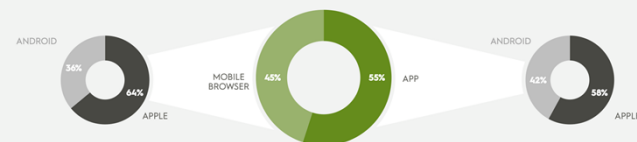
## E-commerce example - 3



Apps outperform mobile browsers for retailers who invest\*

Committed retailers capture more transactions on apps than on mobile browsers. In both platforms, iOS devices capture the majority of these retailers' transactions.

### Global App Share of Retail Mobile Transactions, Q4 2016



27 | STATE OF CROSS-DEVICE COMMERCE H2 2016

Source: Criteo dataset Q4 2016, all categories. \*Includes retailers that have both a mobile website and app and over 25% of eCommerce transactions on mobile, 5% of which are from mobile apps.

criteo

## Apps on the stores



There are millions of apps in the stores:

- 2,570,000 on the Google Play Store
- 1,840,000 on the Apple App Store
- 669,000 on the Windows Store
- 489,000 on the Amazon Appstore

25% of these apps are used only once

## Some statistics



A user usually spend 90% of the smartphone time using apps

The 84% of the time is spent using 5 apps that change between users, which include, in this order, social apps, games, music, and video streaming

Fonte: <https://www.business.com/articles/mobile-apps-vs-mobile-web-do-you-have-to-choose>

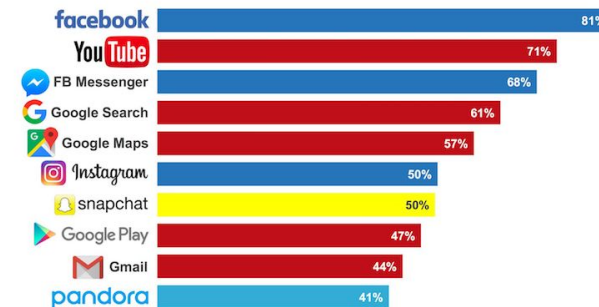
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21

## Top Apps



Top 10 Mobile Apps by Penetration of App Audience  
Source: comScore Mobile Metrix, U.S., Age 18+, June 2017



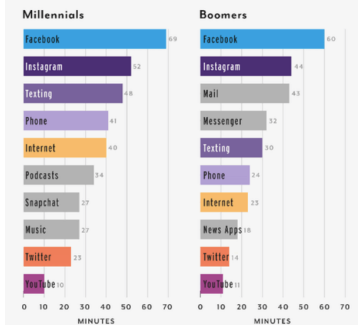
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## Millennials vs Boomers



HOW SCREEN TIME IS SPENT  
Ranked by average minutes per day



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## App vs. mobile web



A mobile application usually tends to encourage brand fidelity (icon on the desktop, notifications, etc.)

A website with a mobile layout allows reaching the user in every situation, immediately

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24

## When to create an app



- A lot of graphics or calculations
- Camera, sensors, or microphone usage
- Gallery or contacts' access
- Push notifications or background service
- ~~For games~~
- It is the only way to have access to the store

*Fonte: J. McWherter, S. Gowell. Professional Mobile Application Development.*

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25

## Ask the users!



- The number of installed apps changes depending on the device (and its operating system)
- According to Nielsen, the best approach is to interview the users to understand if they would accept to install the new app on their device
- Storage space
  - Purpose
  - Loyalty

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26

## Resources



The development of a mobile app requires several resources:

- Interface design
- Development
  - Which operating system?
- Maintenance

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27

## Web apps advantages



- They require a very low knowledge base, HTML is popular
- HTML5 now provides access to almost all smartphone features
- More straightforward “conversion” to different operating systems
- User does not have to worry about the update of the application
- It is not necessary to wait for application approval:
- Apple can require more than 2 weeks!

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28

## App vs Desktop applications - 1



Applications for mobile devices are different from desktop applications:

- Mobile operating systems are soft real-time operating systems:
  - An application can be suspended or terminated in every moment
  - The operating system manages context switch
- Only one application active
  - Not with iOS on iPad
- Limited space, it is not possible to open more than windows at the same time

## App vs Desktop applications - 2



Easy to install (or at least discourage less the use)

Incredibly high number!

- To design and create an exciting app is extremely challenging

Market fragmentation

## Bibliography



Article discussing the choice between app or website

- <https://www.business.com/articles/mobile-apps-vs-mobile-web-do-you-have-to-choose/>

Number of used apps

- <https://techcrunch.com/2017/05/04/report-smartphone-owners-are-using-9-apps-per-day-30-per-month/>