

A World Driven By Apps

Lecture 1



Goal for today



- Mobile app popularity
- Why mobile app development?
- Challenges and perspectives
- Idea evaluation for development, implementation, and publication on the market
- Potential and responsibility of apps
- Sesame Credit: welcome to the Dark Side

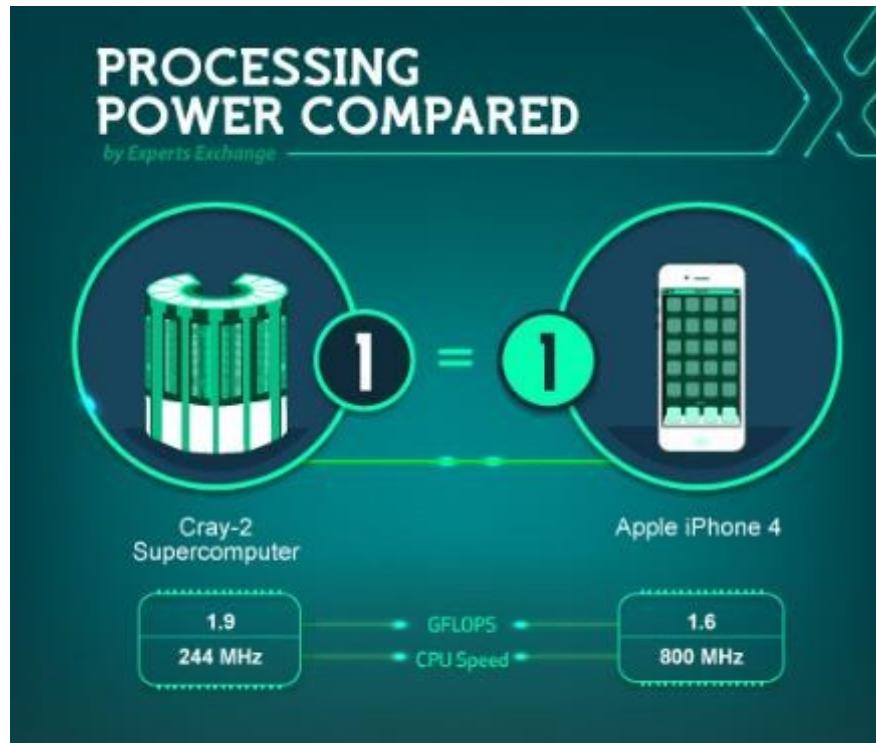
Introduction

Smart mobile devices are part of our **everyday life**, changing the way we interact, work and entertain ourselves.



Introduction

Increase in processing power, memory and storage capacities, number of built-in sensors and number of applications build for such devices.



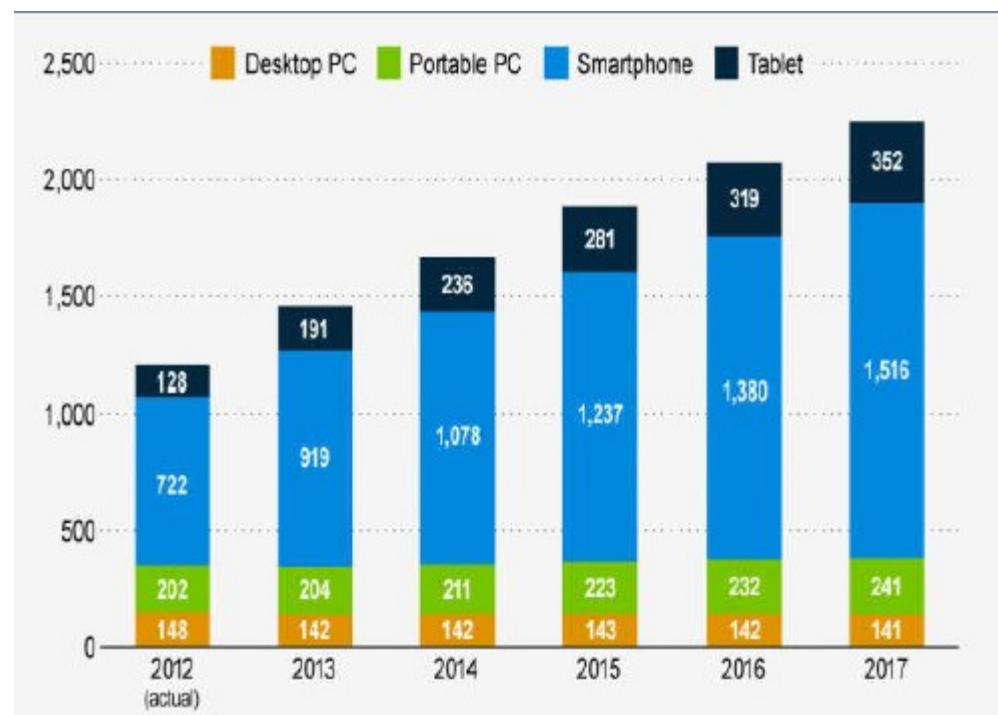
A single Apple iPhone 5 has 2.7 times the processing power of the 1985 Cray-2 supercomputer.

...an iPhone X has 600GFlops

...an iPhone 13 has 1200GFlops

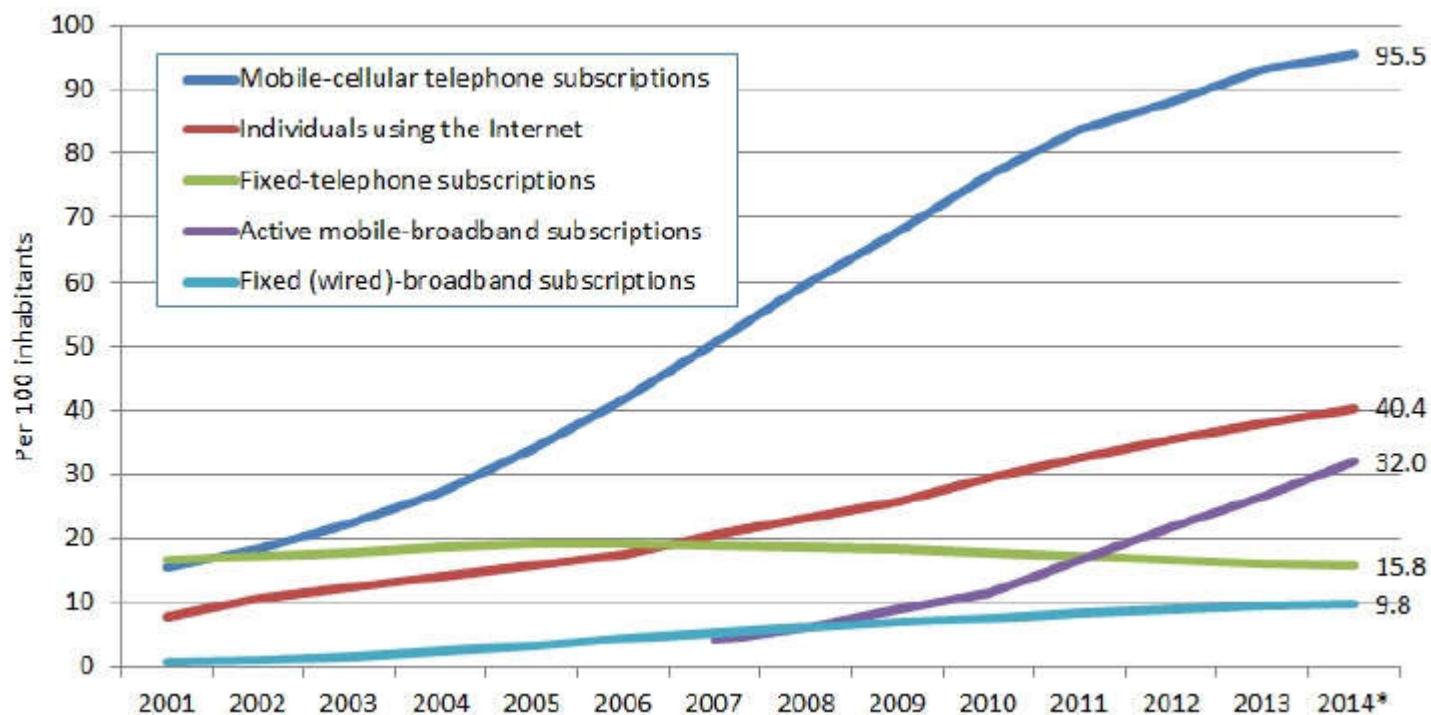
Introduction

Exceeded by far in sales the number of any other types of devices



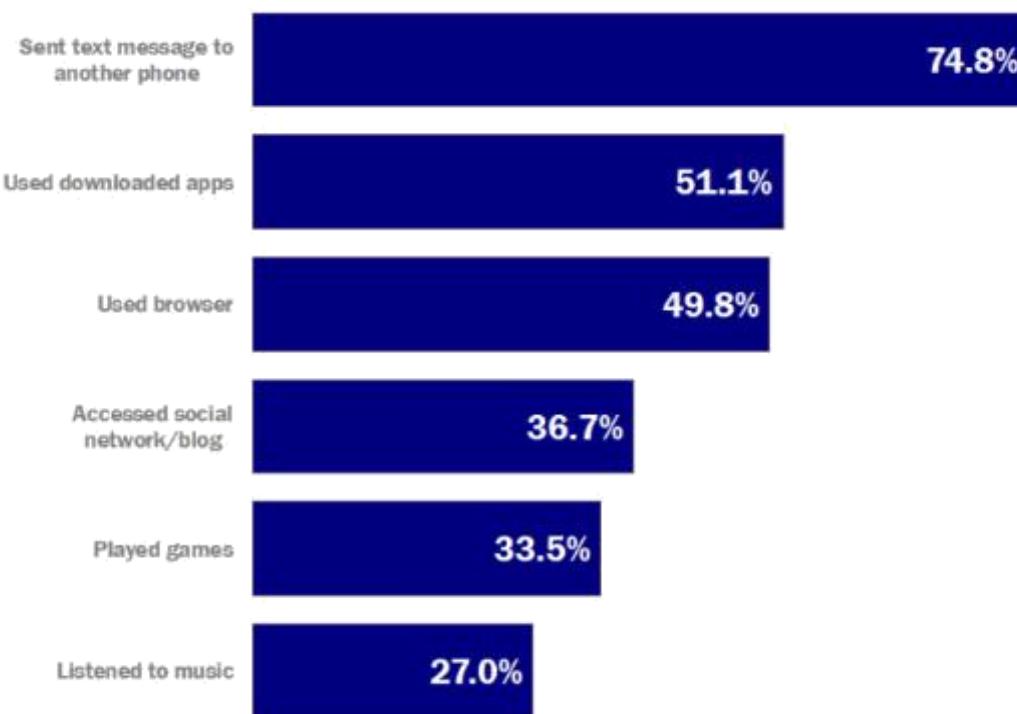
Introduction

Number of mobile communications subscribers exceeds x2 times the number of Internet subscribers (2014)



What are mobiles most used for?

Basic functionalities (call & text) are slowly getting replaced by other apps (video & chat) and entertainment



How we use our smartphones
ACTIVITY BY AVERAGE TIME PER DAY



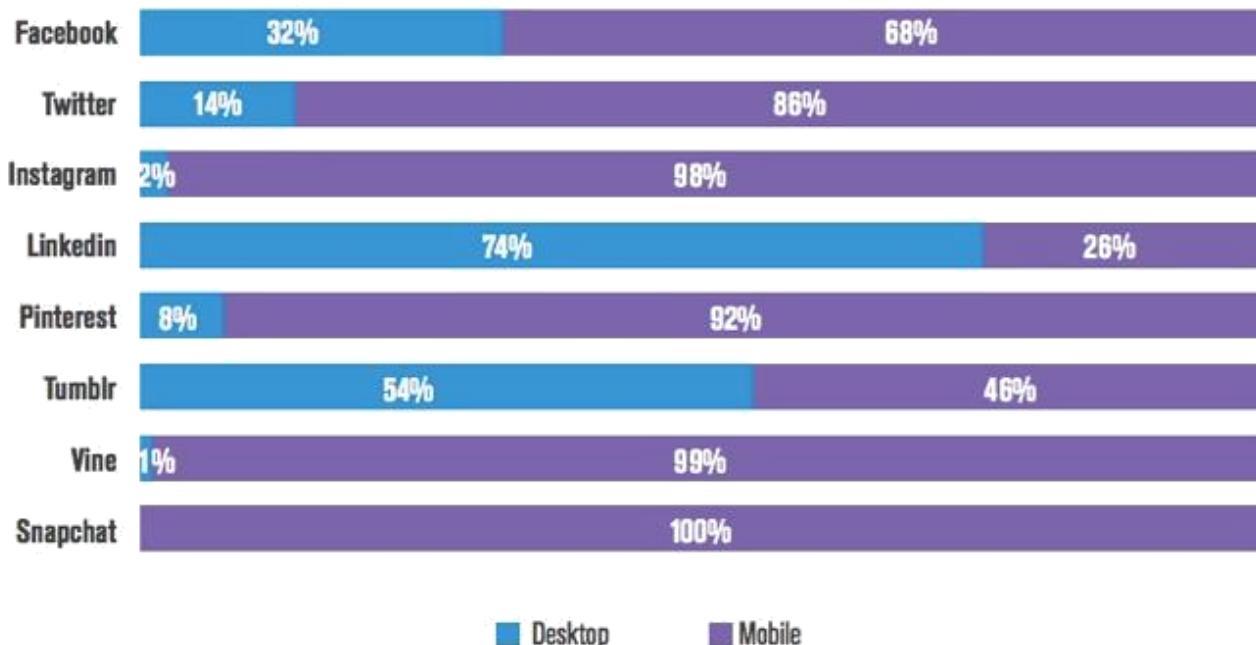
Source: O2

The Mindset: App usage preferences

Development strategy → some apps are desktop oriented, while others are more mobile friendly.

U.S. Share of Time Spent on Social Networks Between Platforms

comScore Media Metrix Multi-Platform, U.S., Age 18+, December 2013



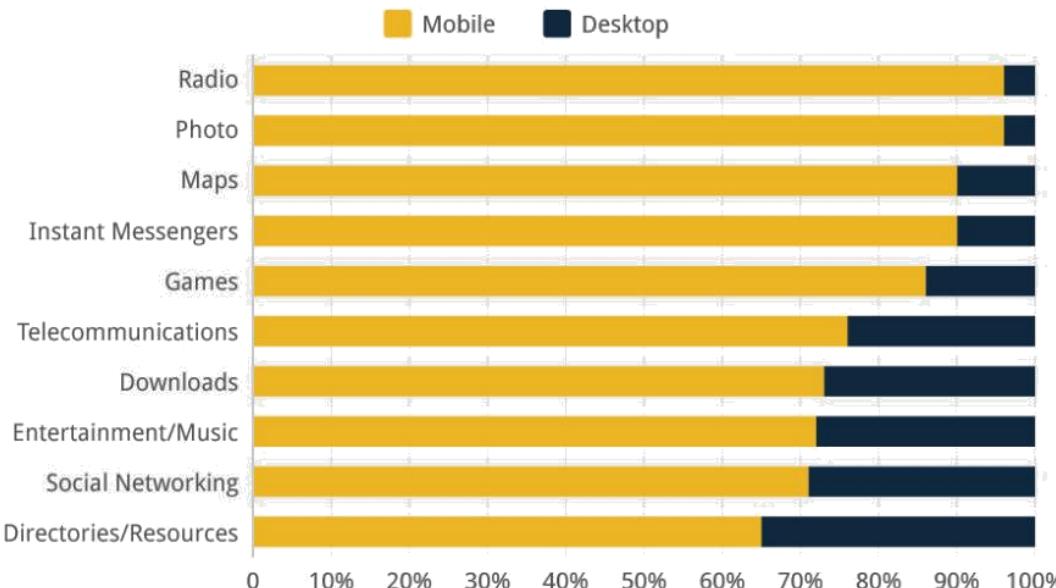
The Mindset: App usage preferences

Bigger market ~ higher competition *versus*

Smaller potential downloads ~ higher chance of success

Mobile Is Taking Over Digital Media Usage

Share of time spent with selected content categories in the U.S. in May 2014, by platform



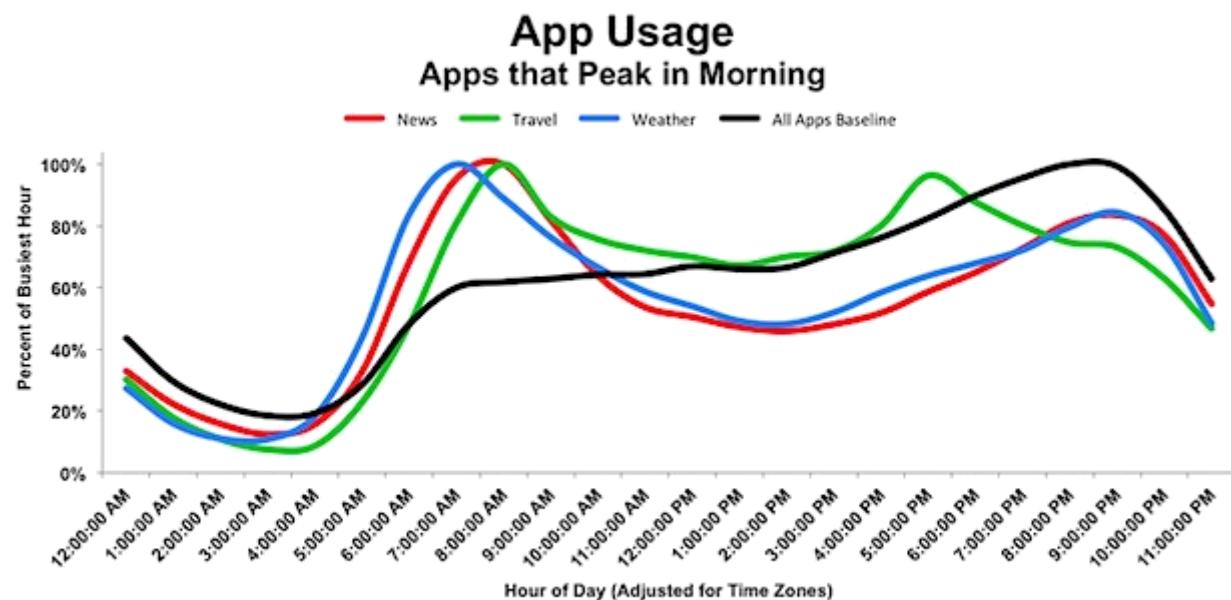
@StatistaCharts

Source: comScore

statista

App usage during the day

News vs. Travel vs. Weather vs. All other types of apps



 Localytics

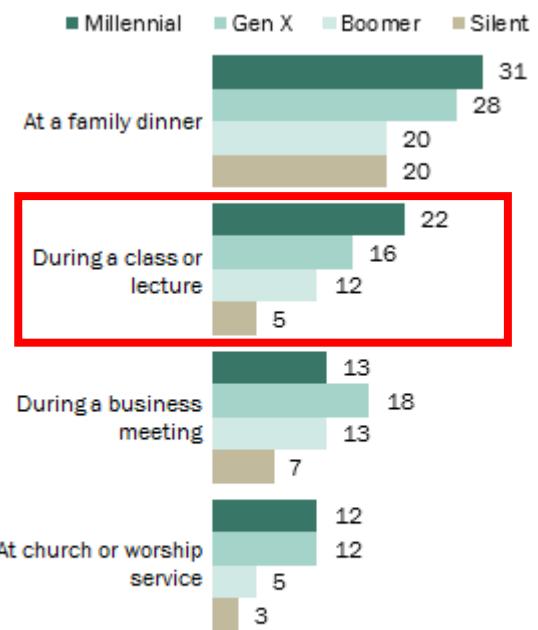
Source: Localytics, February 2015

Phone usage in social contexts

When it is “ok” to use a phone?

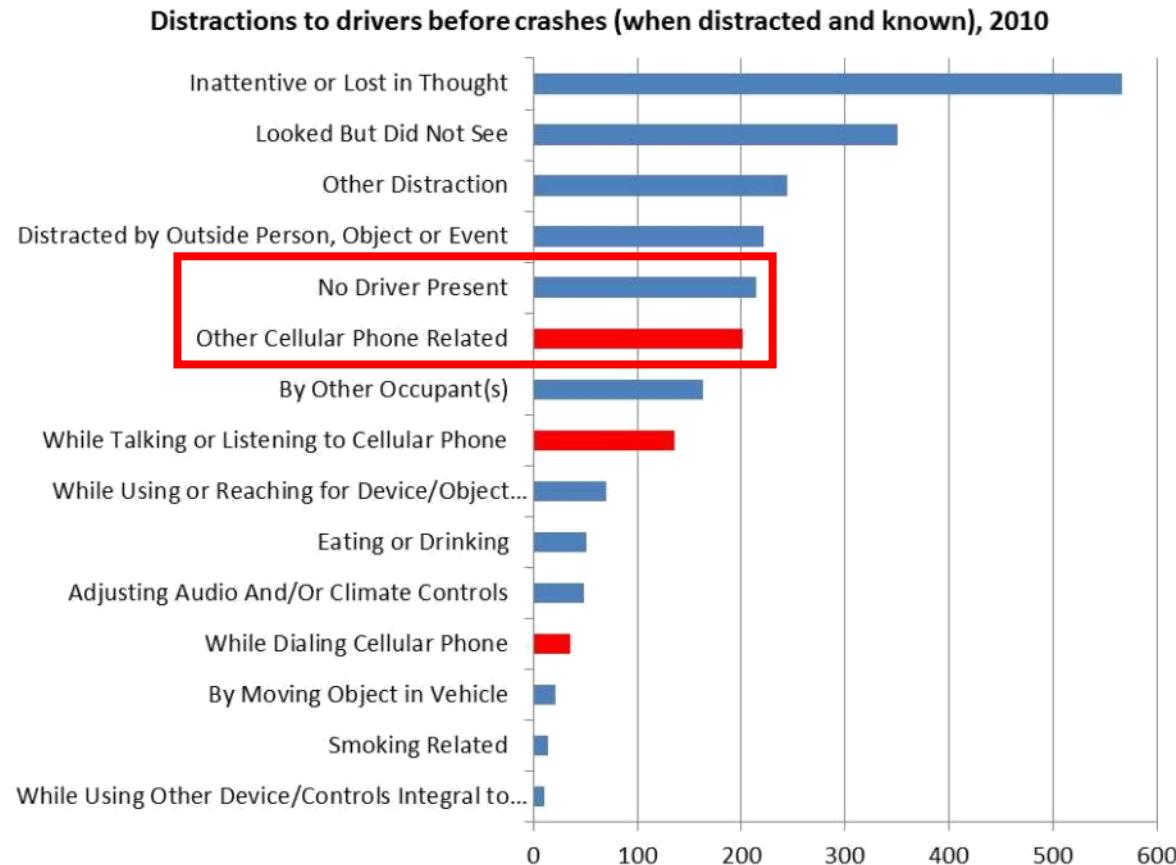
*Survey from 2014

- *Gen Z: 1995+*
- Millennials (Gen Y): 1977-1994
- Gen X: 1966-1976
- Baby boomers: 1946-1965
- Traditionalists/Silent: <1945



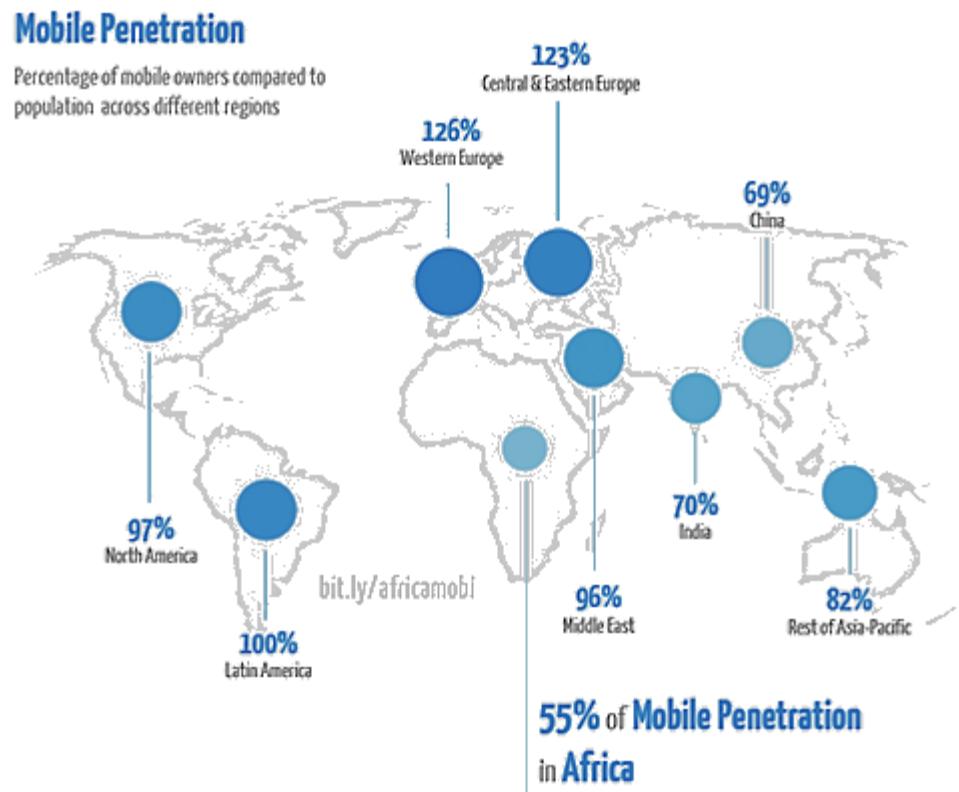
Source: Pew Research survey, Feb. 14-23, 2014
PEW RESEARCH CENTER

Phone usage in social contexts



Mobile usage worldwide

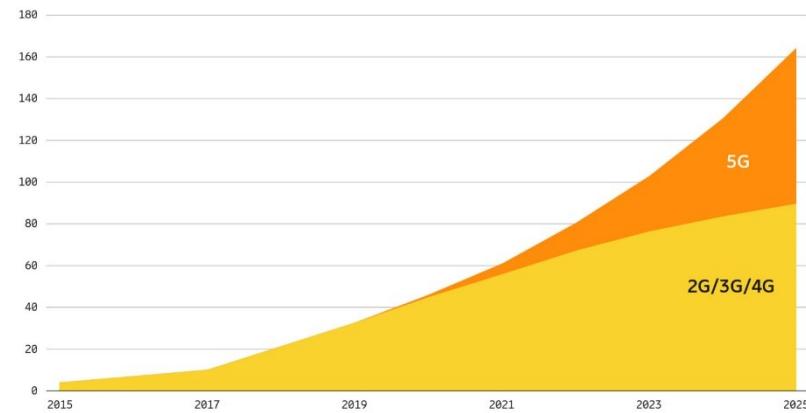
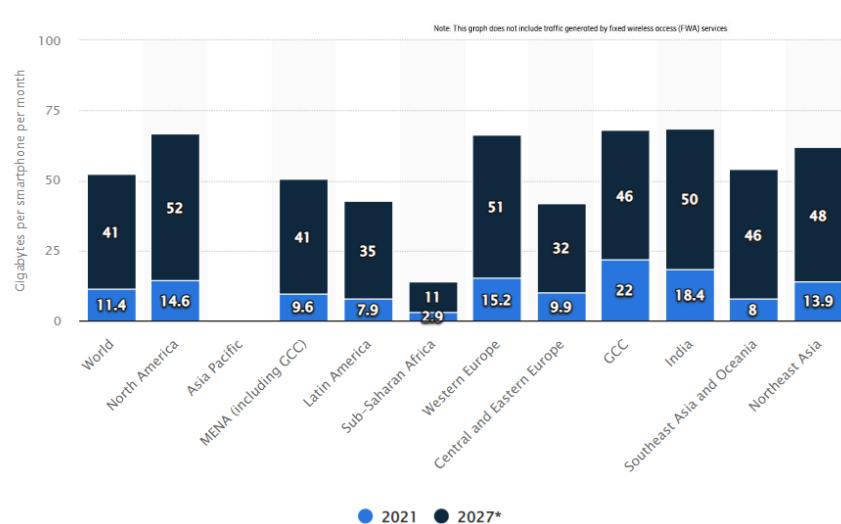
Mobile phones have become an ubiquitous gadget



Mobile usage worldwide

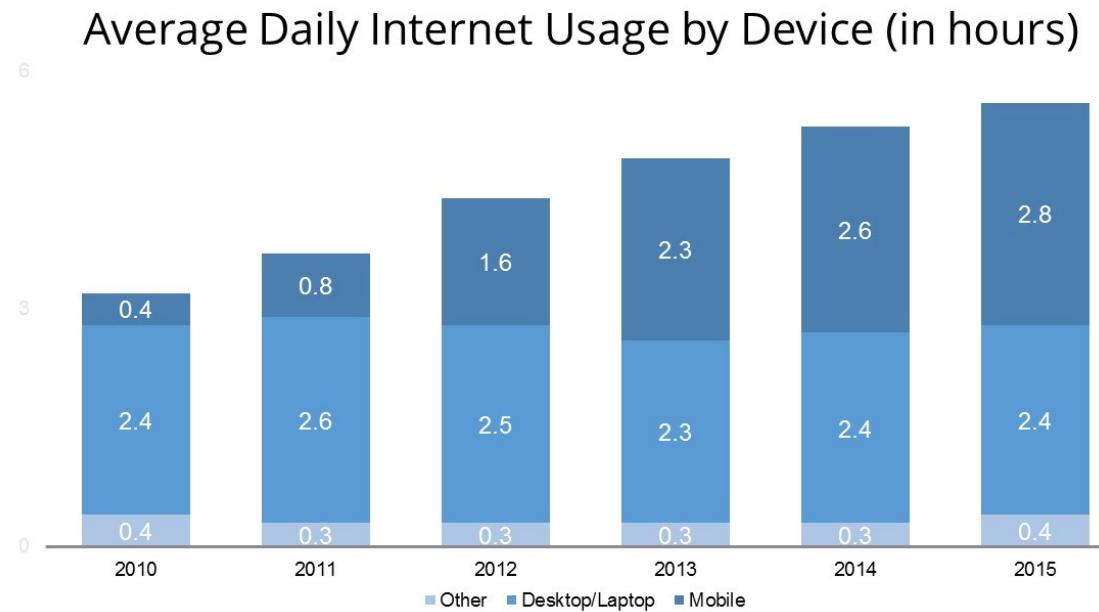
Monthly mobile data usage:

1. Asia-Pacific: 8-14GB/person
2. India: 18GB/person
3. North America: 14GB/person
4. Europe: 10-15GB/person
5. South America: 8GB/person
6. Africa: 3GB/person



Daily internet usage

People spend more time on their mobiles than laptop/PCs (since 2013-2014)



Data Source: 2015 Internet Trends Report, Kleiner Perkins Caufield & Byers
http://www.slideshare.net/kleinerperkins/internet-trends-v1/14-14Internet_Usage_Engagement_Growth_Solid11

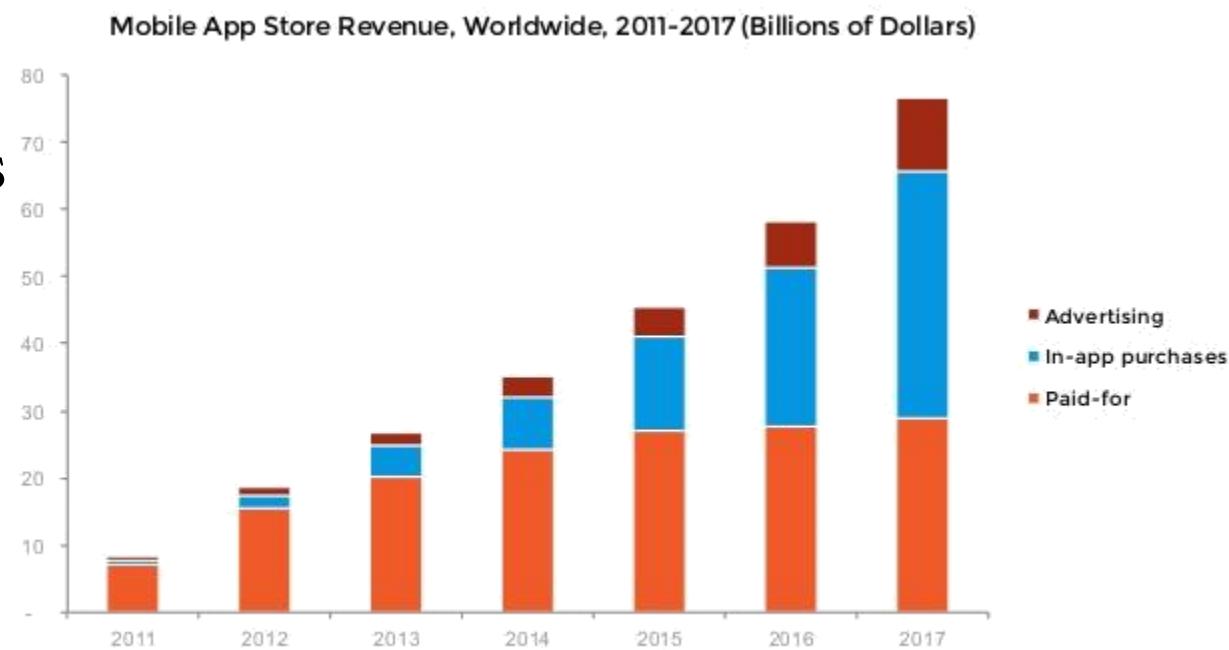
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Revenue sources from mobile apps

Paid apps are becoming less popular

New incentives for making users spend money:

- In-app purchases
- Gamification
- Paid (video) adds
- Free trials

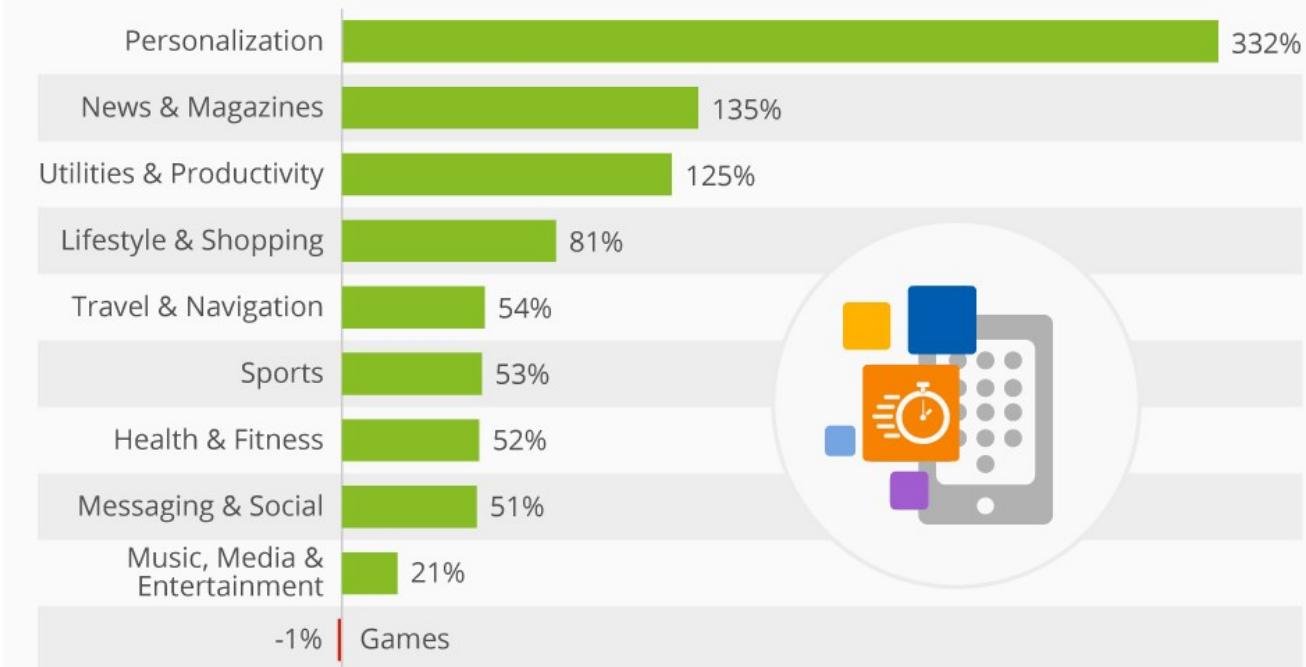


App type popularity

People seek **personalization** in all aspects

The Fastest-Growing App Categories in 2015

Year-over-year increase in app sessions by category (2015 vs. 2014)



Mobile device characteristics

Many operating systems to choose from:

- Android
- iPhone OS
- HarmonyOS
- Windows Phone
- RIM OS
- Bada
- WebOS
- FirefoxOS
- Symbian

Mobile device characteristics

And many programming languages to choose from:

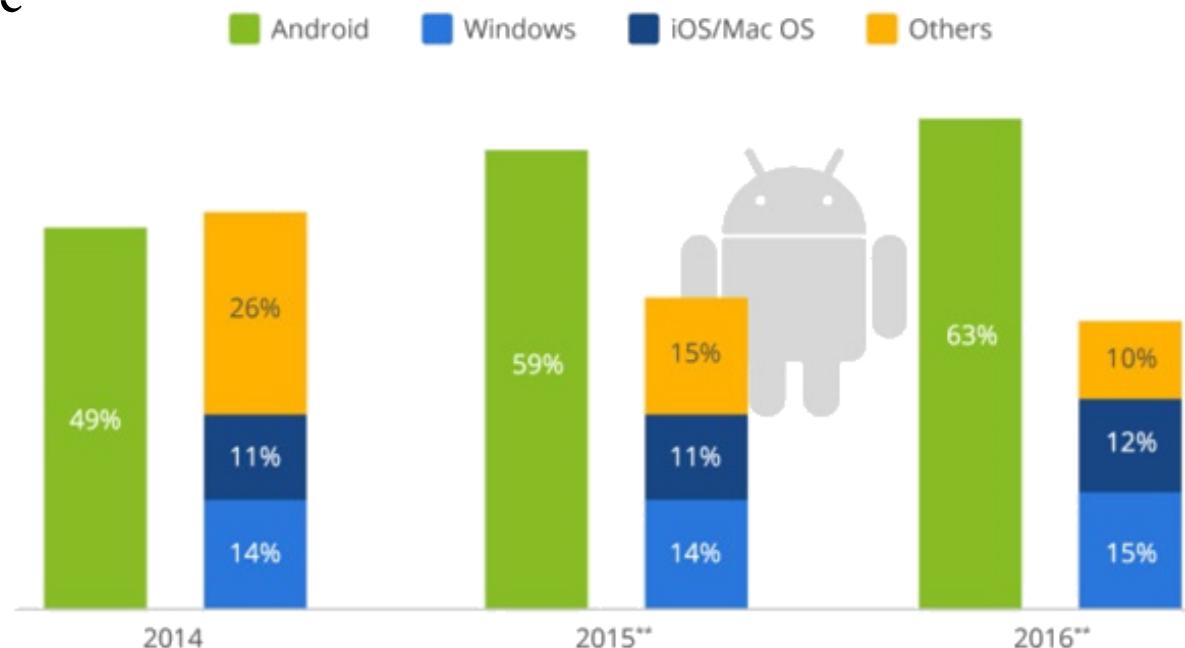
- Java, Kotlin, C#/.NET (compact framework)
 - Easy and fast development
 - Limited control over systems components
- C++ (WP), ObjectiveC/Swift (iOS)
 - More elaborated development
 - Optimized code
 - Experienced developers
- Cross-platform (Xamarin, PhoneGap, Unity, Corona)
 - Targeting multiple OS platforms
 - Limited control over systems components
- Web
 - Python, Flash, HTML, JS (React, React Native).

Android versus competition

- Desktop development
- Web development
- Native mobile
- Cross-platform mobile

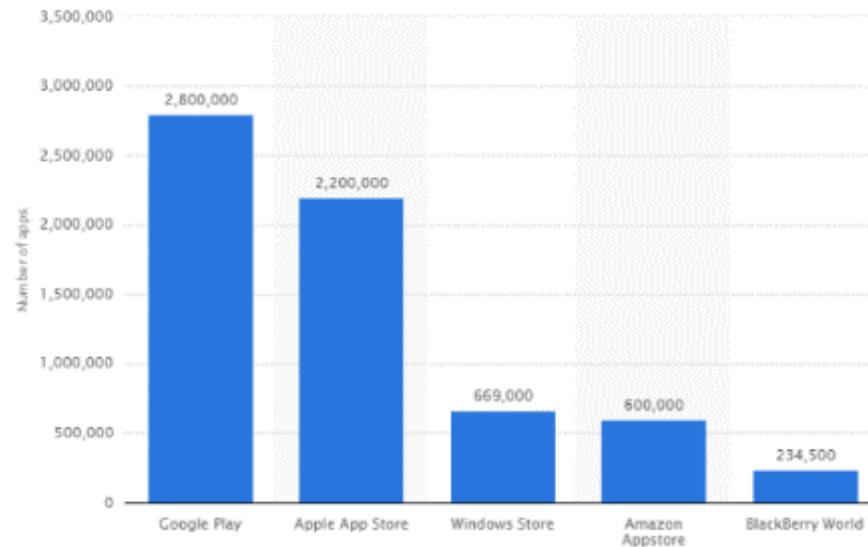
Is Android the new Windows?

2022: Android 71%,
iOS 28%, others 1%



App markets

- Between 2008 and 2010 there were more than 300,000 mobile applications launched, especially on [App Store](#).
- This number doubled in [2011](#), and [Android Market](#) overtook App Store.
- Today we can search among 3 million apps on Google Play and 2.2 million on App Store.



App markets

- 29 billion application downloads in 2011, compared to 9 billion at the end of 2010.
- Tripling the number of yearly downloads in 2012.
- More than 400 millions apps are downloaded each day.
- Many developers are looking to achieve success on this market

App markets

- More than 1500 apps submissions **per day** on App Store
 - Only few of them manage to succeed
- Rovio Mobile (2005) – launched another **18 games** before having the success with Angry Birds (2009)
 - >100.000.000 downloads
- 25% from applications are installed and used **only once**
- Ideas coming from **kids** (e.g. 10 years old – Bubble Ball)
 - >500.000 downloads
- Approximately 5% of mobile **developers** manage to **survive** this competition

MSA organization

Exam, lab, grading

Organization

Final exam (50%) + Laboratory (50%) + bonus points

~~Written exam: 4-6 straightforward questions + 1-2 problems~~

F2F quiz on Campus: many straightforward questions

Lecture attendance: +2p bonus

App on market (with downloads): 1-10p bonus

App at SCM UPT 2023: 1-10p bonus

Weekly lectures, Wednesday 12:00, A204.

Organization

Final exam (50%) + Laboratory (50%) + bonus points

~~Activity at the lab: +1p bonus ?~~

~~Final lab test: 30%~~

Lab project (Darian Velciov): 100%

Questions?

Mobile development characteristics

Mobile development specifics

Are there any differences between mobile development and desktop development?

1. What are the **limitations** of a mobile device?
2. How mobile devices can be **classified**?
3. What are the **applications** of smart mobile devices?

Limitations

When developing mobile applications there are some specific aspects that have to be considered:

- Usage pattern
- **Input** sources
- Display specific features
- **Performance** and resources
- Access to **network** services
- Mobility
- Unstandardized devices – Device fragmentation
- Significant differences between mobile **operating systems**
- Physical sensors
- **Battery** capacity and limited energy

Limitations – user behavior

Multimodal interaction and distributed attention

- Many ways to interact with the mobile device
- Hands can be occupied with something else
- Attention is focused somewhere else
- The user is walking, eating, talking, driving while using the app

Result

- Low human performance
- High error rates

→ Solutions

- Voice and gesture recognition
- Augmented reality
- Context-aware services

Multitude of input sources & sensors

Touchscreen (multipoint)

Keyboard (limited, miniaturized)

Trackball

GPS (position detection)

Accelerometer (movement, vibrations, gestures detection)

Gyroscope (orientation detector)

Microphone (sound detection) & Camera (image recognition)

Light sensor (light intensity of external environment)

Fingerprint sensor

Proximity, Infrared, temperature, etc.

Input limitations?

The sources of data inputs that has to be considered for desktop applications are the **keyboard** and the **mouse**.

When developing a mobile application all the **environment elements** that are surrounding the device (user) may be considered.

- Complex user **input flow design**
- Design patterns, **callback functions**

Classification of mobile devices

1. Based on their features

- Web-enabled phones

Voice, sms

Small display, dial pad, low cost, limited apps

- Extensible phones

Support app downloads – Java, BREW

- Two-way pagers

Message oriented, keyboard, email support

Classification of mobile devices

- Smartphones
 - OS, SDK+IDE, emulator etc.
- PDA (Personal Digital Assistants)
 - OS (Palm, WinMobile)
 - Location, GSM, WiFi; SDK, emulator
- Handheld PC
- Tablet PC
- Laptop, notebook, ultrabook

Classification of mobile devices

2. Based on their usage

- General purpose devices: laptop, tablet
- Multimedia and gaming devices: iPod video, PlayStation
- Communication devices: smartphone, PDA, BlackBerry
- Wearable devices: smart watch, health devices, fitness devices
- Positioning devices: GPS navigator

Timeline of mobile devices

3. Based on communication evolution

- The brick era (1973-1988)

- External battery

- 1G generation

- Motorola



Timeline of mobile devices

- The candy bar era (1988-1998)

2G generation

Rise of Nokia



Timeline of mobile devices

- The feature phone era (1998-2008)

2.5G generation

Data communication



Timeline of mobile devices

- The smartphone era (2002+)

3G (2003)

Smartphones, PDA, PocketPC

- The touch era (2007+)

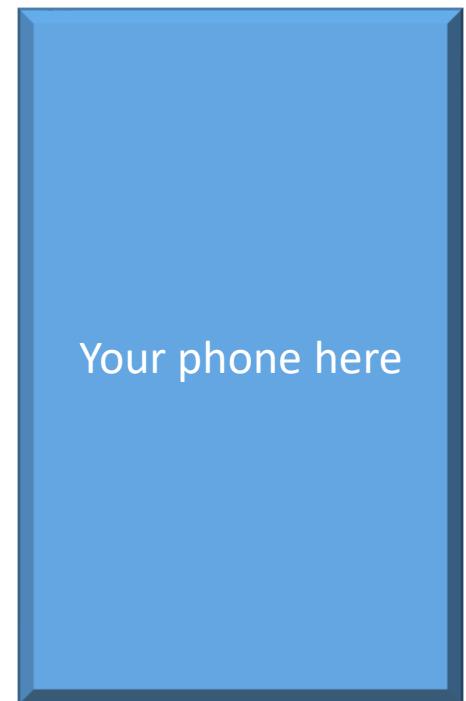
3G/4G, 5G

Touchscreen

iOS, Android, WP8-10, Blackberry,

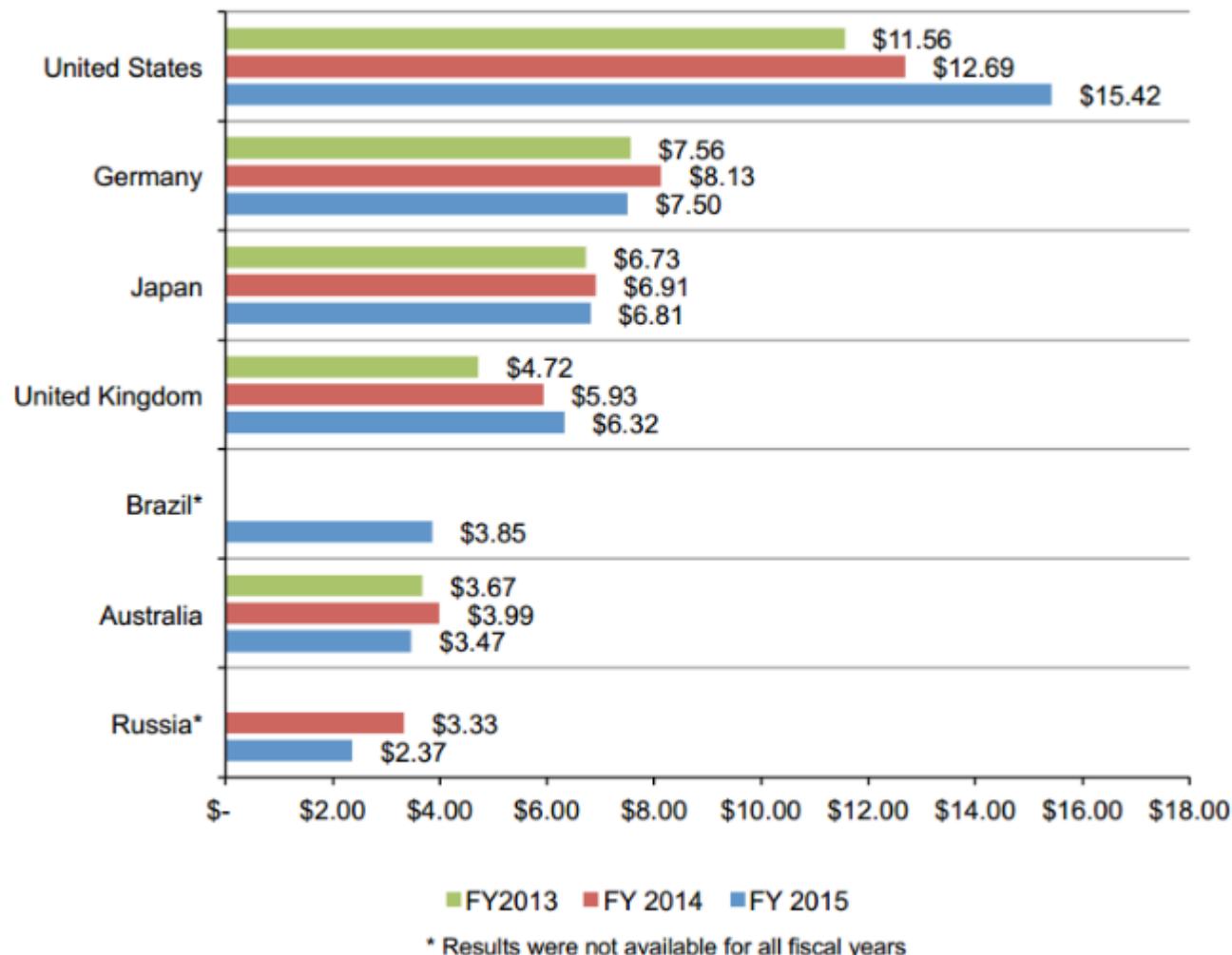
First iPhone (2007),

First Android (2008).



Security matters

Total cost of
cybercrime
expressed in
million \$
(252 companies)



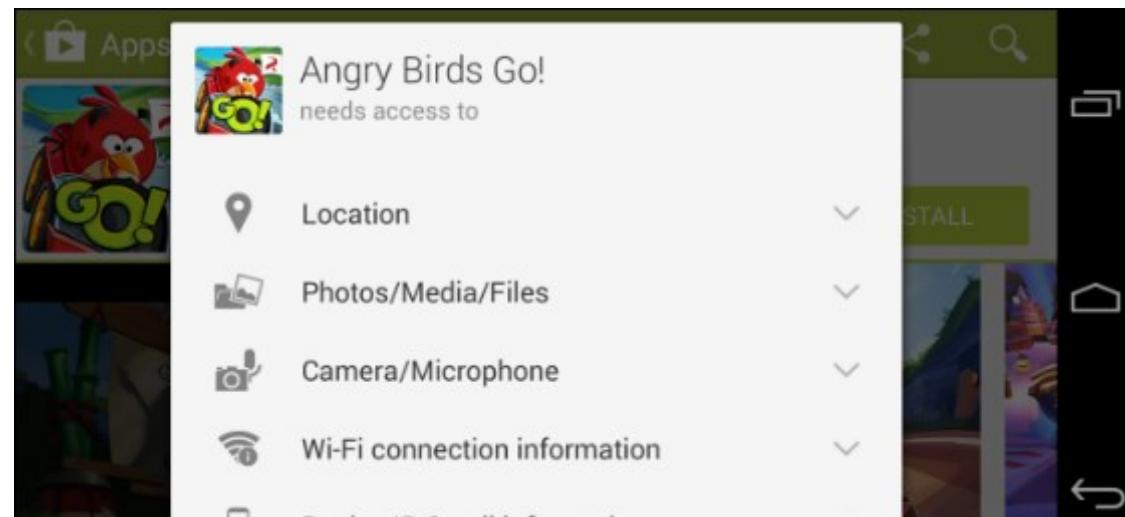
Privacy at your fingertips

NSA data center (Utah, USA) receives 300,000,000 hacking attempts/day

World's biggest data breaches [live](#)

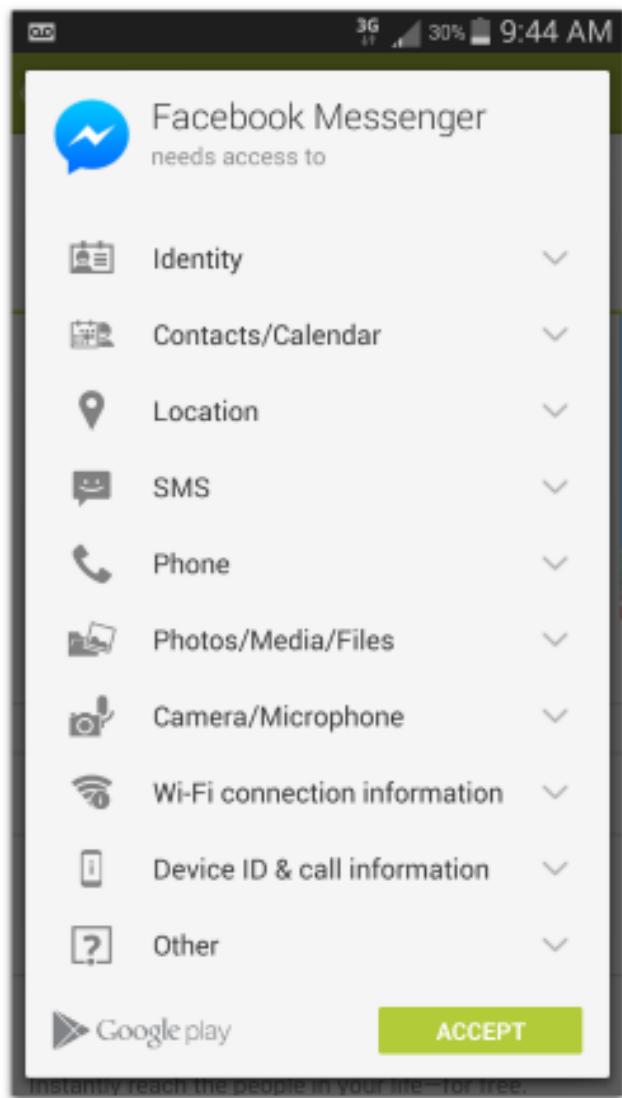
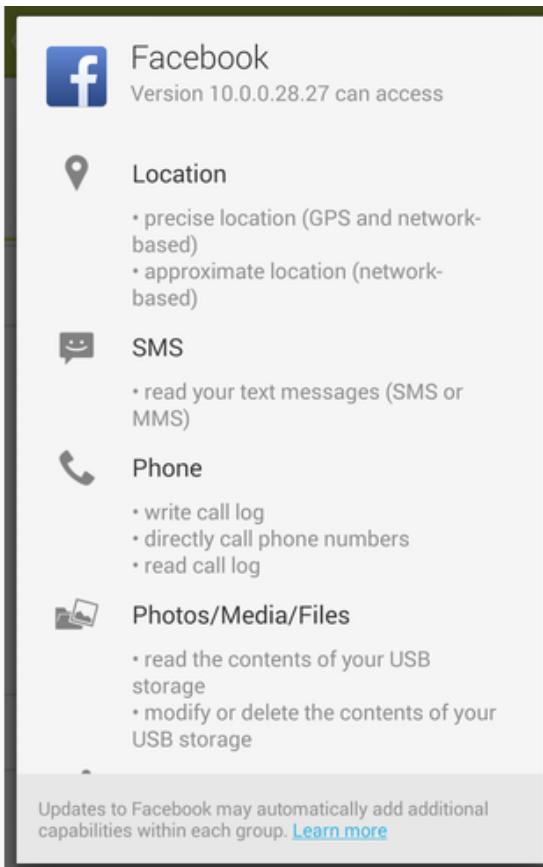
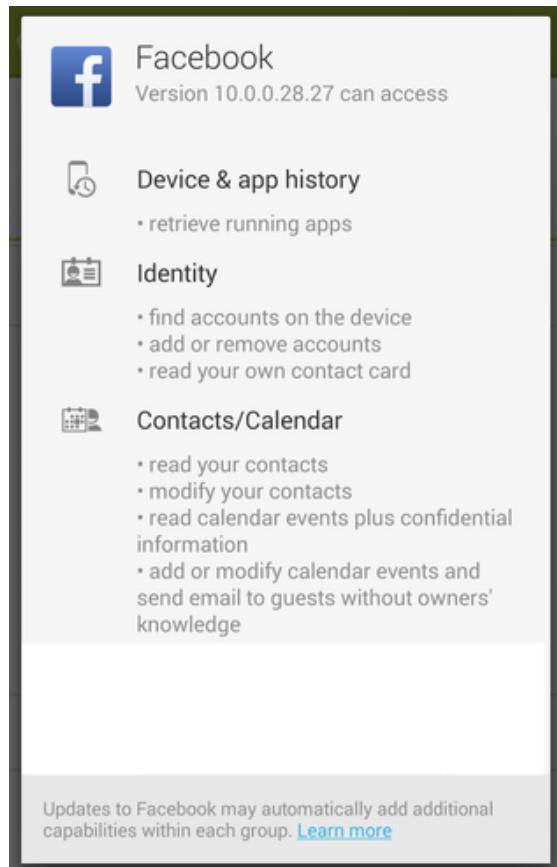
Mobile apps have potential access to:

- Contacts
- Call log, recording
- Messages & emails
- Photos & gallery
- Location



Privacy at your fingertips

Examples are endless ...



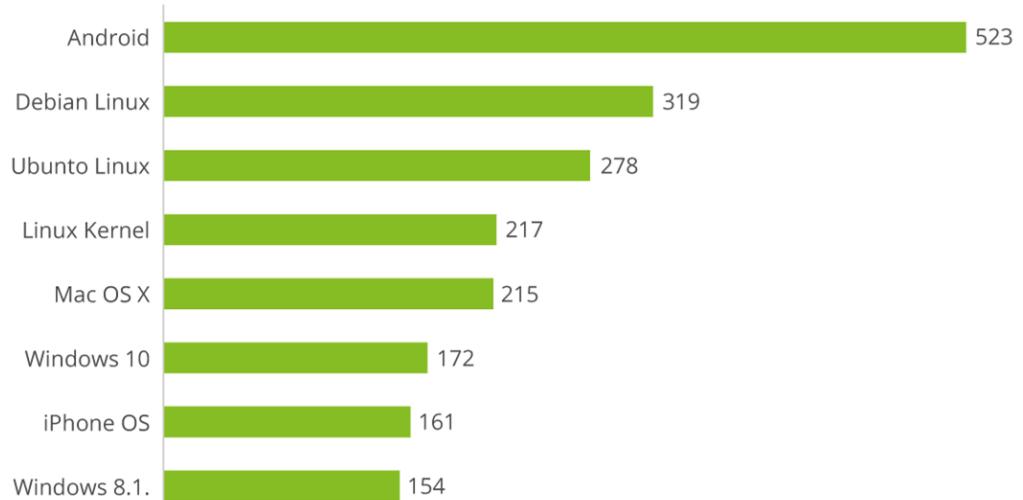
Vulnerability at your fingertips

Android was the most vulnerable OS in [2019](#)

- In 2015 it was the other way around: [iOS](#) (387), [Android](#) (125)
- 2017: Android (843), iOS(300)
- 2019: Android (613), Mac OS X (117)

Android Is The Most Vulnerable Operating System

Number of vulnerabilities by operating system in 2016*

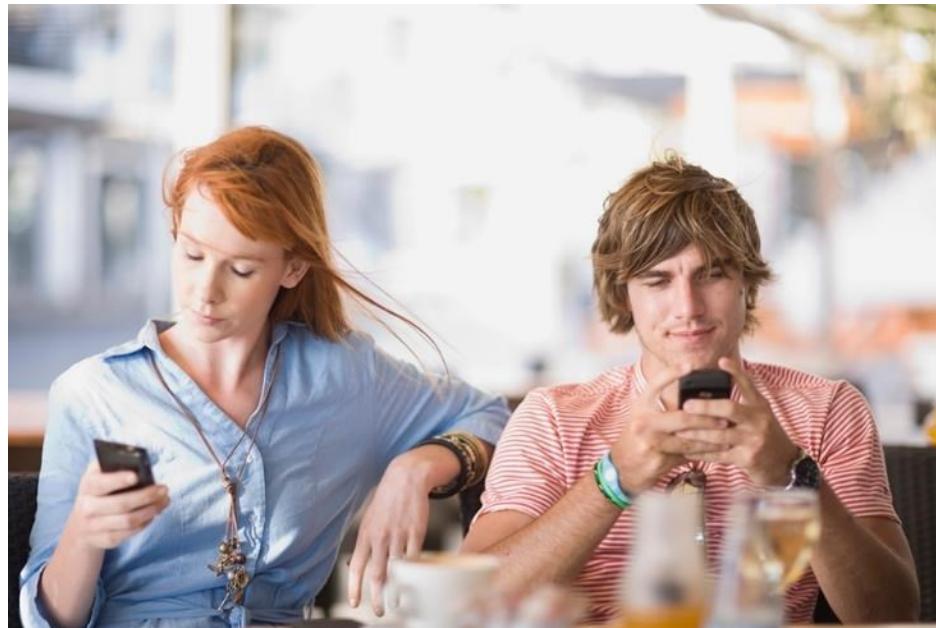


- [CVE details](#)

Phubbing

“The extent to which people use or are distracted by their cellphones while in the company of their partners”.

→ Main factor **sabotaging** (romantic) **relationships** in modern days and also a great source of **depression**.



Phubbing - study

Survey on 145 adults

- 46% admitted they were **phubbed** by their partners
- 23% admitted it caused **conflict**
- 37% felt **depressed** some of the time
- 32% were currently satisfied

Negative side-effect: the need to connect online is replacing/fulfilling the need to connect with the people around us.

Really bad since we are social creatures!

Welcome to the Dark Side

Aka how China's new way of controlling society will grade you on behavior.

Youtube: <https://www.youtube.com/embed/lHcTKWiZ8sI>

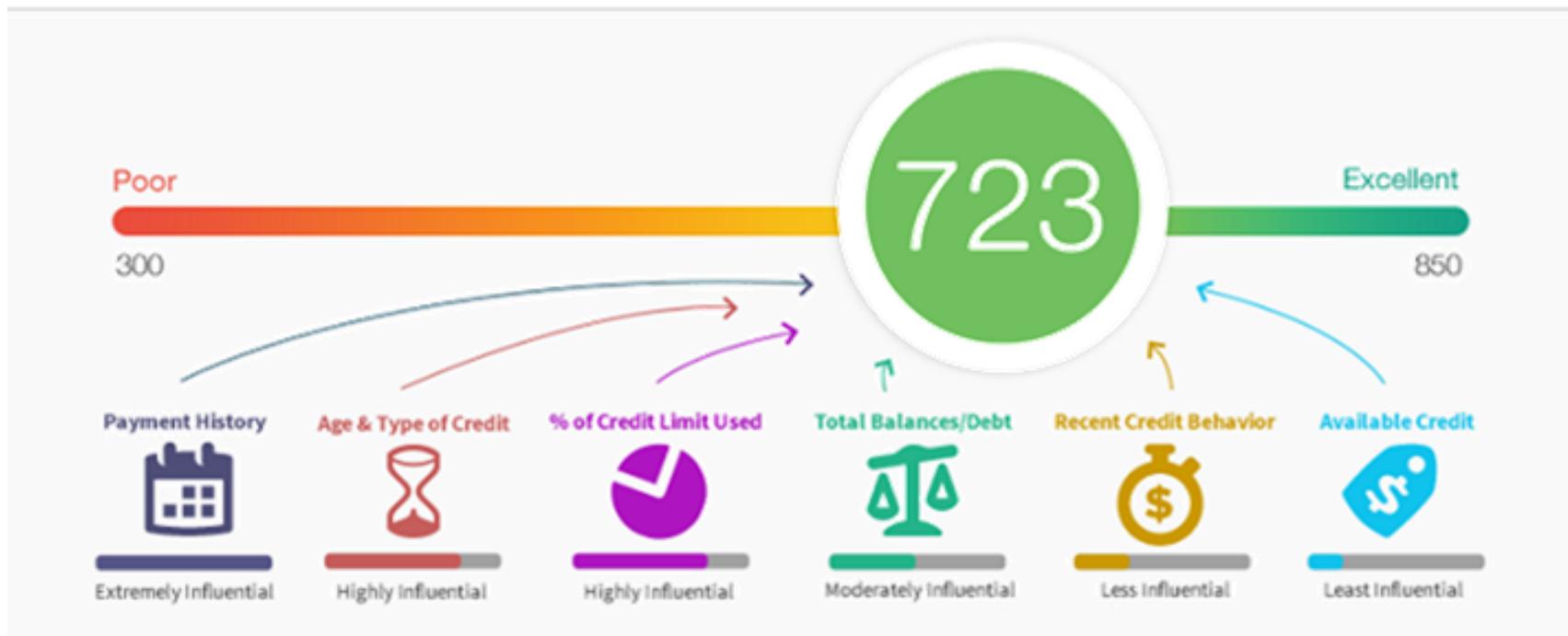
Input: whole online, social and economic activity

Output: score which regulates quality of life “imposed by the state”

- Social division
- Psychological aspects
- Security aspects!

Sesame Credit

Currently, a **proposed** initiative to qualify an individual for loans/credits
→ financial insights, loan management, savings, alerts, **mobile!**



Conclusions

Mobile apps development challenges

- Intermittent **communication** (adaptive)
- **User experience** and GUI design
- **Energy** management (energy awareness)
- Security
- Privacy
- Time to market
- **Ethics**

What to take home

→ Huge global market and easy to access app markets lead to multiple opportunities

Many developers are looking to achieve success on this market

→ Many aspects have to be taken in consideration when developing a mobile application

Few mobile developers manage to survive this competition

Computer science, management, marketing, economics, psychology, design etc.

→ Device fragmentation – many types of devices, OS, characteristics (lack of any standardization)

→ Implications?

Privacy

Technology addiction

... Used against users

Suggested read

Nineteen Eighty-Four

Published 1949 by George Orwell

*A world of perpetual war,
omnipresent government surveillance,
and public manipulation.*

