Mobile App Development

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EXERCISE

WHERE ARE YOU IN THE WORLD?

WHAT MOBILE APPS DO YOU USE?

WHAT MOBILE PHONE DO YOU HAVE?

AGENDA

- Background
- Overview of Android development
  - Kotlin versus Java
  - Demo
- Importance of testing
- How I teach Android development
- Demo of a student project

Background


GLASS


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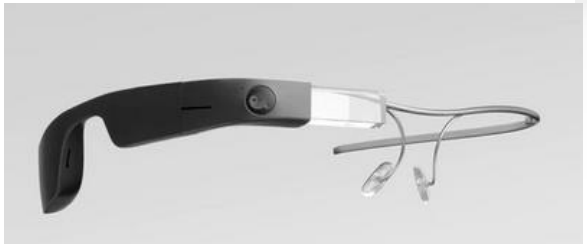
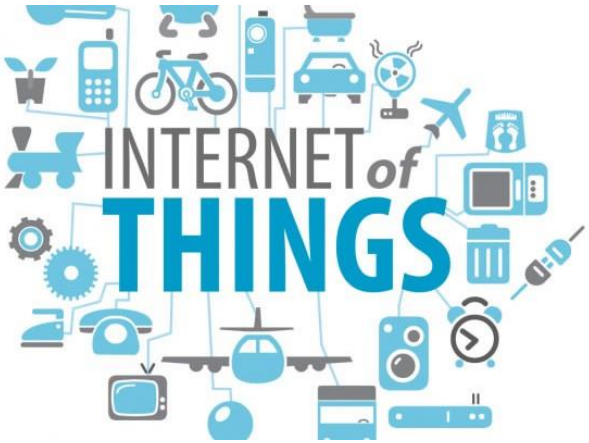


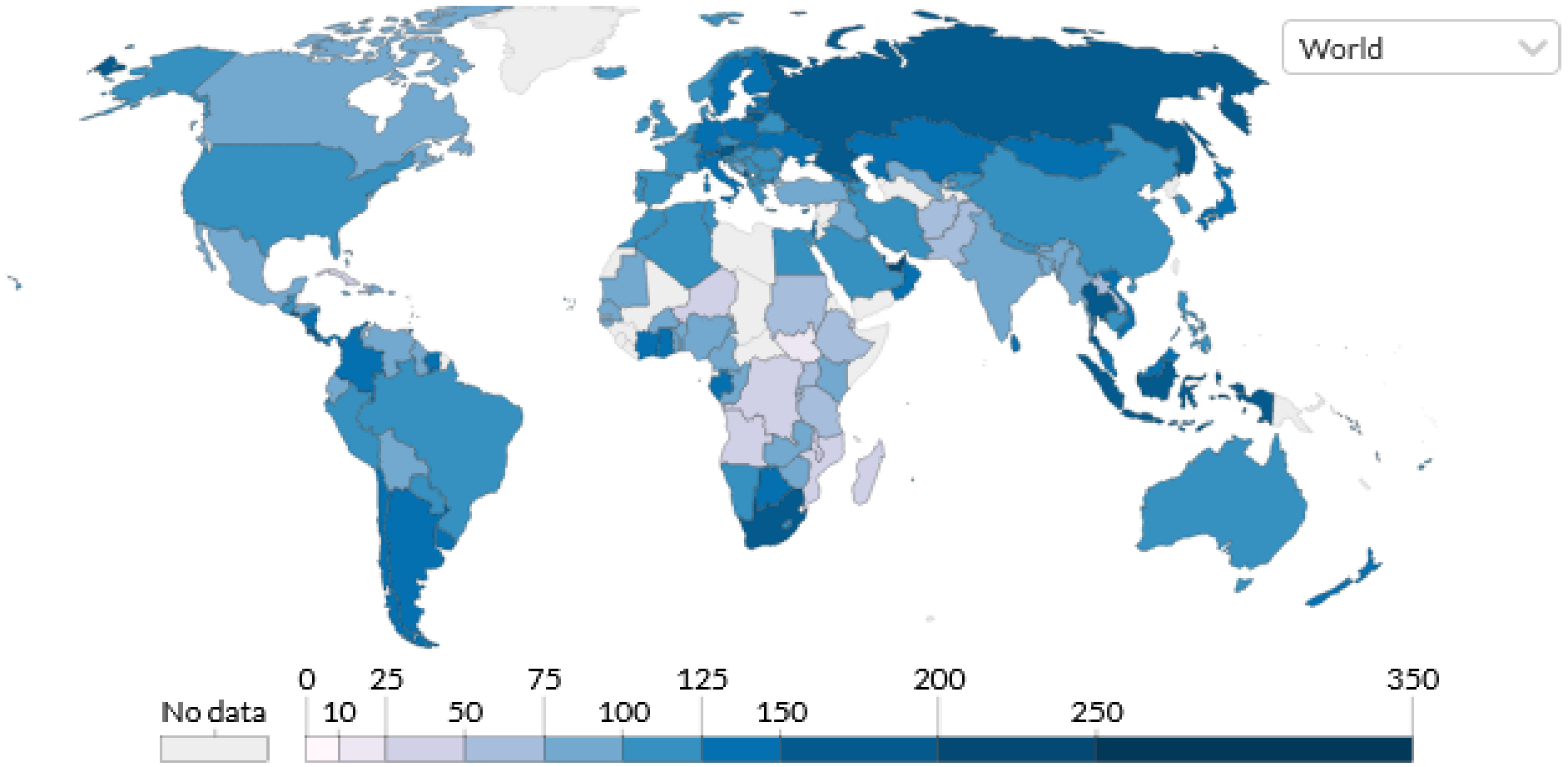

INTERNET of
THINGS


DATA

Mobile cellular subscriptions, 2017

Mobile phone subscriptions, measured as the number per 100 people.

Our World in Data



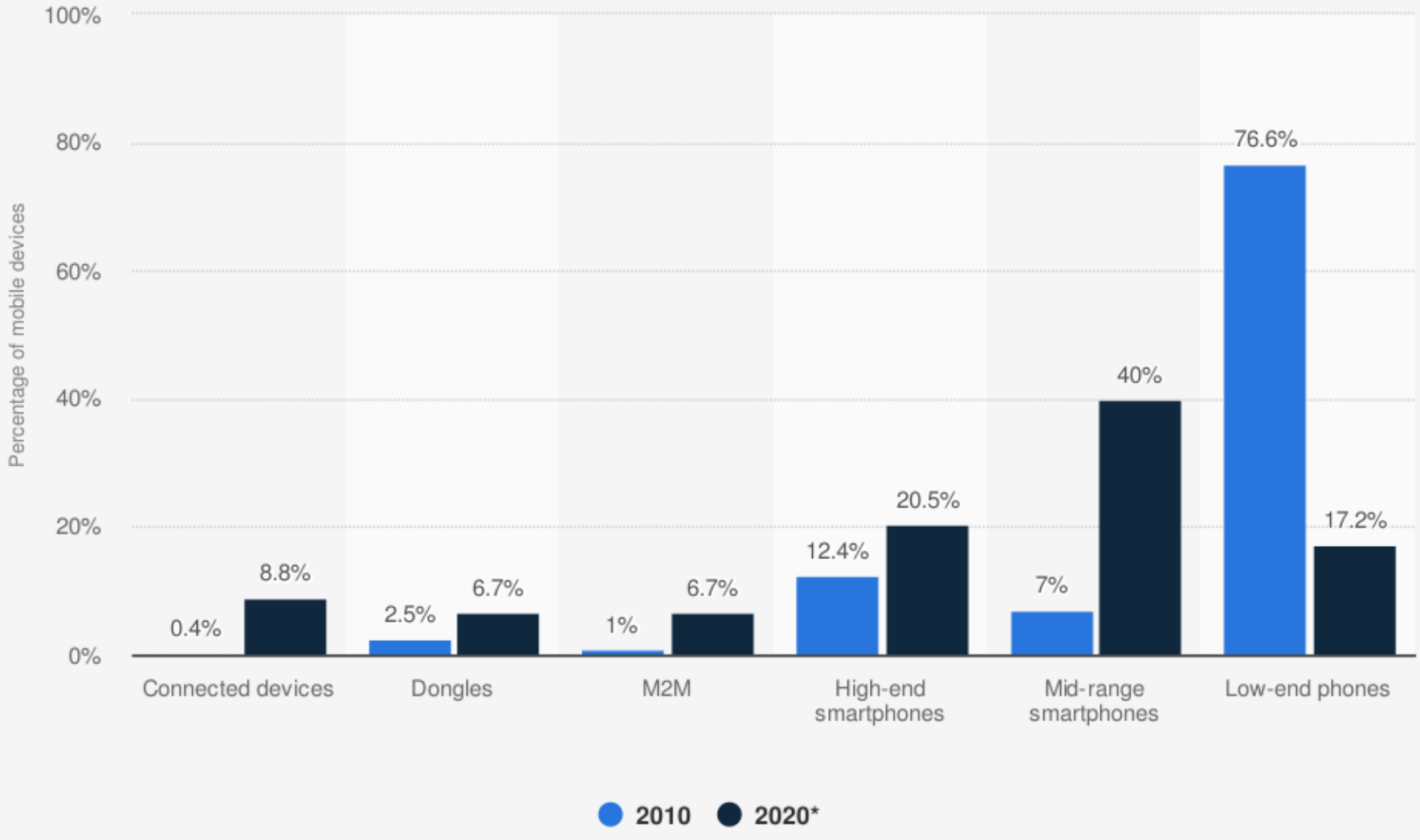
Source: International Telecommunication Union

OurWorldInData.org/technology-adoption/ • CC BY

African mobile market

> 650 million of subscribers

Worldwide device mix in 2010 and 2020, by device (in percent)



Source
UMTS Forum

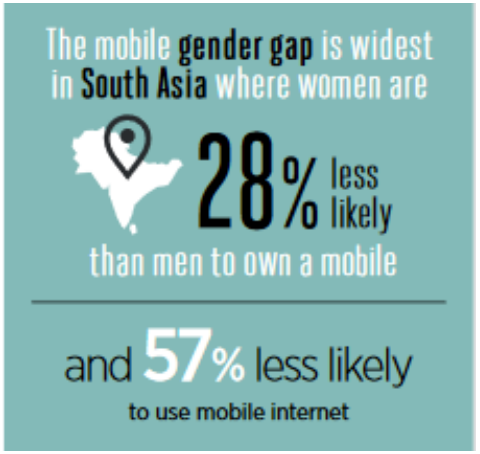
Additional Information:
Worldwide; IDATE DigiWorld; 2010

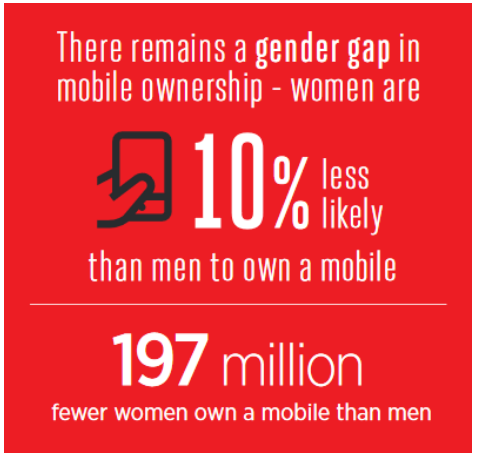
TECH

Why the Vast Majority of Women in India Will Never Own a Smartphone

Technology, promoted as a social equalizer, is having the opposite effect in one of the world's largest markets

https://www.wsj.com/articles/why-the-vast-majority-of-women-in-india-will-never-own-a-smartphone-1476351001





Mobile technologies

- SMS
- MMS
- Bluetooth
- QR codes
- NFC (Near Field Communication)
- Beacons
- IVR (Interactive Voice Response)
- USIM
- USSD (e.g., #123#)
- Etc.
- Mobile web sites (CSS, HTML, JavaScript…)
- Native applications (Java, Kotlin, Swift, Objective C…)
- Mobile web applications (CSS, HTML, JavaScript…)
- Hybrid mobile applications (CSS, HTML, JavaScript…)

Mobile platforms

- **Android**
- **iOS**


statcounter
GlobalStats
Press Releases
FAQ
About
Feedback
Android
72.48%
iOS
26.91%
Samsung
0.23%
Unknown
0.14%
KaiOS
0.13%
Windows
0.02%
Mobile Operating System Market Share Worldwide - December 2020


statcounter
GlobalStats
Press Releases
FAQ
About
Feedback
iOS
61.07%
Android
38.76%
Samsung
0.11%
Unknown
0.01%
Windows
0.01%
KaiOS
0.01%
Mobile Operating System Market Share in United States Of America - December 2020

PercentMobile

Android OS - The First 100 Devices

Acer E110 320x480, 3 mega pixels, 118g **Acer E400** 320x480, 3 mega pixels, 125g **Acer S100** 480x800, 5 mega pixels, 135g **Alcatel OT-980** 240x320, 2 mega pixels, 155g **Apad P7901a** 800x480, Non-phone, 388g **Archos 5 Tablet** 800x480, 182g **Archos 7 Tablet** 800x480, Non-phone, 388g **Barnes&Noble Nook** 600x800, Non-phone, 353g **Cincinnati Bell Blaze** 320x480, 5 mega pixels, 113g **Cydle M7** 480x800, 480g

Dell Aero 360x640, 5 mega pixels, 105g **Dell Mini 5** 480x854, Non-phone, 220g **Eken M001** 800x480, Non-phone, 350g **Eken M003** 800x800, 590g **Garmin A10** 320x480, 5 mega pixels, 130g **Garmin A50** 320x480, 3 mega pixels, 0g **General Mobile DSTL1** 240x400, 5 mega pixels, 135g **Haipad M701** 800x480, 350g **HTC Aria** 320x480, 5 mega pixels, 115g **HTC Desire** 480x800, 5 mega pixels, 130g

HTC Desire HD 480x800, 8 mega pixels, 164g **HTC Droid Eris** 320x480, 5 mega pixels, 120g **HTC Espresso** 320x480, 5 mega pixels, 167g **HTC EVO 4G** 480x800, 8 mega pixels, 170g **HTC G1** 320x480, 3 mega pixels, 159g **HTC G2** 320x480, 3 mega pixels, 118g **HTC G2 Touch** 320x480, 5 mega pixels, 135g **HTC Incredible** 480x800, 8 mega pixels, 130g **HTC Legend** 320x480, 5 mega pixels, 126g **HTC Liberty** 320x480, 5 mega pixels, 113g

HTC Nexus One 480x800, 5 mega pixels, 130g **HTC Tattoo** 320x480, 3 mega pixels, 113g **HTC Wildfire** 240x320, 5 mega pixels, 130g **Huawei U7510** 240x320, 2 mega pixels, 105g **Huawei U8100** 240x320, 3 mega pixels, 104g **Huawei U8110** 240x320, 3 mega pixels, 110g **Huawei U8220** 320x480, 3 mega pixels, 130g **Huawei U8230** 320x480, 3 mega pixels, 130g **Huawei V845** 240x320, 3 mega pixels, 115g **i-mobile 6010** 240x400, 3 mega pixels, 106g

i-mobile i858 480x800, 5 mega pixels, 164g **Kyocera M6000** 480x800, 3 mega pixels, 109g **Kyocera Zio** 480x800, 3 mega pixels, 105g **LG Ally** 480x800, 3 mega pixels, 159g **LG GT540** 240x400, 3 mega pixels, 115g **LG GW620** 320x480, 5 mega pixels, 139g **LG KH5200** 320x480, 2 mega pixels, 139g **LG LU2300** 480x800, 5 mega pixels, 128g **LG SU950** 480x640, 5 mega pixels, 135g **Motorola CLIQ XT** 320x480, 5 mega pixels, 131g

Motorola Devour 320x480, 3 mega pixels, 180g **Motorola Droid** 480x854, 5 mega pixels, 169g **Motorola Droid X** 480x854, 8 mega pixels, 140g **Motorola Droid2** 480x854, 5 mega pixels, 169g **Motorola i1** 320x480, 5 mega pixels, 131g **Motorola MB200** 320x480, 5 mega pixels, 165g **Motorola MB300** 320x480, 5 mega pixels, 165g **Motorola MB502** 320x240, 3 mega pixels, 110g **Motorola MB511** 320x240, 3 mega pixels, 120g **Motorola XT502** 320x480, 5 mega pixels, 113g

Motorola XT701 480x854, 8 mega pixels, 140g **Motorola XT720** 480x854, 8 mega pixels, 140g **Motorola XT800** 480x854, 5 mega pixels, 120g **Motorola XT806** 480x854, 5 mega pixels, 165g **Nexian A890** , 5 mega pixels, 0g **Orange Boston** 320x480, 5 mega pixels, 118g **Pantech 630** 480x800, 5 mega pixels, 128g **Pantech IM-A600** 480x800, 5 mega pixels, 128g **Pantech IM-A650S** 480x800, 5 mega pixels, 114g **Samsung Behold 2** 320x480, 5 mega pixels, 119g

Samsung Galaxy S 480x800, 5 mega pixels, 120g **Samsung Galaxy Tab** 1024x600, Non-phone, 3 mega pixels, 380g **Samsung Galaxy U** 480x800, 5 mega pixels, 131g **Samsung GT-I5500** 240x320, 2 mega pixels, 102g **Samsung GT-I5503** 240x480, 2 mega pixels, 102g **Samsung GT-I5700** 320x480, 3 mega pixels, 120g **Samsung GT-I5800** 240x400, 3 mega pixels, 110g **Samsung GT-I8520** 480x800, 8 mega pixels, 156g **Samsung i7500** 320x480, 5 mega pixels, 114g **Samsung M100s** 480x800, 5 mega pixels, 128g

Samsung R880 320x480, 5 mega pixels, 140g **Samsung SGH-i896** 480x800, 5 mega pixels, 128g **Samsung SHW-M110S** 480x800, 5 mega pixels, 121g **Samsung SPH-D700** 480x800, 5 mega pixels, 155g **Samsung SPH-M900** 480x854, 5 mega pixels, 169g **Samsung SPH-M910** 240x400, 3 mega pixels, 138g **Sharp IS01** 960x480, 0g **Sharp SH-10B** 960x480, 5 mega pixels, 230g **SMiT MID-560** 800x480, Non-phone, 388g **SonyEricsson X10** 480x854, 8 mega pixels, 135g

SonyEricsson X10 mini 240x320, 5 mega pixels, 120g **SonyEricsson X10 mini pro** 240x320, 5 mega pixels, 120g **SonyEricsson X8** 320x480, 3 mega pixels, 104g **Spice Mi300** 320x480, 5 mega pixels, 0g **Vibo A688** 320x480, 5 mega pixels, 0g **Videocon V7500** 320x480, 5 mega pixels, 114g **Wellcom A800** 480x800, Non-phone, 3 mega pixels, 0g **Wellcom A88** 320x480, 5 mega pixels, 114g **Witstech A81-E** 800x480, Non-phone, 380g **ZTE X850** 240x320, 3 mega pixels, 100g

Source: http://percentmobile.com

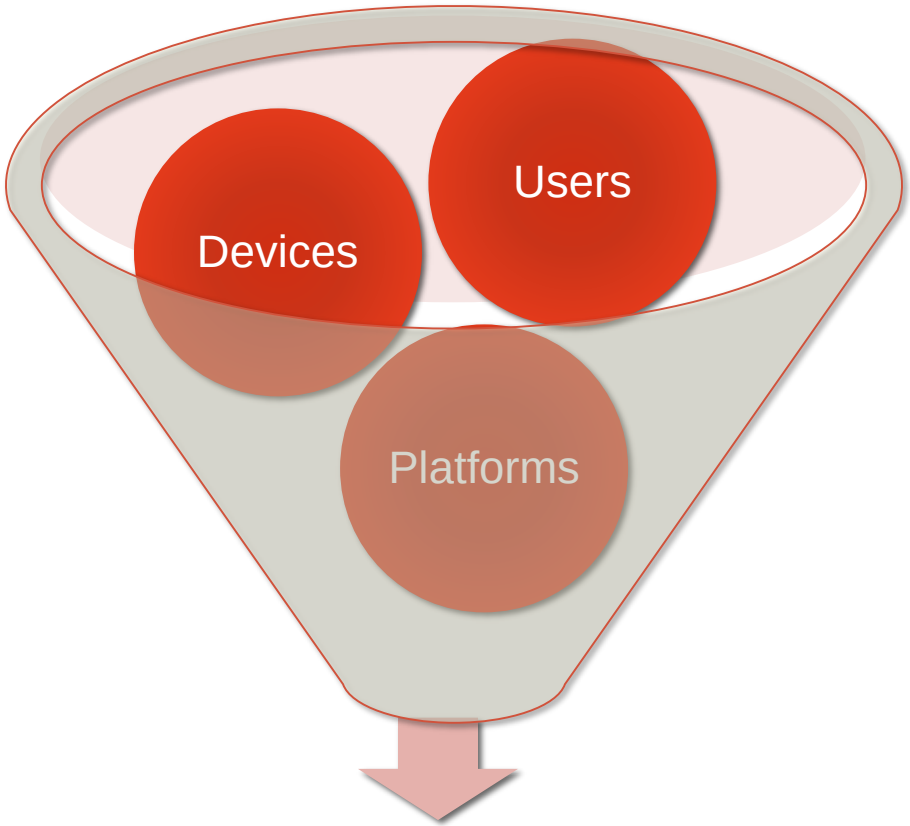
Native versus web versus hybrid mobile development

- **Native development**
  - Develop using languages such as Java, Kotlin, Swift, Objective C etc. that target a specific platform
  - Broader access to hardware features
  - Faster, more powerful, more integration of hardware/platform
  - Integer the latest innovations
  - More attractive look and feel
  - Apps are installed on phones and released on the app markets
- **Web development**
  - Propose condensed website content
  - Executed in a browser
  - Develop using HTML, CSS and HTML and templates can be used
- **Hybrid development**
  - Based on web technologies (HTML, CSS, and JavaScript or DART) and frameworks (Ionic, React Native, Flutter…)
  - Permits multi-platform development
  - Based on standards
  - Apps need to be packaged to be installed on a phone and released on the market
- Differences of capabilities between native and hybrid apps is decreasing

Native versus web versus hybrid mobile development

	Single codebase	User experience and performance	Access to device hardware	Time to market
Native	+	+++	+++	+
Web	+++	+	+	+++
Hybrid	++	++	++	++

Mobile development



~~Mobile apps~~

Mobile experience

Business models

iButterfly

- http://youtu.be/vEE6M0iW-Nw

MOBILE DEVELOPMENT: HOW IS IT DIFFERENT? IS IT REALLY DIFFERENT?

- Ecosystem
- People
- Devices
- Platforms
- Process
- Usage
- UI / UX
- etc

Overview of Android development

Java versus Kotlin

- Android app development became Kotlin-first in 2019

Source: AndroidPub

android

Kotlin

Open-source
Full Java Interoperability
Conciseness
Supportive Community
Functional

Java POJO Kotlin

```java
class Person {
    private String name;

    public Person(String name) {
        this.name = name;
    }

    public String getName() {
        return name;
    }

    public void setName(String name) {
        this.name = name;
    }

    // toString…

    // hashCode…

    // equals…

    // copy…
}
```

```kotlin
data class Person(val name: String)
```

Java Code Kotlin

```java
public void createAndPrintPerson() {
    String name = "Pieter";
    Person person = new Person(name);

    printName(person.getName());
    // Prints: Pieter Otten
}
```

```kotlin
fun createAndPrintPerson() {
    val name = "Pieter"
    val person = Person(name)

    printName(person.name)
    // Prints: Pieter Otten
}
```

https://www.mediaan.com/mediaan-blog/kotlin-vs-java

“Kotlin helped the Google Home team reduce the size of their codebase by 33% and decrease their number of Null Pointer Exception-caused crashes by 30% .”

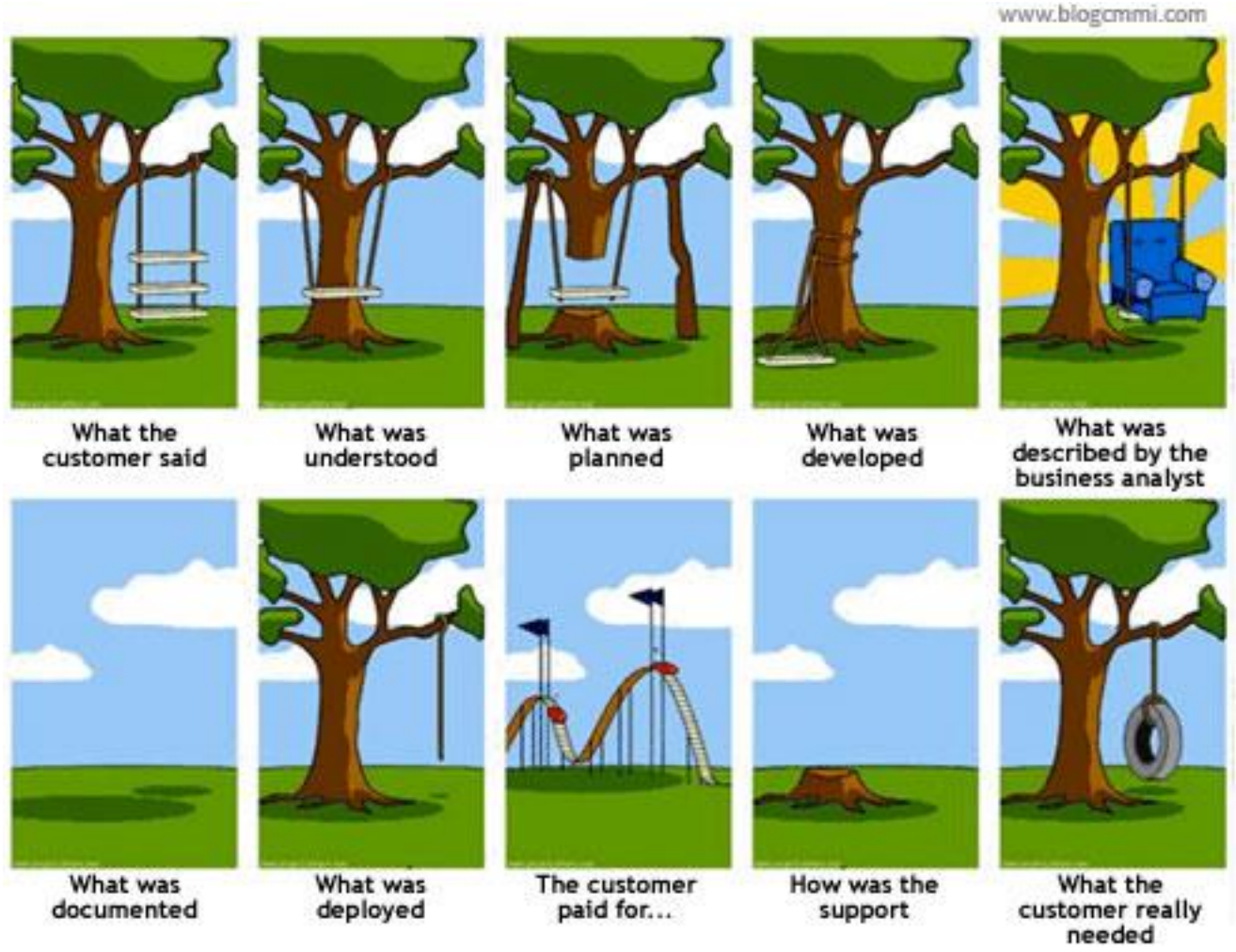
https://developer.android.com/kotlin/first

DEMO

Overview of Android Studio

Process

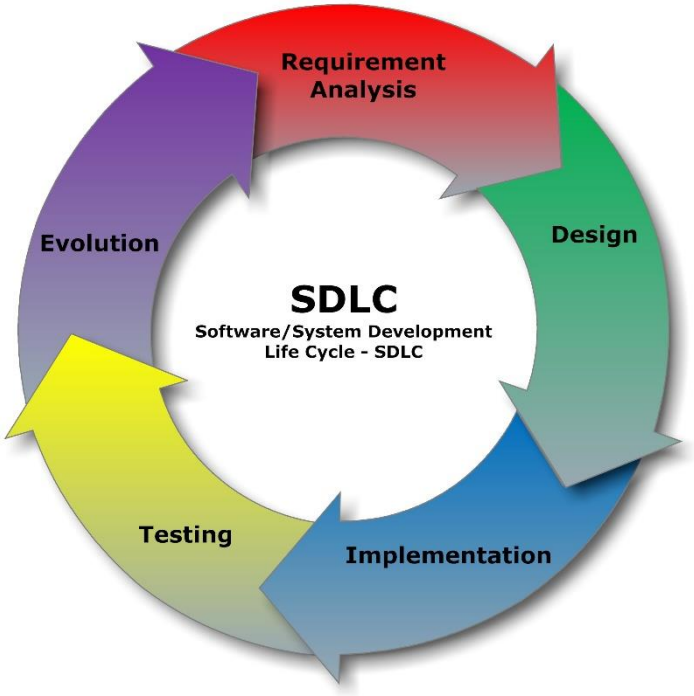
Communication is key!

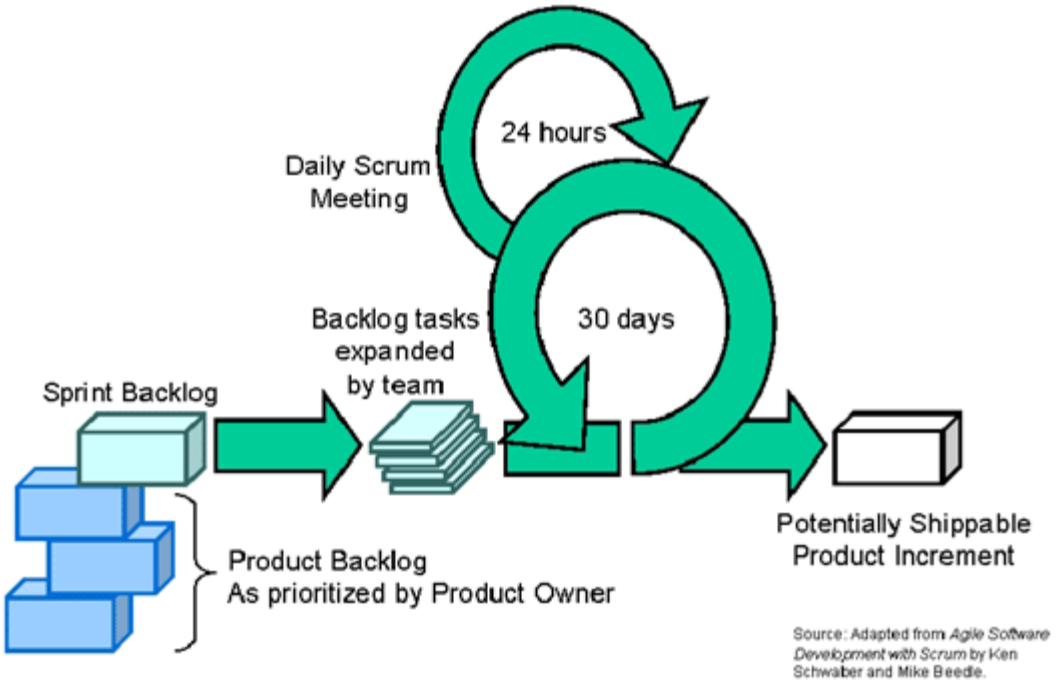


Software development process

SDLC

Scrum



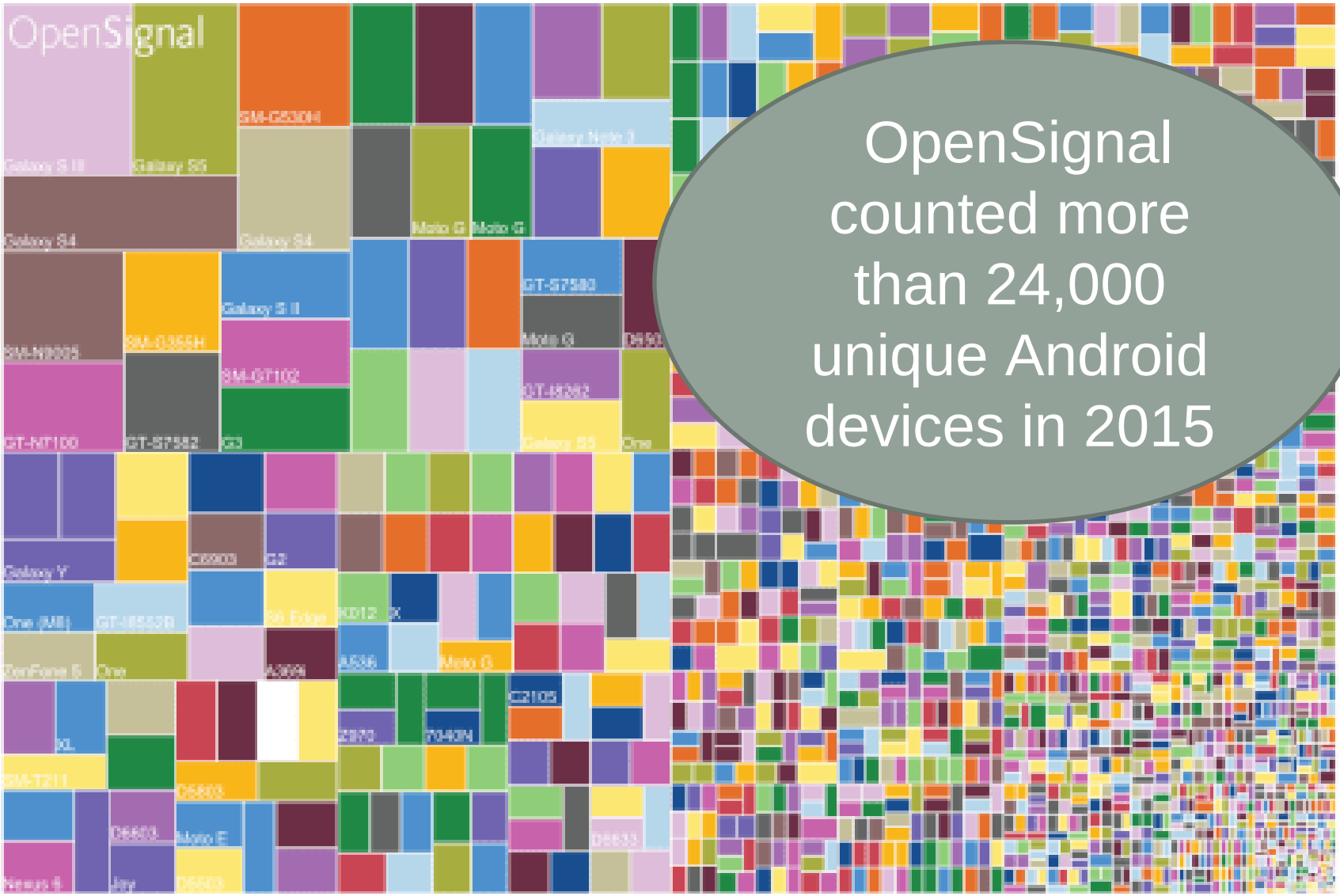


Testing & QA

Types of Mobile App Testing

By www.SoftwareTestingClass.com

Testing and QA



Testing and QA

- https://code.facebook.com/posts/485459238254631/improving-facebook-on-android/

How I teach mobile app development

Courses on Mobile App Development

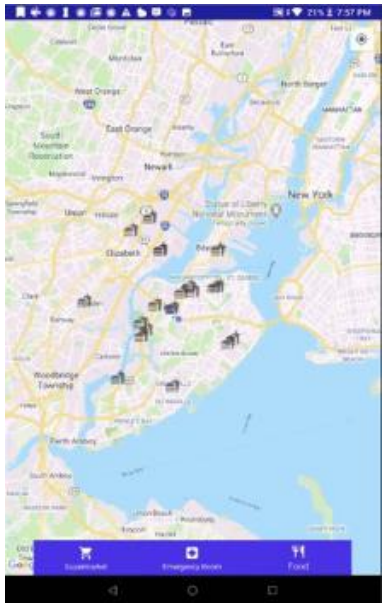
- CS 639 – Mobile App Development
- CS 641 – Mobile Web & Content
- CS 643 – Mobile Innovations for Global Challenges

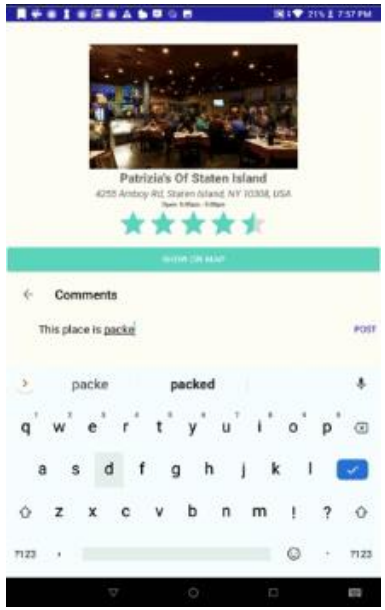
Teaching Android Development

- HackerRank to test students skills in Java
- Extensive use of GitHub
- Use of different APIs (including Firebase)
- Quiz
- Weekly Google Codelabs https://codelabs.developers.google.com and crafted assignments
- Assignments submitted to GitHub
- Peer review of the assignments
- Project submitted to GitHub
  - Description
  - Design
  - Coding
  - Testing
  - Presentation
  - Video

SocialX

- SocialX aims to take the guessing out of our new everyday life by providing users with a map displaying the concentration of people within a certain area, as well as comments from users
- GitHub https://github.com/galefoox/SocialX/wiki
- Video https://youtu.be/g0wh4sUEN8w
- Presentation http://bit.ly/3o2L3fL



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