Application Development on Mobile Platforms

Jaroslav Skrabalek

About me

1998, 2004

3 commercial mobile divisions
1st academic mobile lab in Czech

Editor (past)
- mobilmania.cz, Mobility, gsmarena.com,
- zive.cz, Computer

Project Manager & Division leader
responsible for mobile development (past)
- JavaME, iOS
- Sazka, Tipos
- iCRM, Play.cz

Mobile development division as a key part
of several companies
- Entrepreneur

Modern Mobile Platforms Group
Leader@LaSArIS

- Mobera conference chief-organizer
- Project manager (EU projects)
- Ministry of Education/ Interior
  consultant
- Lecturer (PV206, VAMP, XV004, ...)
- AI projects, Face Recognition

Masarykova univerzita se zaměří na smartphony

Chcete studovat smartphony a vývoj mobilních aplikací na vysoké škole? Brněnská Masarykova univerzita vám to umožní.

Why ?
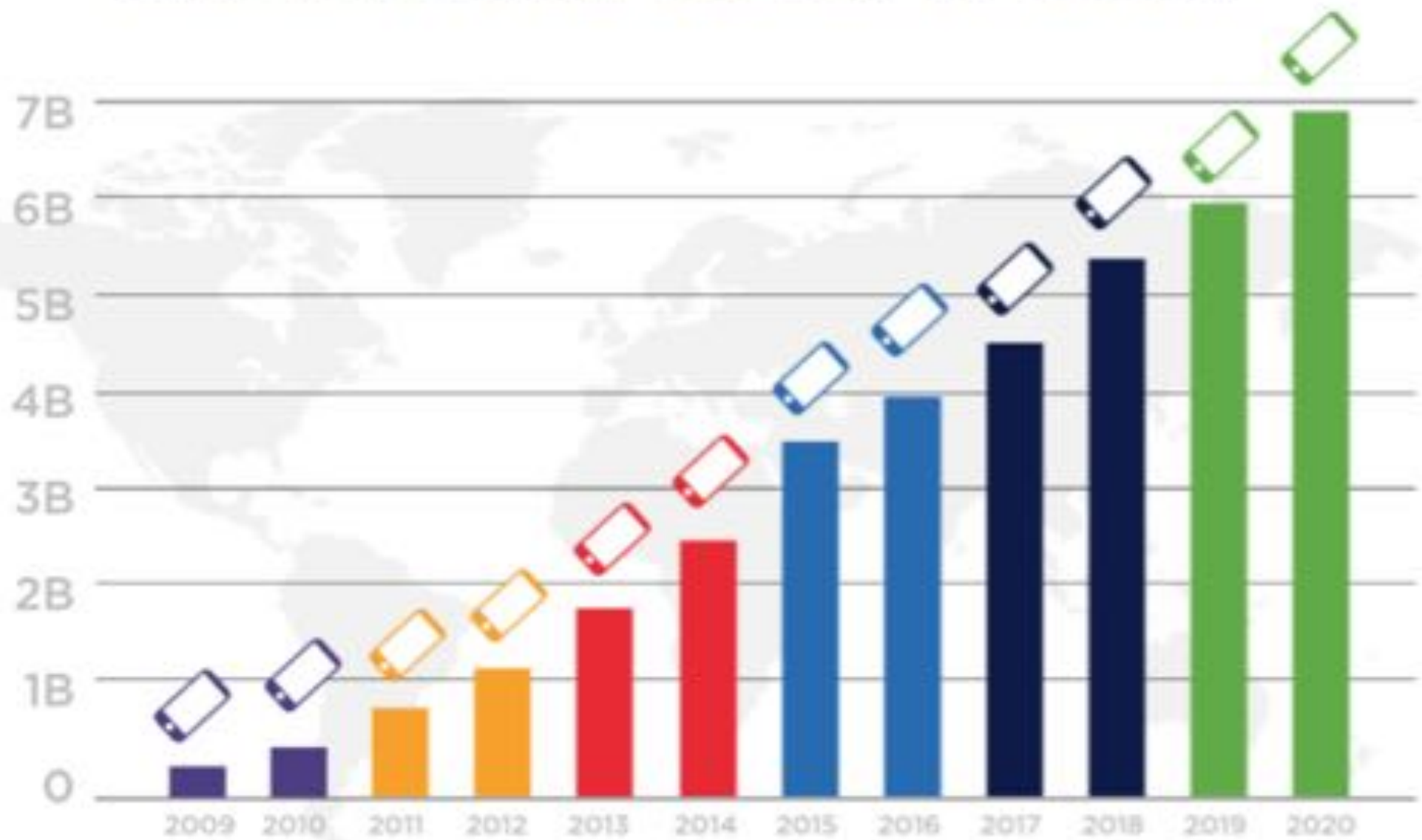
10 Billion mobile phone users in 2014
- Earth population seven billion people

high speed data coverage

More mobile connection than desktop connection to Internet in 2011

International Telecommunication Union

SMARTPHONE USERS: UP 800M

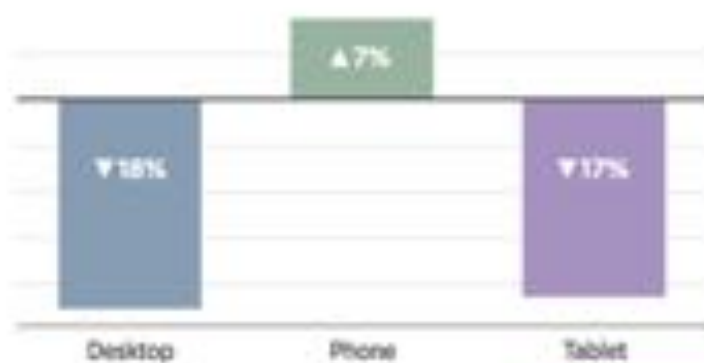| Year	Users
2009	~0.25B
2010	~0.5B
2011	~0.8B
2012	~1.1B
2013	~1.8B
2014	~2.5B
2015	~3.5B
2016	~4B
2017	~4.6B
2018	~5.5B
2019	~6B
2020	~7B

TUNE

PornHub case study

2019 Year in Review — Porn hub

Traffic by Phone, Desktop & Tablet

- 16.3% — Desktop
- 76.6% — Phone
- 7.1% — Tablet

Change in Traffic Share from 2018 to 2019

- Desktop ▼18%
- Phone ▲7%
- Tablet ▼17%

Mobile

- Apple iOS 52.8%
- Android 46.6%
- Other 0.5%

Change in Traffic Share from 2018 to 2019

- Android ▼14%
- Apple iOS ▲19%
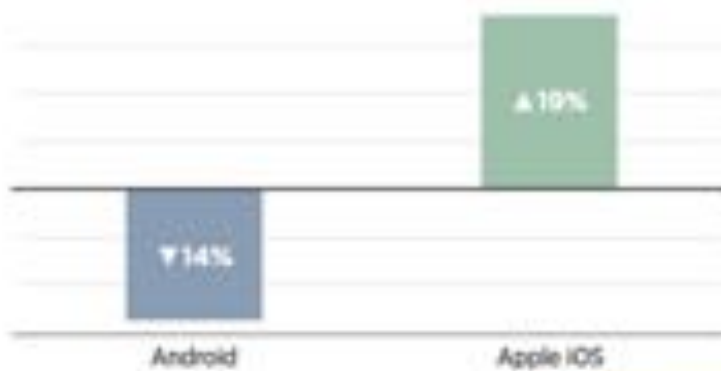
PORNHUB.COM/INSIGHTS

Why ?

Change of computers' usage

- Everywhere

- Everyone

- Simply

Why ?

Old way

New way

In her 100th year,
Virginia buys her first
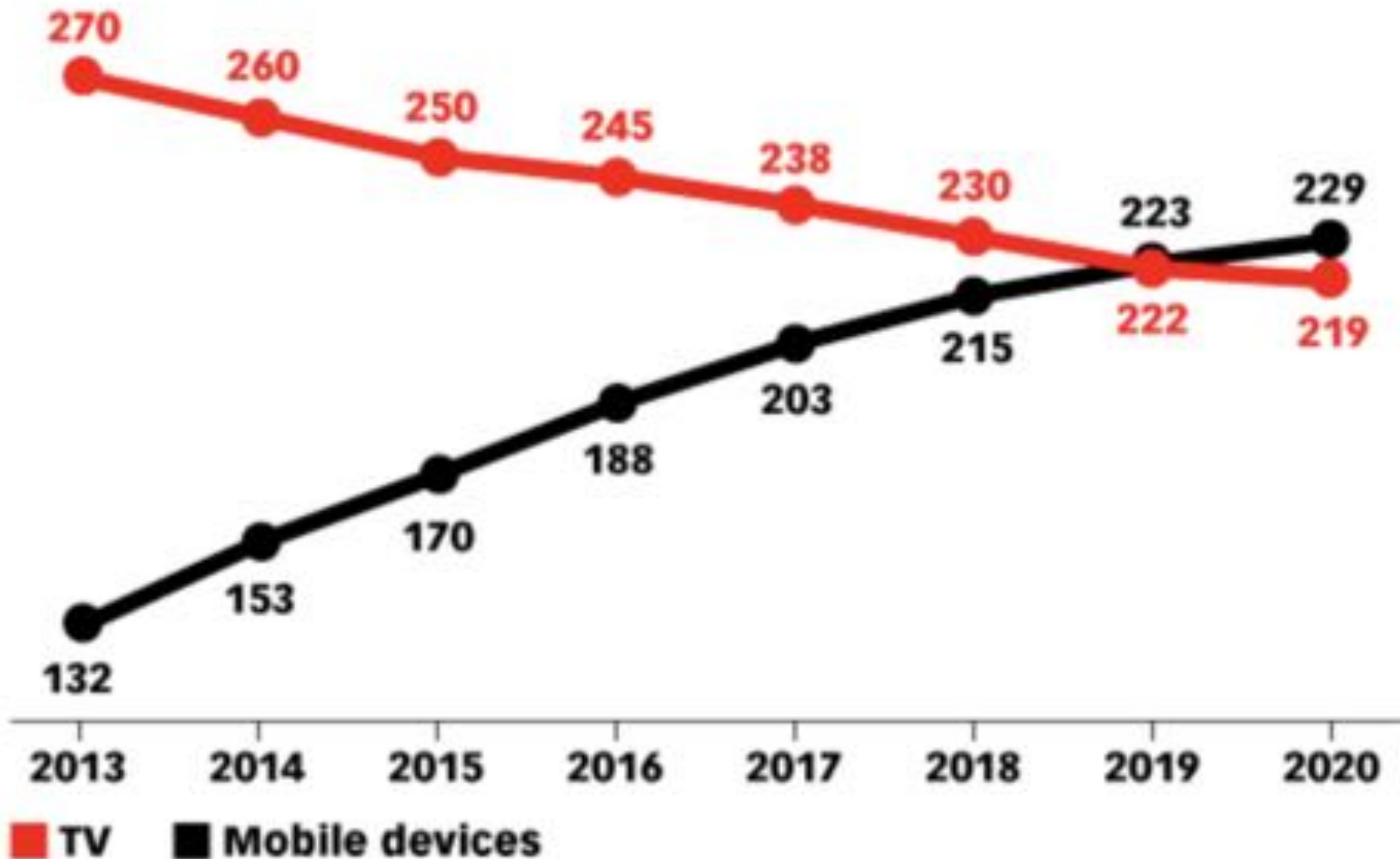computer -- an iPad

Why ?

„Within five years, 70 % of collaboration and communications applications designed on PCs will be modeled after user experience lessons from smartphone collaboration applications."

Gartner, also PWC, 2010

Average Time Spent per Day with TV and Mobile Devices by US Adults, 2013-2020

minutes

Year	TV	Mobile devices
2013	270	132
2014	260	153
2015	250	170
2016	245	188
2017	238	203
2018	230	215
2019	222	223
2020	219	229

■ TV   ■ Mobile devices

Figure 1. Gartner's Hype Cycle

Biochips

AI PaaS

Edge Analytics

5G

Autonomous Driving Level 5

Low-Earth-Orbit Satellite Systems

Edge AI

Graph Analytics

Explainable AI

Personification

Knowledge Graphs

Next-Generation Memory

Synthetic Data

3D Sensing Cameras

Light Cargo Delivery Drones

Transfer Learning

Emotion AI

Flying Autonomous Vehicles

Augmented Intelligence

Autonomous Driving Level 4

Nanoscale 3D Printing

Decentralized Autonomous Organization

DigitalOps

Generative Adversarial Networks

Adaptive ML

Decentralized Web

AR Cloud

Immersive Workspaces

Biotech - Cultured or Artificial Tissue

Innovation Trigger

Peak of Inflated Expectations

Trough of Disillusionment

Slope of Enlightenment

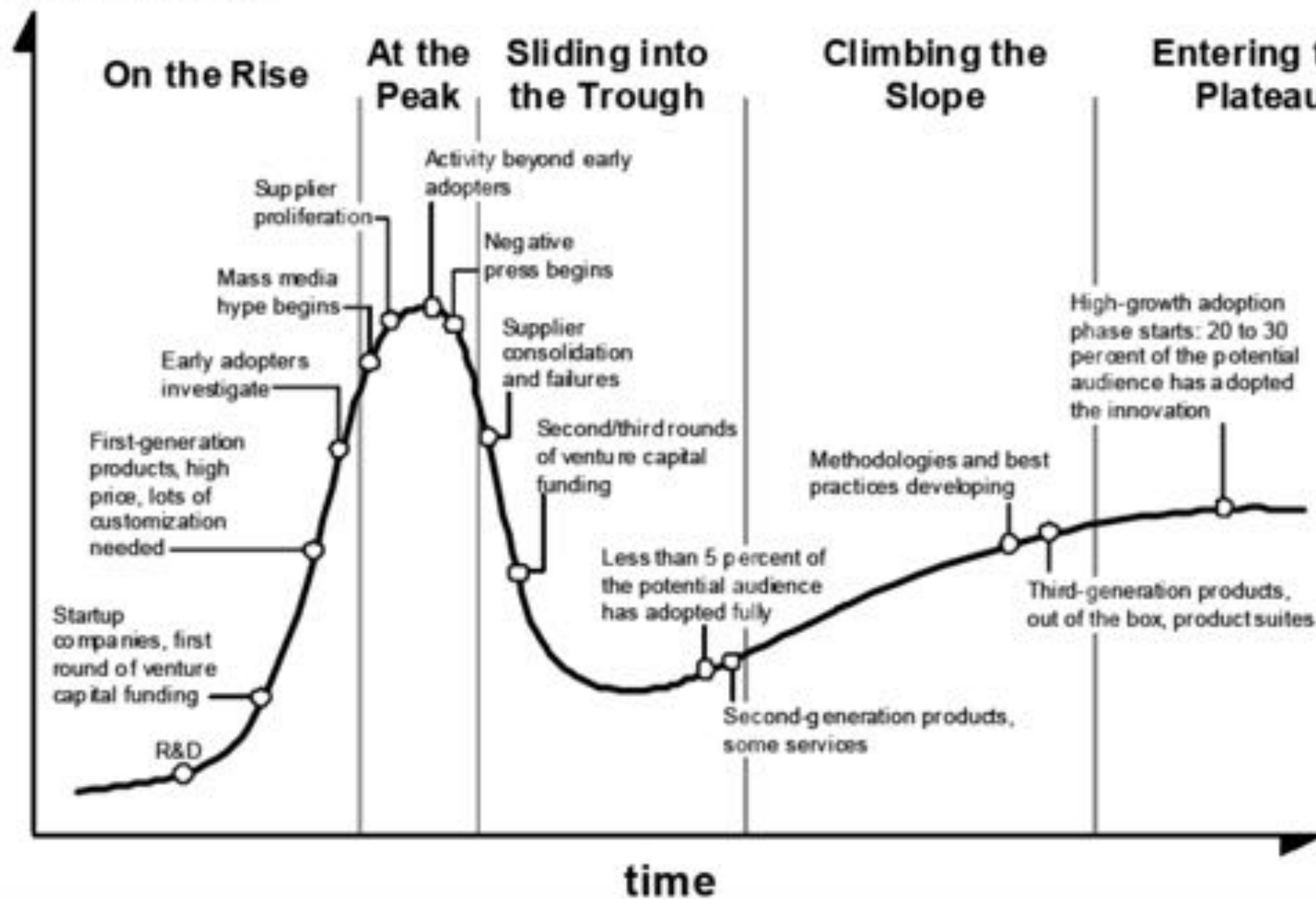**Plateau of Productivity**

Time

Plateau will be reached:

○ less than 2 years   ● 2 to 5 years   ● 5 to 10 years   ○ more than 10 years   ● obsolete before plateau   As of August

Figure 1. Gartner's Hype Cycle

Why

expectations

On the Rise | **At the Peak** | **Sliding into the Trough** | **Climbing the Slope** | **Entering the Plateau**

Supplier proliferation

Activity beyond early adopters

Negative press begins

Mass media hype begins

Early adopters investigate

Supplier consolidation and failures

Second/third rounds of venture capital funding

High-growth adoption phase starts: 20 to 30 percent of the potential audience has adopted the innovation

First-generation products, high price, lots of customization needed

Methodologies and best practices developing

Less than 5 percent of the potential audience has adopted fully

Startup companies, first round of venture capital funding

Third-generation products, out of the box, product suites

Second-generation products, some services

R&D

time

Why ?

NFC
- Mobile payments instead of cards
- Localization (profiles, alarm, night mode, automode)

Augmented reality
- navigation
- health
- handicapped

Sources of energy
- New technologies (fuel cells)
- Alternative energy sources (solar energy)
- "eternal" endurance

Why ?

Third Dimension
- 3D Displays
- 3D cameras
- 3D multitouch

Materials
- Liquid metals
- biochips

Performance
- parallelism - the X-core CPUs and frequency of gigahertz
- miniaturization

History

Modern is essential

R.I.P.
- EPOC
- Windows Mobile <6.5
- Palm OS
- Symbian
- BB10

- Meego
- WebOS

Milestones

EPOC -> Symbian
- Nokia 7650 (2002)

Touch (2007)
- Apple iPhone
- Simplicity (!)

AppStore (2008)

Siri (2011)

Watch (2014-2015)

Approaches

Full IBM/PC in your pocket

vs.

Simple mobile oriented solution

Quick Tour   Calc   Calendar

Card Info   CMDBar   Contacts

Dialer   Documents   Expense

abc   123

Approaches

Connectivity, Media, Content

Rich yet Simple Functionality
  • Hundreds of functions
    vs. tens but well-controllable
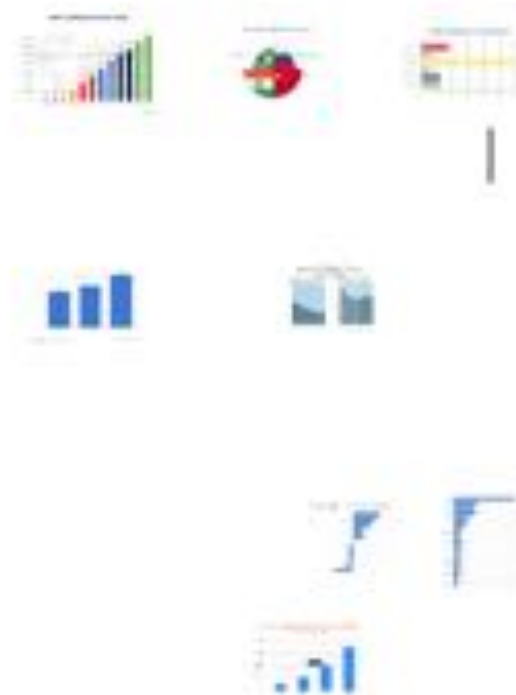
Touch

Cross-field area

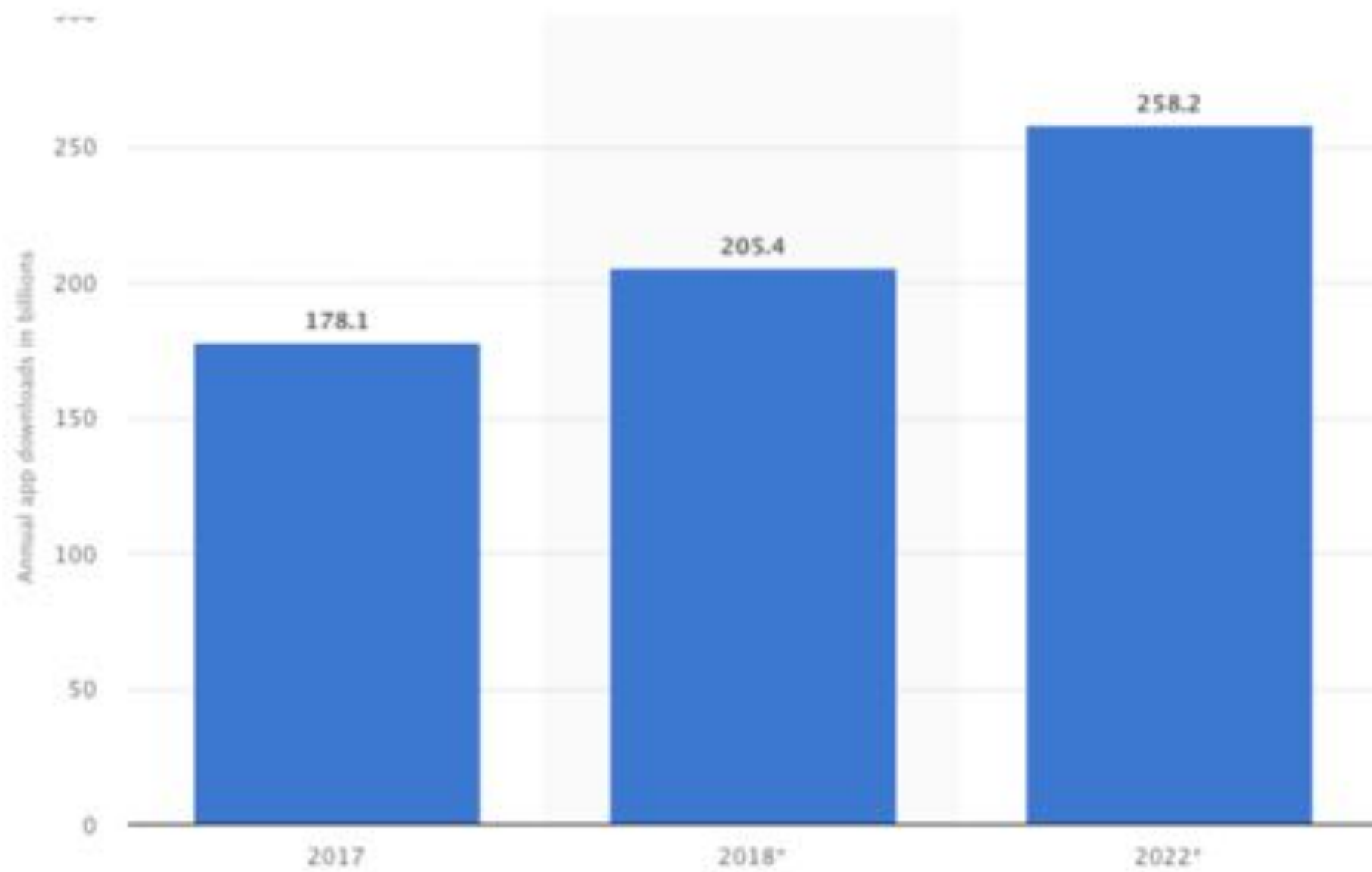# Why ?

Business is there — up to $205bn revenue in 2020

Apple AppStore (7/2019)
- 2,2M+ apps
- Revenue $50 000+ not unusual
- 75 % revenue
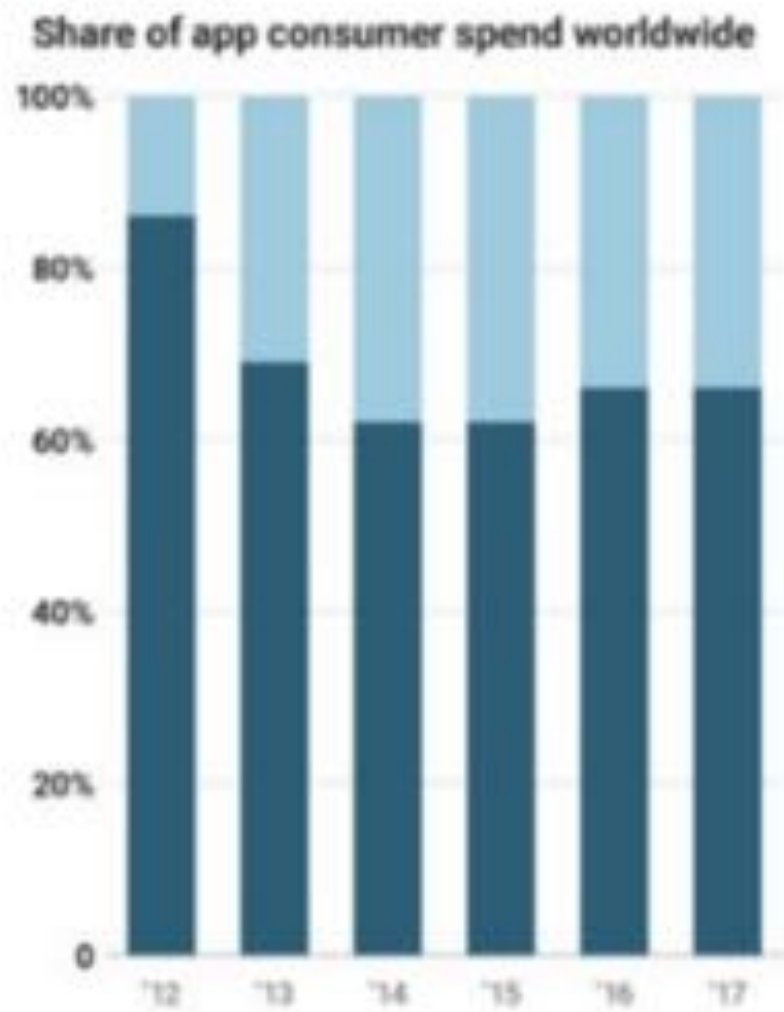
Google Android Market (12/2019)
- 2,9M+ apps, ~3500-4000 apps/day
- Revenue ~ poor, insecure

Apple users more willing to pay for apps

■ Apple app store   ■ Google play

Share of app downloads worldwide

Share of app consumer spend worldwide

Year-on-year growth in time spent per mobile app cat

Category	Growth
Shopping	54%
Music, media and entertainment	43%
Business and finance	33%
Utilities and productivity	20%
News and magazines	20%
Overall average growth	6%
Personalization	-8%
Photography	-8%
Sports	-8%
Games	-16%
Lifestyle	-40%

Year-on-year usage growth

Category	Percentage
Games	24.86%
Business	9.77%
Education	8.5%
Lifestyle	8.32%
Entertainment	6.03%
Utilities	5.06%
Travel	3.9%
Health & Fitness	3.01%
Book	2.92%
Food & Drink	2.89%
Productivity	2.66%
Music	2.48%
Finance	2.27%
Photo & Video	2.2%
Reference	2.17%
Sports	2.17%
Social Networking	2.11%
News	1.94%
Medical	1.83%

Worldwide Consumer Spend in Entertainment Apps iOS & Google Play
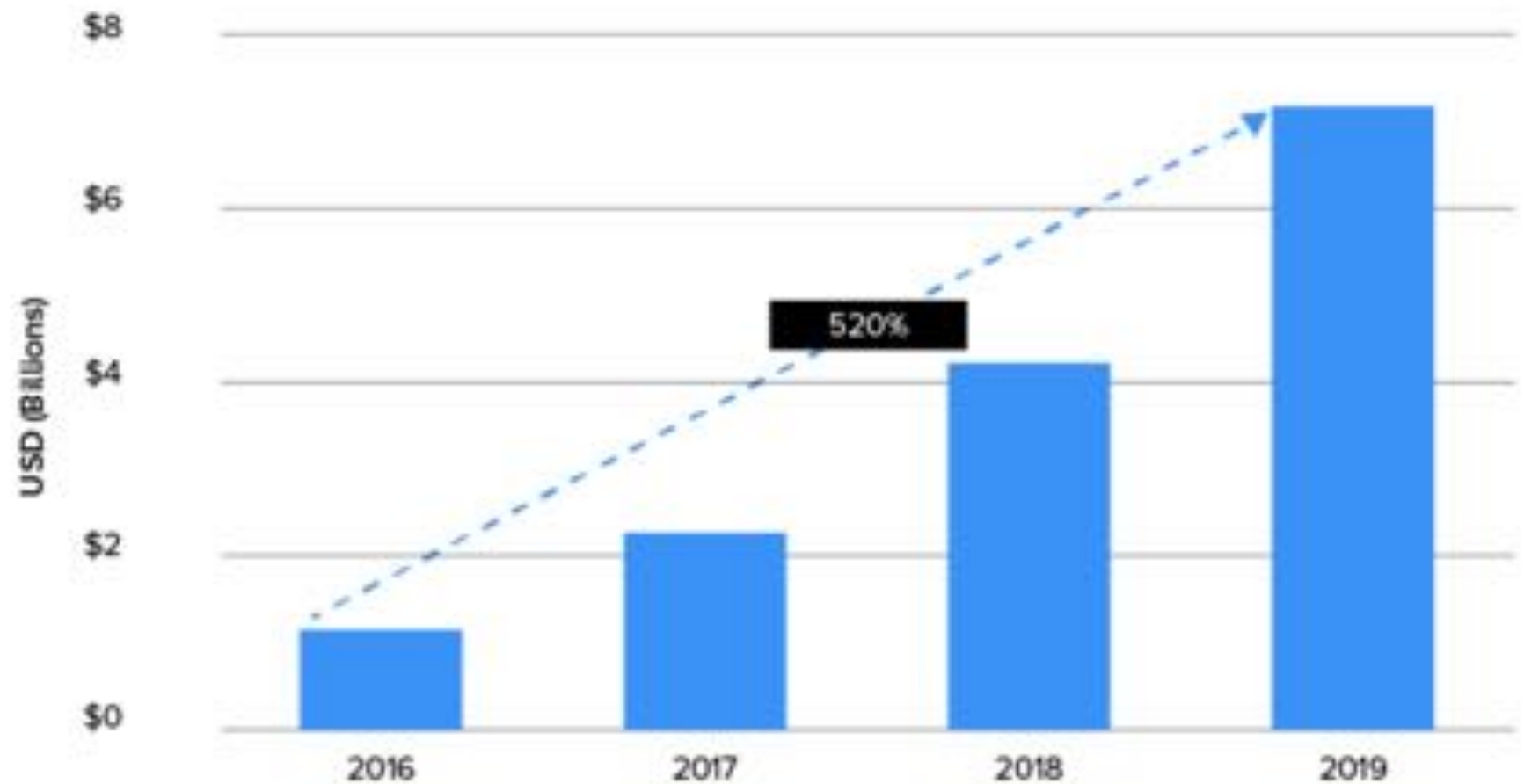
Bar chart showing USD (Billions) on the y-axis ($0, $2, $4, $6, $8) across the years 2016, 2017, 2018, 2019. A dashed arrow indicates 520% growth.

Why ?

Business is there — up to $205bn revenue in 2020

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- 2,2M+ apps
- Revenue $50 000+ not unusual
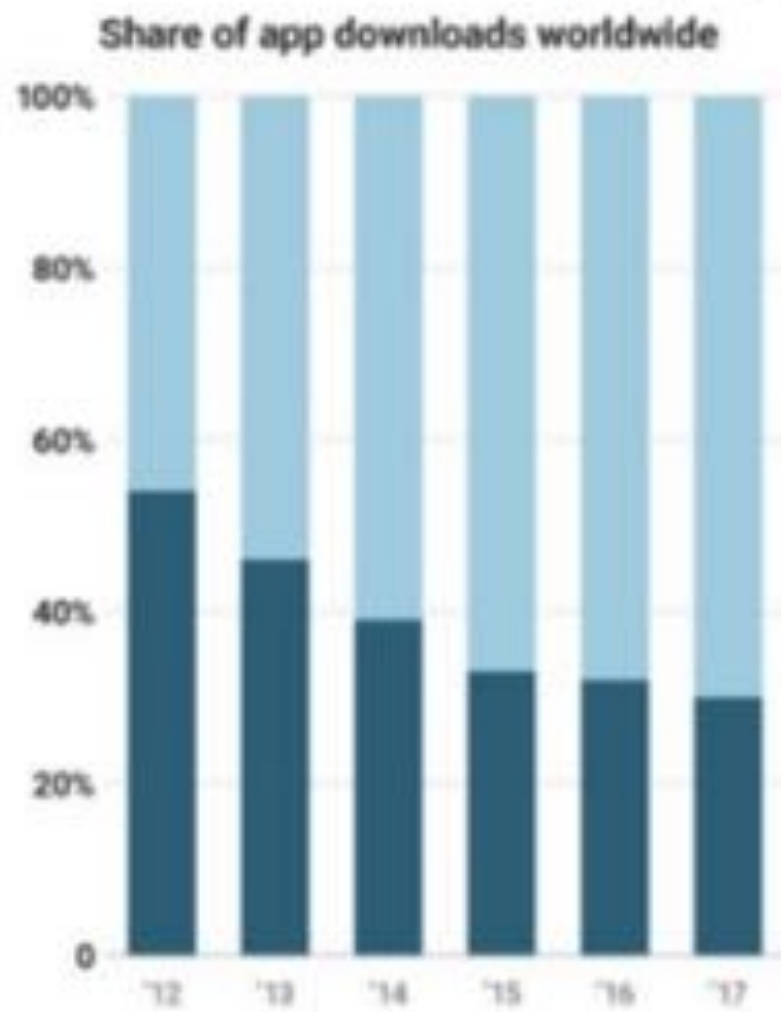- 75 % revenue

Google Android Market (12/2019)
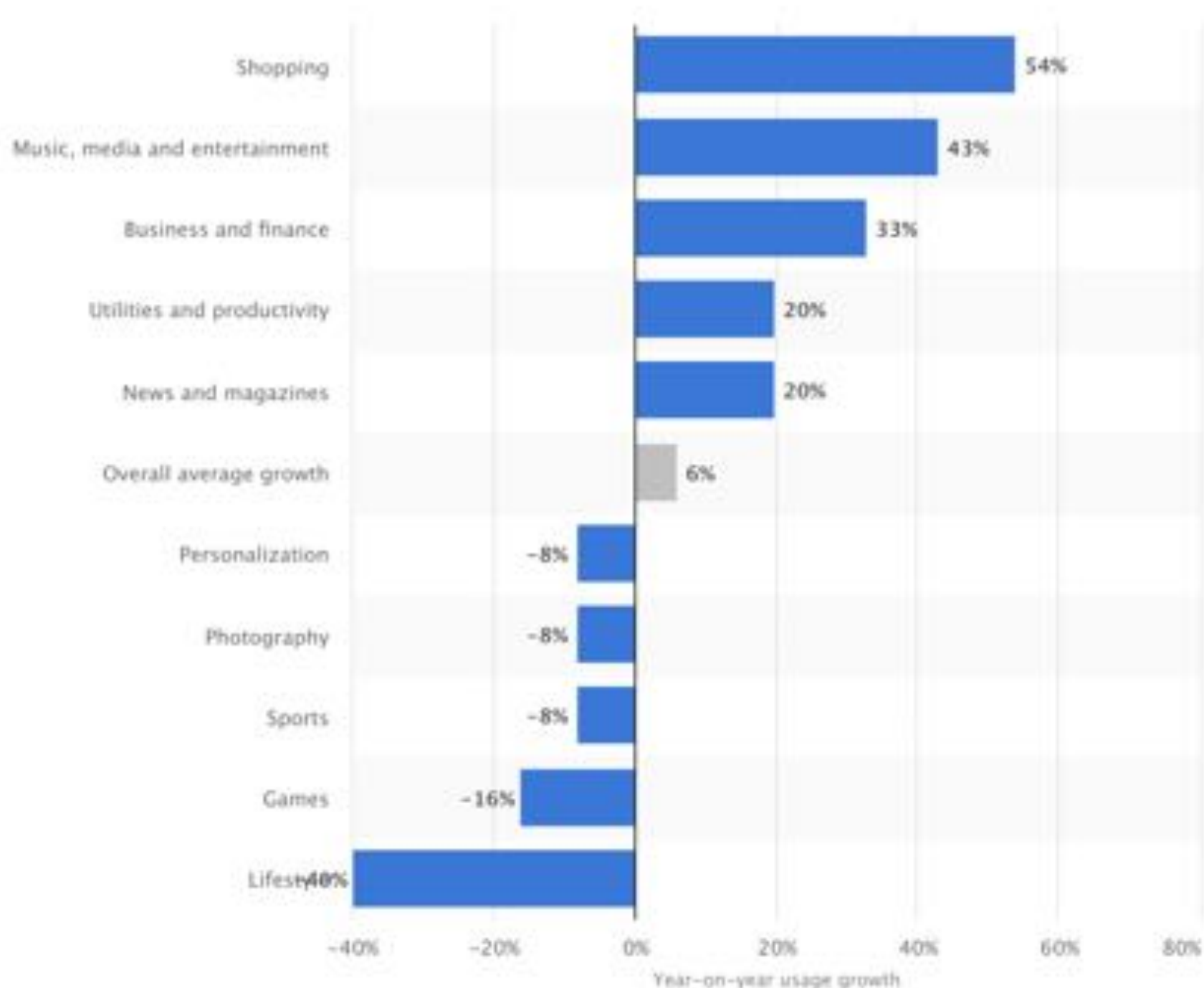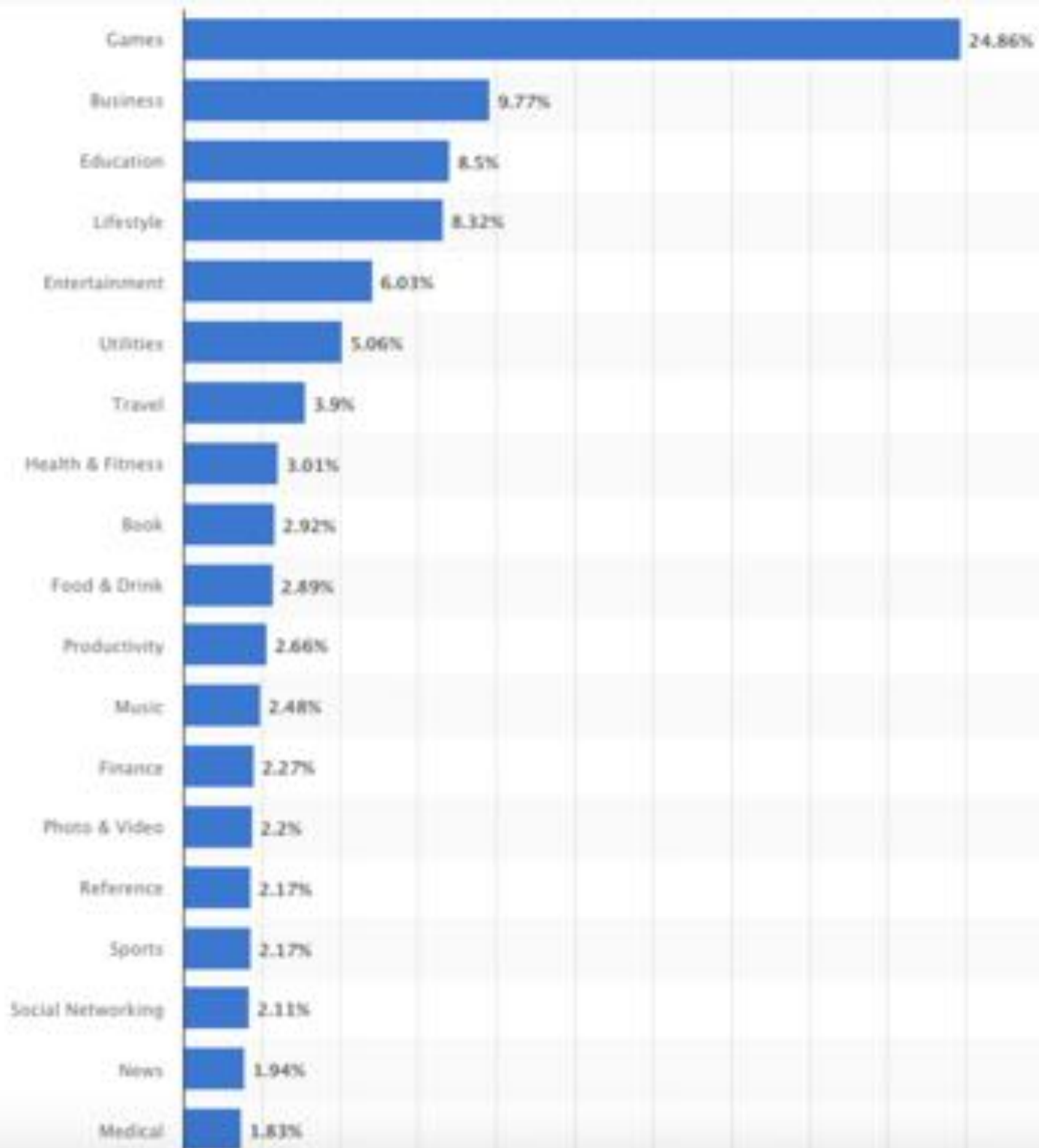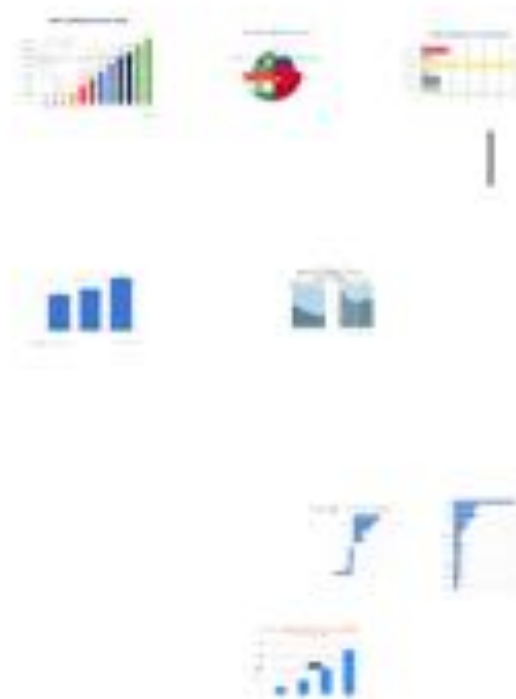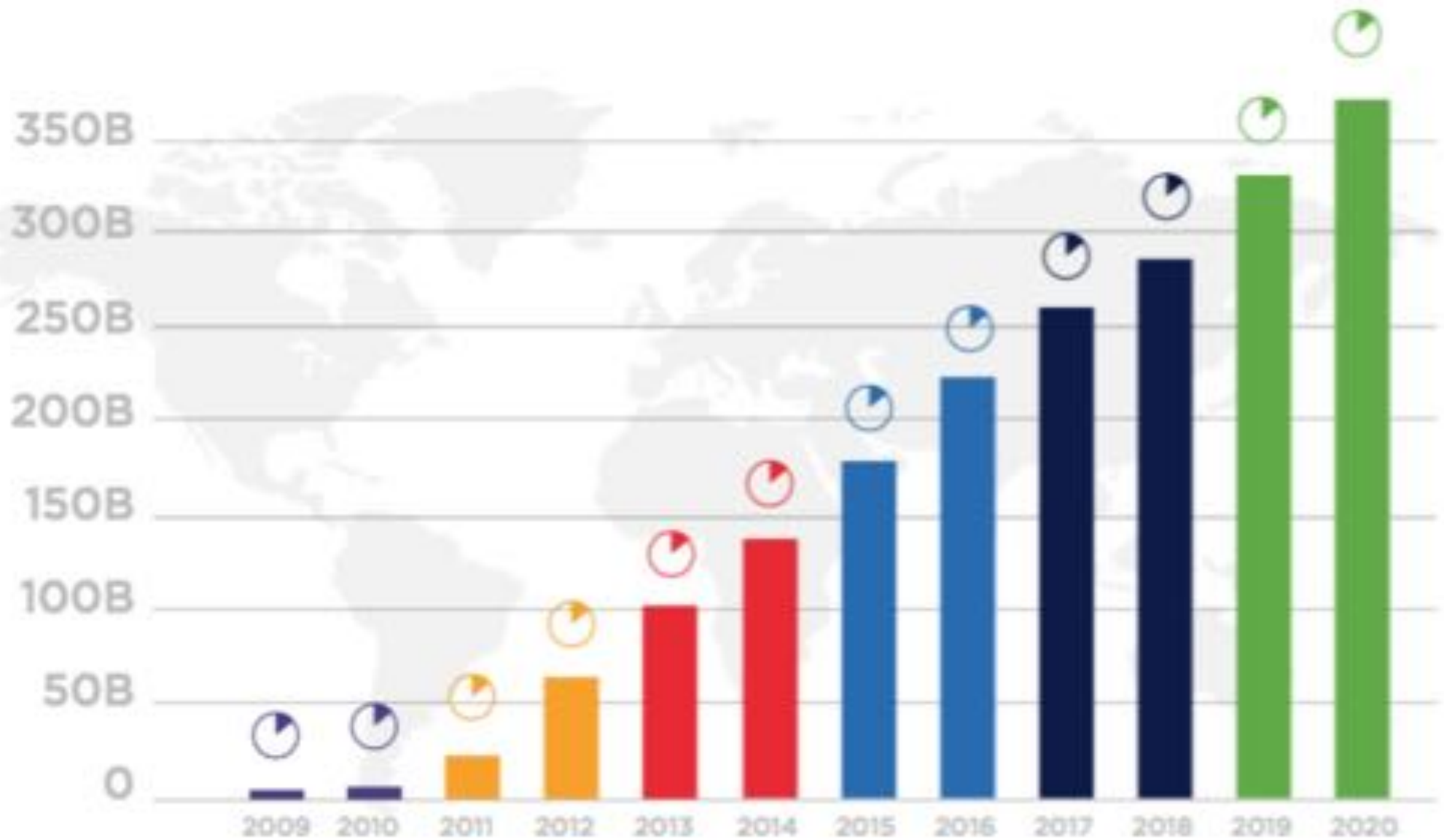- 2,9M+ apps, ~3500-4000 apps/day
- Revenue ~ poor, insecure

APP DOWNLOADS: 180B
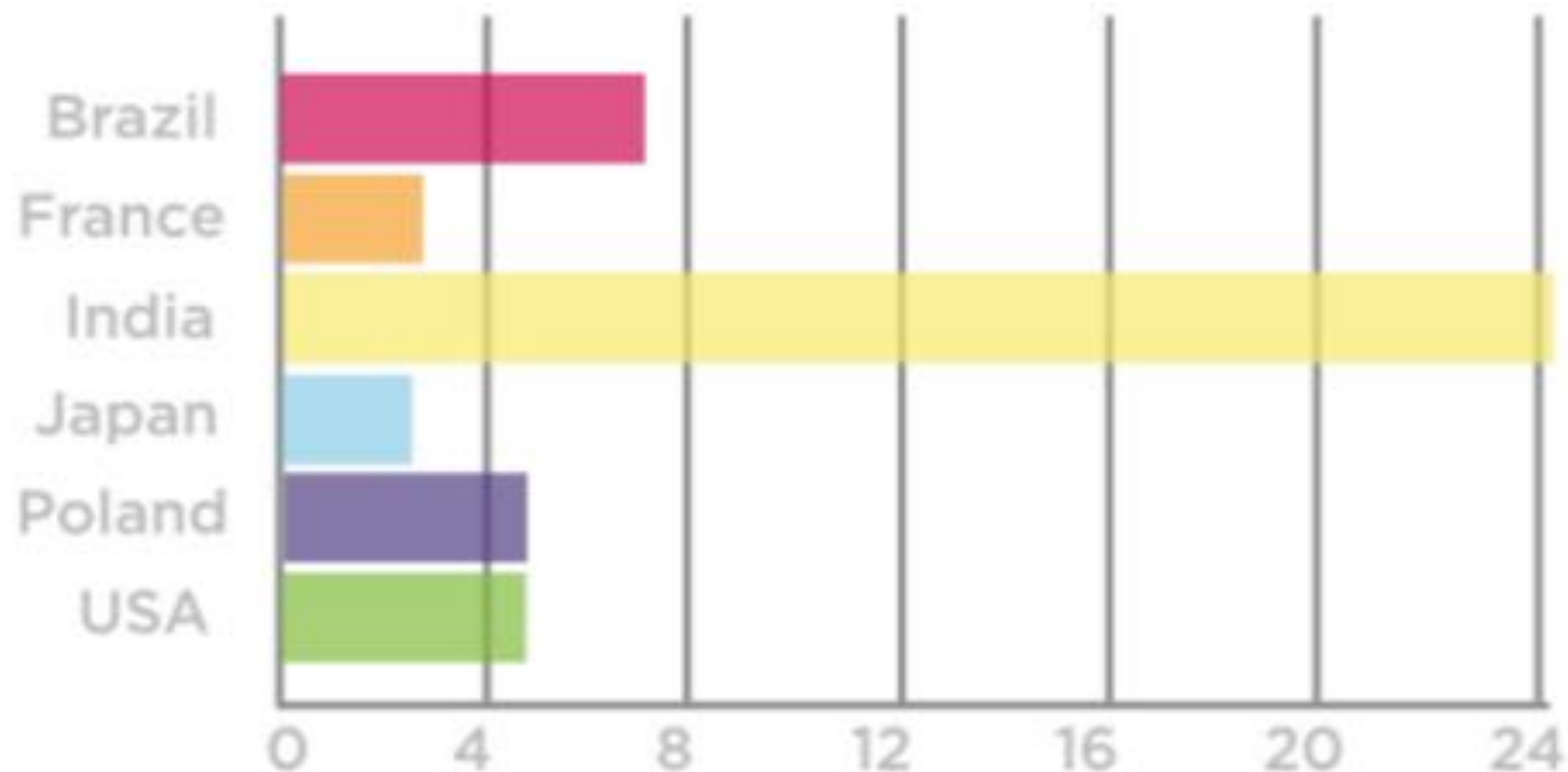

| | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |

350B
300B
250B
200B
150B
100B
50B
0

BIG BRIC: DOUBLED IN 2015

BRAZIL

RUSSIAN FEDERATION

INDIA

CHINA
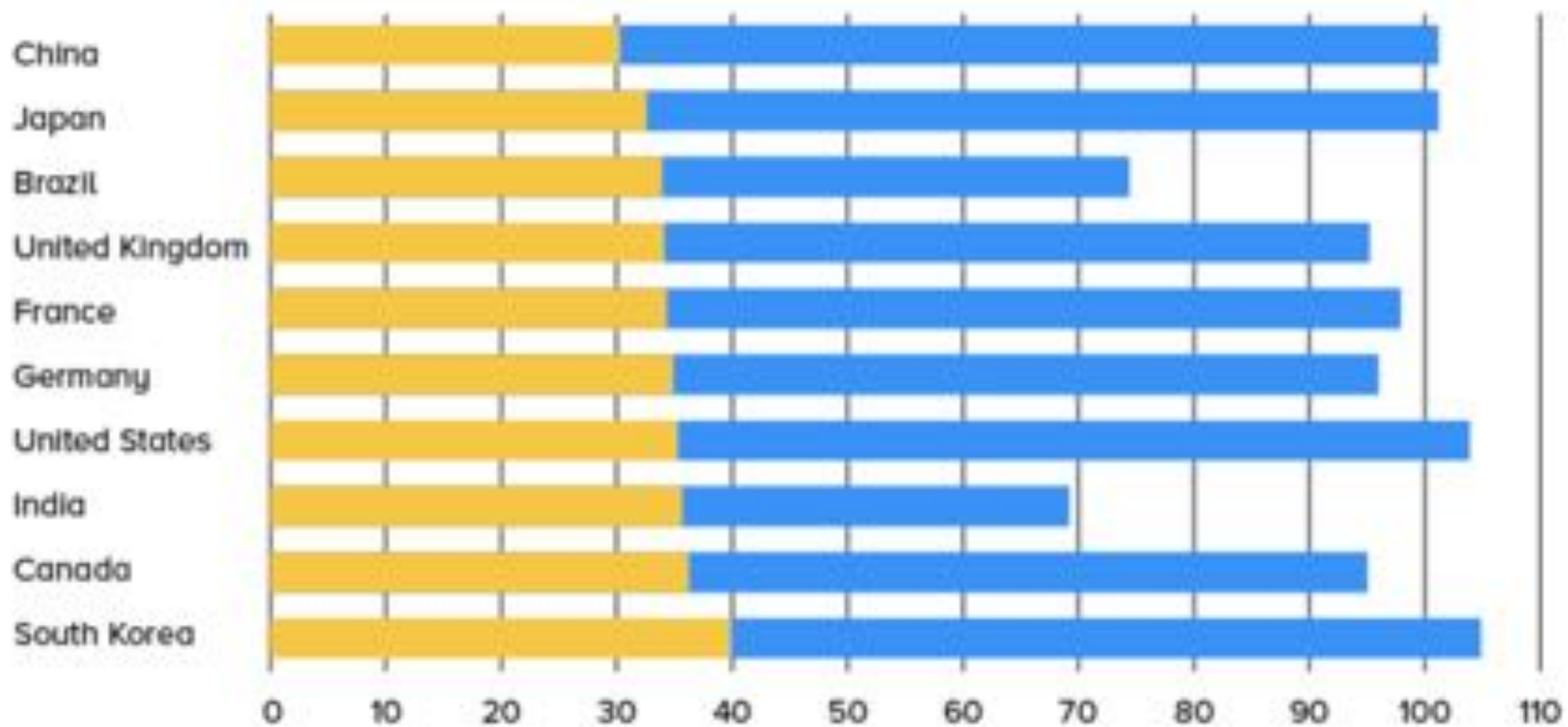
TUNE

India: leading in m-commerce

Monthly Average Number of Apps Used and Installed Smartphone Users, Q1 2018

Country	
China	
Japan	
Brazil	
United Kingdom	
France	
Germany	
United States	
India	
Canada	
South Korea	

0 10 20 30 40 50 60 70 80 90 100 110

ONE TIME USE

PERCENTAGE OF APPS ONLY USED ONCE (BY APP CATEGORY)

23% Sports

22% Games

21% Photography

11% Social Networking

20% of all mobile apps downloaded once are never used again

POPULAR APP CATEGORIES

1. GAMES
2. EDUCATION
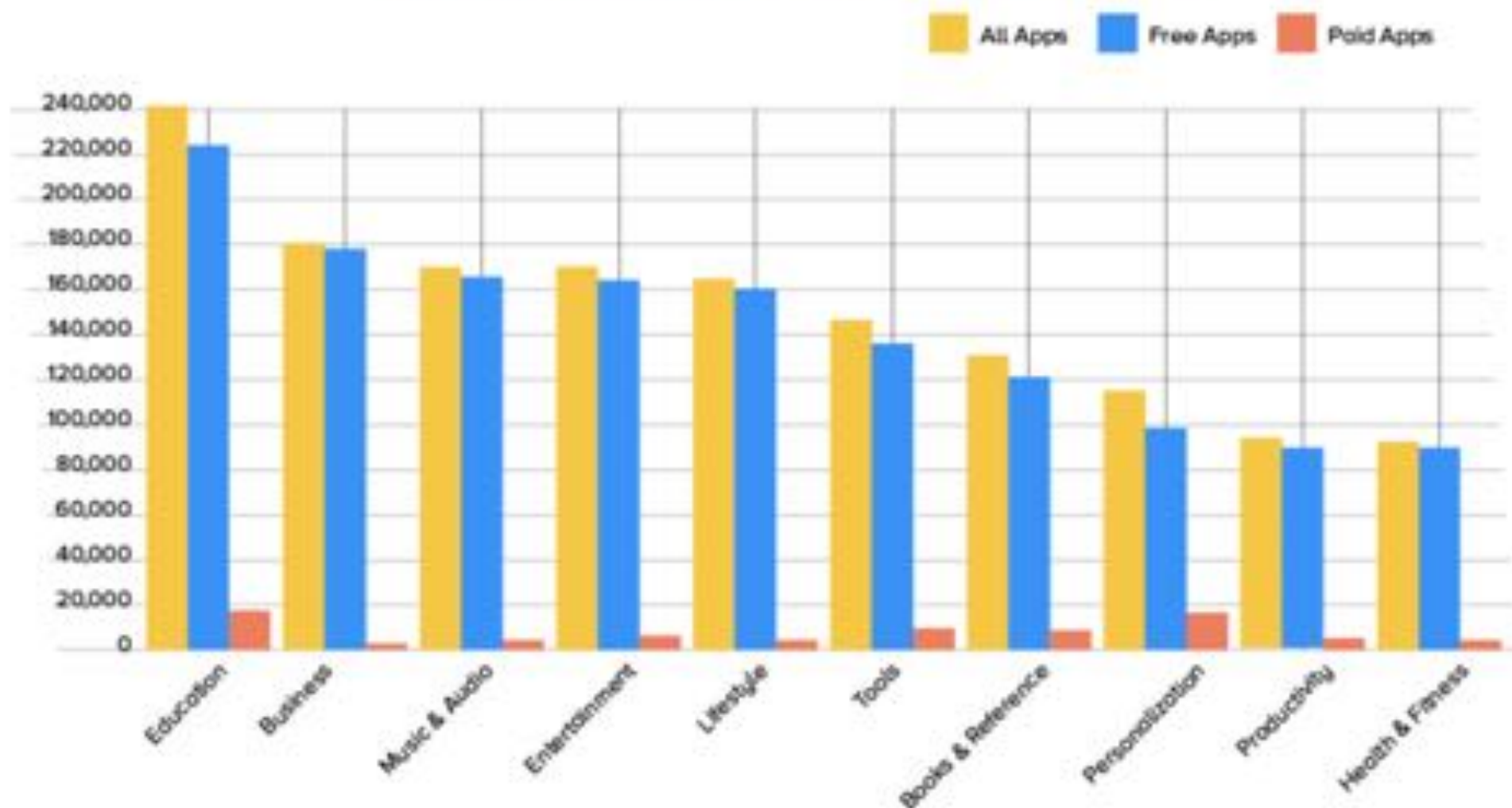3. BUSINESS
4. LIFESTYLE
5. ENTER-TAINMENT
6. UTILITIES
7. BOOKS
8. TRAVEL
9. MUSIC
10. SPORTS

Top 10 Google Play Categories

Legend: All Apps, Free Apps, Paid Apps

Categories (left to right): Education, Business, Music & Audio, Entertainment, Lifestyle, Tools, Books & Reference, Personalization, Productivity, Health & Fitness

Y-axis: 0 to 240,000 (in increments of 20,000)

THE APPSTORE IS STUFFED
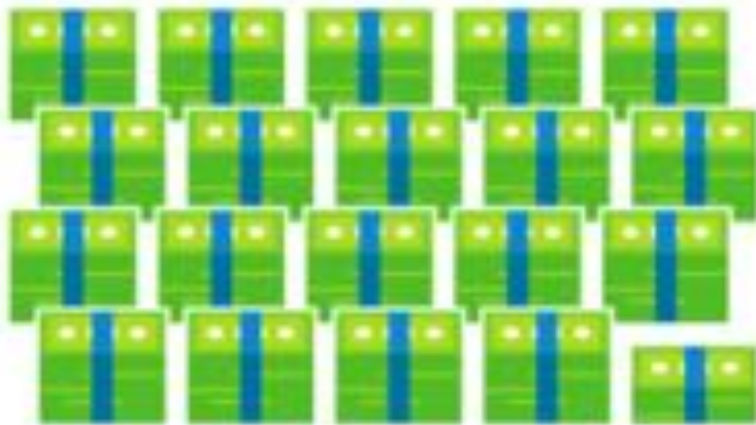
5,257 iPhone Apps for Workout

5,200 Android Apps for Workout

THE CONSEQUENCE: ONLY A FEW DEVELOPERS EARN WELL

While Clash of Clans makes

$1,221,606 /DAY

THE AVERAGE APP MAKES:

$625
$2,222 /developer

$1,125
$6,000 /developer

$4,000
$21,276 /developer

- 21% of Millennials open an app 50+ times per day.
- 49% of people open an app 11+ times each day.
- 57% of all digital media usage comes from mobile apps.
- The average smartphone owner uses 30 apps each month.

App Users Spend 77% of Their Time on Their Top 3 Apps

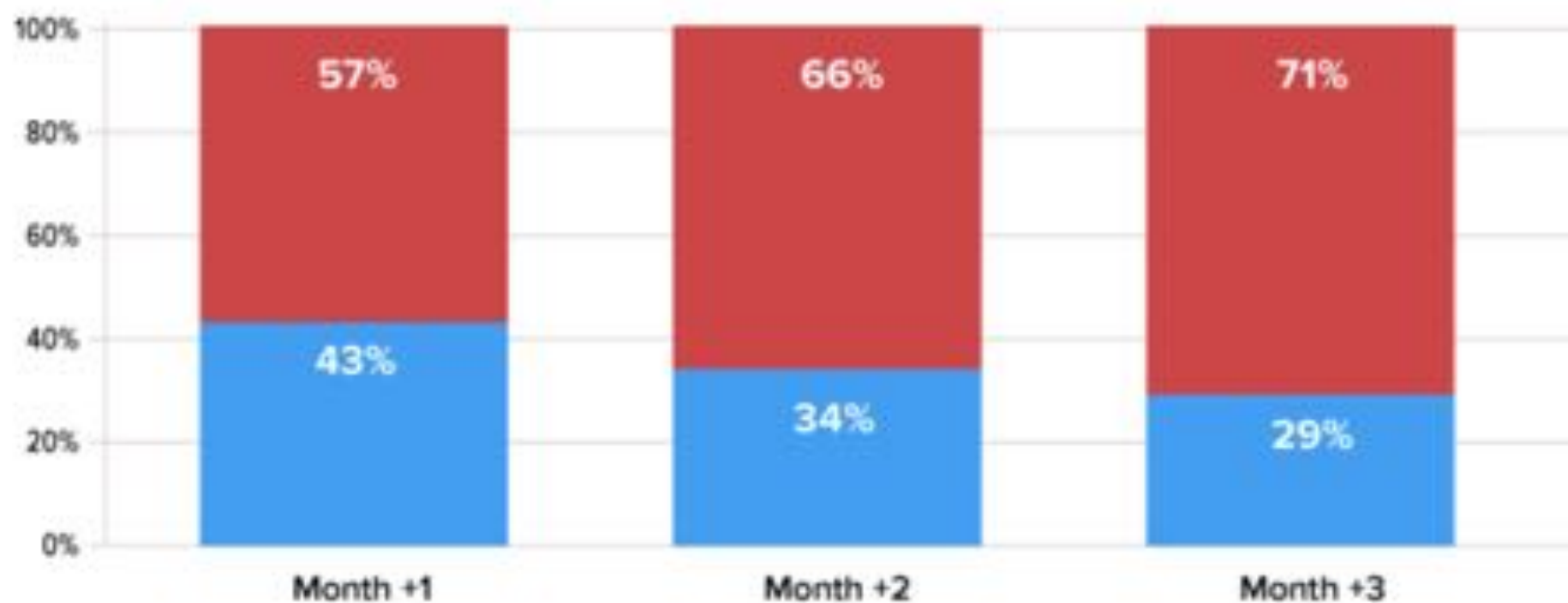Percentage of individuals' app usage spent on each user's personal top 10 apps

49%
18%
10%
6%
4%
3%
2%
2%
1%
1%
4%

96%
of time
is spent on
top 10 apps

Average # of apps
used per month
25

1 2 3 4 5 6 7 8 9 10 11+

Individuals' top ranked apps by usage

NATIVE MOBILE APPS

25% ARE ABANDONED AFTER FIRST TIME USE

-77% AVG. DAILY ACTIVE USER LOSS IN 1ST 3 DAYS OF INSTALL

Cost Per Loyal User Index
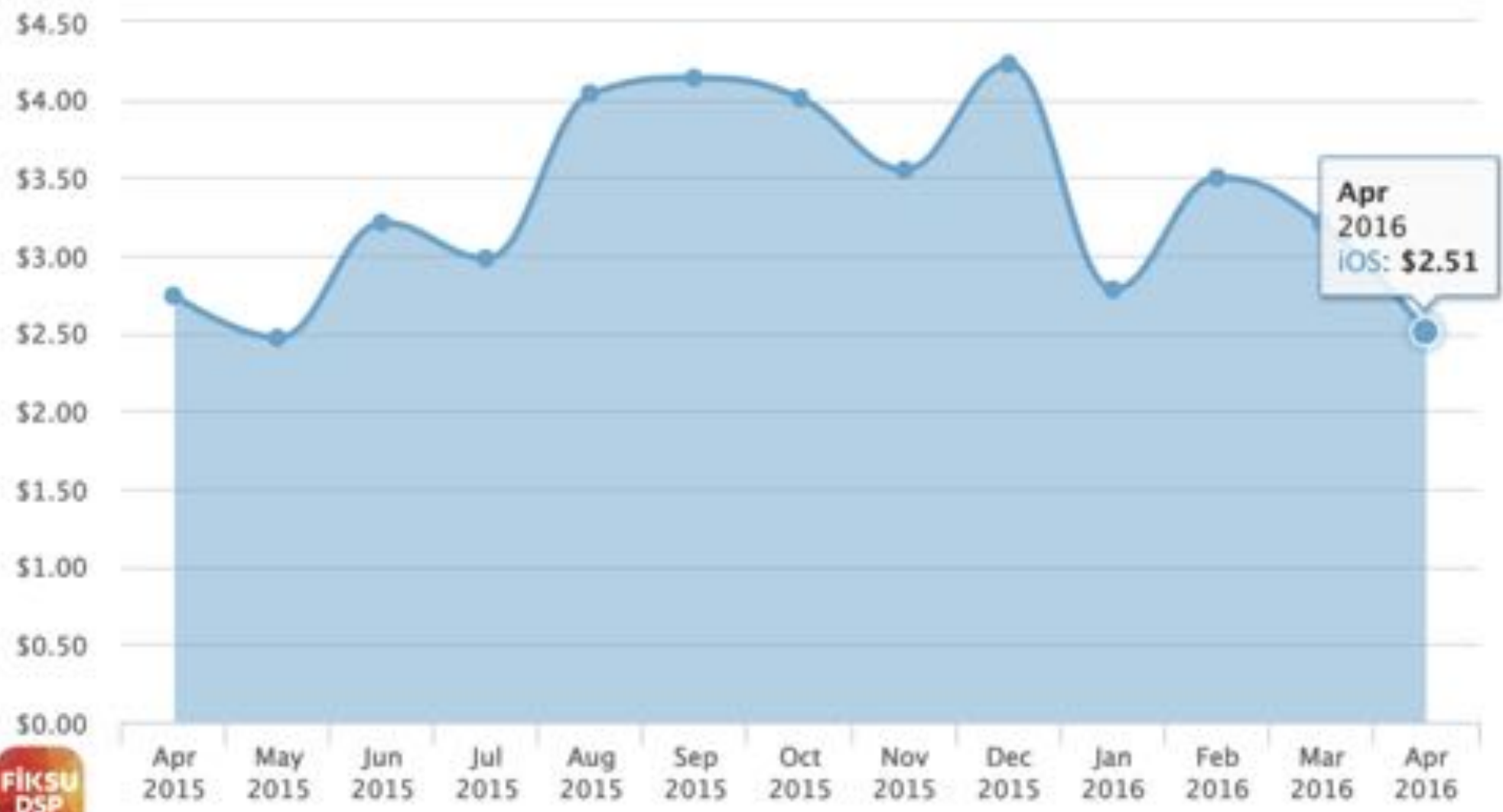
Legend: iOS

Y-axis values: $4.50, $4.00, $3.50, $3.00, $2.50, $2.00, $1.50, $1.00, $0.50, $0.00

X-axis values: Apr 2015, May 2015, Jun 2015, Jul 2015, Aug 2015, Sep 2015, Oct 2015, Nov 2015, Dec 2015, Jan 2016, Feb 2016, Mar 2016, Apr 2016

Apr 2016 iOS: $2.51

FIKSU DSP

User first

usability

marketing

user experience

customer service

sales

Any idea, but...

Problem ➡ Solution

Three kinds
- Must-to-have
- Nice-to-have
- ehm, next one

Feasible

HOW TO GO FROM APP IDEA TO APP STORE

1 IT ALL STARTS WITH AN IDEA

Ensure your idea

1. Is unique

2. Solves a problem or provides entertainment

3. Has been evaluated by an expert for areas of improvement and technical limitations

Most frequently used apps:

On average, developers make:

$1125 revenue/app
in the Google Play Store

$4000 revenue/app
in the Apple App Store

Ways to monetize your app include:

Ways to monetize your app include:

$0.99

1. Charge a one-time fee to download your app

2. One-time fee + in-app purchase (i.e. for extra features)

3. Offer a free version + a paid version (which has extra features)

ADVERTISE 4. Include advertising

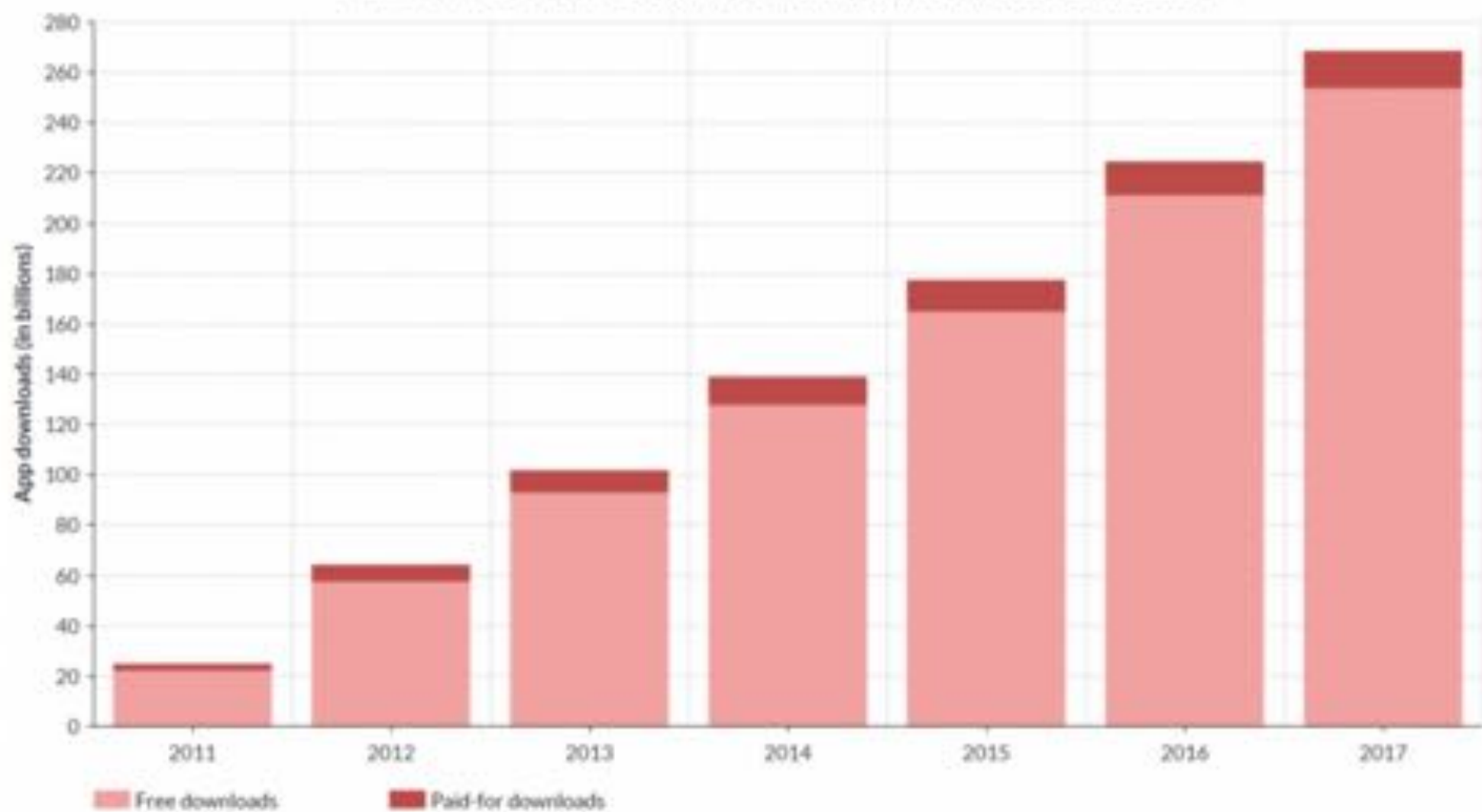**SUBSCRIBE** 5. Charge subscription fee

6. Free for a limited time, then charge a fee

However, **80%** of app developers are not generating enough revenue to support a stand alone business.

Number of free and paid mobile app store downloads worldwide from 2011 to 2017 (in billions)

Free downloads
Paid-for downloads

3 DEVELOP A MARKETING PLAN

This starts early! Why?
2/3 of all apps have never been downloaded

Build Buzz Through:

Social Media

Featured in news stories

WWW...
App Website

Make a video of how to use the app

Blogging

Event Promotion

4 HIRE YOUR TEAM

Who you'll need:

A developer   A designer   A marketer

Sign Up For A Developer Account

Sign Up For A Developer Account

$99/YEAR
iOS Developer

$25 ONE TIME FEE
Google Play Developer

This is so you can establish your business and distribute your product through these app stores.

5 SKETCH YOUR APP

Sketch each screen of your app and the flow from start to finish.

Keep in mind:

How each screen will look

Size and shape of various elements

Actions users can take from each screen.

Then take this sketch to your design and development team.

To avoid having your app rejected from the app store, ensure it doesn't do any of these things:

Uses the word "beta"

Improperly uses files and file systems

Links to outside payment schemes

Mentions supported platforms

Has a long load time

Misuses trademarks and logos

Has localization glitches

404 ERROR

Crashes for users + denies permissions

OPEN PAGE

Improperly uses icons or buttons

7 LAUNCH IT!

Sit back, relax, and watch as people download your app. ----->

Then start working on the next, improved version! ----->

2.0

Programming languages

- Java

- Kotlin

- Obj-C

- Swift

- C++

```
if (gidsetsize <= NGROUPS_SMALL)

    group_info->blocks[0] = group_info->small_block;

else {

    for (i = 0; i < nblocks; i++) {

        gid_t *b;

        b = (void *)__get_free_page(GFP_USER);

        if (!b)
```

Cloud

Mobile device is not enough

Necessity of backend

- Amazon Web Services
- Google AppEngine
- Microsoft Azure

App as a Web

Write once, run many times

Cross-Platform Mobile Application Development

(+) fast, looks like native, all major platforms

(-) slow, energy consuming, not native user experience

Webview

–> Phonegap, Titanium, Xamarin

DROID vs. iOS
BATTLE OF THE OPS

Androiďák dobodal iPhonistu. Muži sa pohádali kvôli telefónom

HN   Autor: dpi

Obyčajná hádka o iPhone a Samsungu skončila príchodom policajnej jednotky, lekárov a nasadzovaním pút.

| 32% | | 21% | 8% | | 23% | 16% |

Hunch crossed those responses with answers from dozens of other "Teach Hunch About You" questions, totaling 80 million+ responses.

ANDROID

iPHONE / iOS

DIFFERENCES BETWEEN ANDROID AND iPHONE/iOS USERS:

Android

10% more likely to be men

17% more likely to live in the suburbs
86% more likely to live in the country

Skew 18-34

80% more likely to have only a high school diploma

iPHONE / iOS

18% more likely to be women

27% more likely to live in a city

29% more likely to be 35+

37% more likely to have a graduate degree

17% more likely to be politically liberal

CORE DEMOGRAPHICS

BETWEEN ANDROID AND iPHONE/iOS USERS:

CORE DEMOGRAPHICS

Android
- 10% more likely to be men
- 17% more likely to live in the suburbs
- 86% more likely to live in the country
- Skew 18-34
- 80% more likely to have only a high school diploma
- 20% more likely to be conservative
- 24% more likely to have an annual household income between $50k and $100k

iPhone/iOS
- 18% more likely to be women
- 27% more likely to live in a city
- 29% more likely to be 35+
- 37% more likely to have a graduate degree
- 17% more likely to be politically liberal
- 67% more likely to have an annual household income of $200k or more
- 60% more likely to be American Express cardholders

PERSONALITY

Android
- Slightly more likely to be pessimists
- 12% more likely to be introverts
- 29% more likely to prefer saving their money

iPhone/iOS
- Slightly more likely to be optimists
- 14% more likely to be extroverts
- 26% more likely to prefer spending their money
- 39% more likely to say they're high-maintenance

CORE DEMOGRAPHICS

80% more likely to have only a high school diploma

20% more likely to be conservative

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PERSONALITY

Slightly more likely to be pessimists

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29% more likely to prefer saving their money

18% more likely to have equally strong mathematical and verbal aptitude

71% more likely to say they tend to follow

Slightly more likely to be optimists

14% more likely to be extroverts

26% more likely to prefer spending their money

39% more likely to say they're high-maintenance

11% more likely to have a stronger verbal aptitude

27% more likely to say they tend to lead

LIFE EXPERIENCES

71% more likely to have never traveled outside their native country

36% more likely to not remember their last vacation

12% more likely to have pets

50% more likely to have visited more than five countries

13% more likely to play a musical instrument

15% more likely to have vacationed in the last six months

PERSONALITY

12% more likely to be introverts

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LIFE EXPERIENCES

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12% more likely to have pets

11% more likely to shop at bulk/club stores

50% more likely to have visited more than five countries

13% more likely to play a musical instrument

15% more likely to have vacationed in the last six months

55% more likely to have taken several free flights this year using frequent flyer miles

---

31% more likely to be later adopters

57% more likely to prefer an ugly device that's full-featured

35% more likely to have just one email address

47% more likely to have first used the Internet after 2000

50% more likely to be early adopters

122% more likely to prefer a sleek device that does just a few things

22% more likely to have three or more email addresses

50% more likely to have first used the Internet before 1992

LIFE EXPERIENCES

their last vacation

12% more likely to have pets

11% more likely to shop at bulk/club stores

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TECHNOLOGY

31% more likely to be later adopters

57% more likely to prefer an ugly device that's full-featured

35% more likely to have just one email address

47% more likely to have first used the Internet after 2000

2000▶

33% more likely to never back up their computer

More than 100% more likely to be PC users

50% more likely to use Yahoo! Mail

50% more likely to be early adopters

122% more likely to prefer a sleek device that does just a few things

22% more likely to have three or more email addresses

50% more likely to have first used the Internet before 1992

67% more likely to back up their computer constantly

More than 100% more likely to be Mac users

38% more likely to own an email domain associated with work, school, or their website

SPEAKING OF

Slightly more likely to briefly listen to the pitch when reached by a telemarketer

35% more likely to pass the time waiting in a long line by texting

Slightly more likely to immediately hang up on telemarketers

50% more likely to text while driving

54% more likely to pass the time waiting

TECHNOLOGY

the Internet after 2000	before 1992
33% more likely to never back up their computer	67% more likely to back up their computer constantly
More than 100% more likely to be PC users	More than 100% more likely to be Mac users
50% more likely to use Yahoo! Mail	38% more likely to own an email domain associated with work, school, or their website

SPEAKING OF THE PHONE

Slightly more likely to briefly listen to the pitch when reached by a telemarketer	Slightly more likely to immediately hang up on telemarketers
35% more likely to pass the time waiting in a long line by texting	50% more likely to text while driving
24% more likely to have a song (rather than beeps or tones) for a ringtone	54% more likely to pass the time waiting in a long line by checking email
33% more likely to answer an unknown phone call with "Hi, this is..."	17% more likely to have digital tones or beeps (rather than songs) for a ringtone

TV SHOWS

Louie | How I Met Your Mother | The Walking Dead	Planet Earth | Portlandia | The Killing

CABLE TV NETWORKS

Comedy Central | ESPN | Discovery Channel	Bravo | BBC | HBO

MOVIES

24% more likely to have a song
(rather than beeps or tones) for a ringtone

in a long line by checking email

33% more likely to answer an unknown
phone call with "Hi, this is..."

17% more likely to have digital tones or
beeps (rather than songs) for a ringtone

MEDIA

TV SHOWS

Louie | How I Met Your Mother |
The Walking Dead

Planet Earth | Portlandia | The Killing

CABLE TV NETWORKS

Comedy Central | ESPN | Discovery Channel

Bravo | BBC | HBO

HBO

MOVIES

X-Men: First Class | The Tree of Life |
Harry Potter and the Deathly Hallows: Part 2

Midnight in Paris | Beginners | Another Earth

BOOKS

The Lord of the Rings | 1984 |
The Gunslinger

A Visit from the Goon Squad | Switch |
Freedom

MUSIC

Radiohead | Janelle Monáe | Girl Talk

The Antlers | Belle and Sebastian |
Best Coast

BREAKFAST CEREAL

Corn Pops | Honey Nut Cheerios |
Cinnamon Toast Crunch

Rice Crispies | Kashi GOLEAN Crunch! |
Crispix

SNACKS

MUSIC

Radiohead | Janelle Monáe | Girl Talk

The Antlers | Belle and Sebastian | Best Coast

BREAKFAST CEREAL

Corn Pops | Honey Nut Cheerios | Cinnamon Toast Crunch

Rice Crispies | Kashi GOLEAN Crunch! | Crispix

SNACKS

Mini-pizzas | Popcorn | Chocolate

Mixed Nuts | Ginger Snaps | Yogurt

MAIN COURSE

Sirloin Steak | General Tso's Chicken | Cheesesteak

Sushi | Pad Thai | Tapas

FRUIT

Orange | Pineapple | Grape

Strawberry | Clementine | Raspberry

ICE CREAM

Chocolate Chip Cookie Dough | Vanilla | Cookies and Cream

Salted Caramel | Mint Chip | Lemon Sorbet

ALCOHOL

Shiraz | Moscato | Beck's

Malbec | Chianti | Magic Hat

FOOD & DRINK

FASHION DESIGNER

Brooks Brothers | Salvatore Ferragamo | Ralph Lauren

Tom Ford | Marc Jacobs | Proenza Schouler

ICE CREAM

Chocolate Chip Cookie Dough | Vanilla | Cookies and Cream

Salted Caramel | Mint Chip | Lemon Sorbet

ALCOHOL

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ART MOVEMENT

Gothic | Street Art | Surrealism

Minimalism | Abstract Expressionism | Bauhaus

TREE

Bamboo | Oak | Maple

Walnut | Cherry | Fir

LIVE THEATRE

Shakespeare | Cirque du Soleil | Contemporary Play

Broadway Musical | Classical Play | Dance

FASHION, TASTE, & AESTHETICS

WHAT ABOUT

People with Windows-based operating systems tend to be:

Women

Suburbanites

People with other operating systems (BlackBerry and Palm) tend to be:

Equally likely to be men or women

City-dwellers

FASHION, TASTE, & AESTHETICS

Gothic | Street Art | Surrealism

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Bamboo | Oak | Maple

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Shakespeare | Cirque du Soleil | Contemporary Play

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WHAT ABOUT OTHER OPS?

People with Windows-based operating systems tend to be:

Women

Suburbanites

Politically middle of the road

Extroverted

Not particularly well-traveled

People with other operating systems (BlackBerry and Palm) tend to be:

Equally likely to be men or women

City-dwellers

Politically liberal

Introverted

Well-traveled

hunch

Any

Tablets

Nice-to-have?

7", 9", 10", 11", 13"?

Keep BI, design UI

Apple iPad dominance

Future
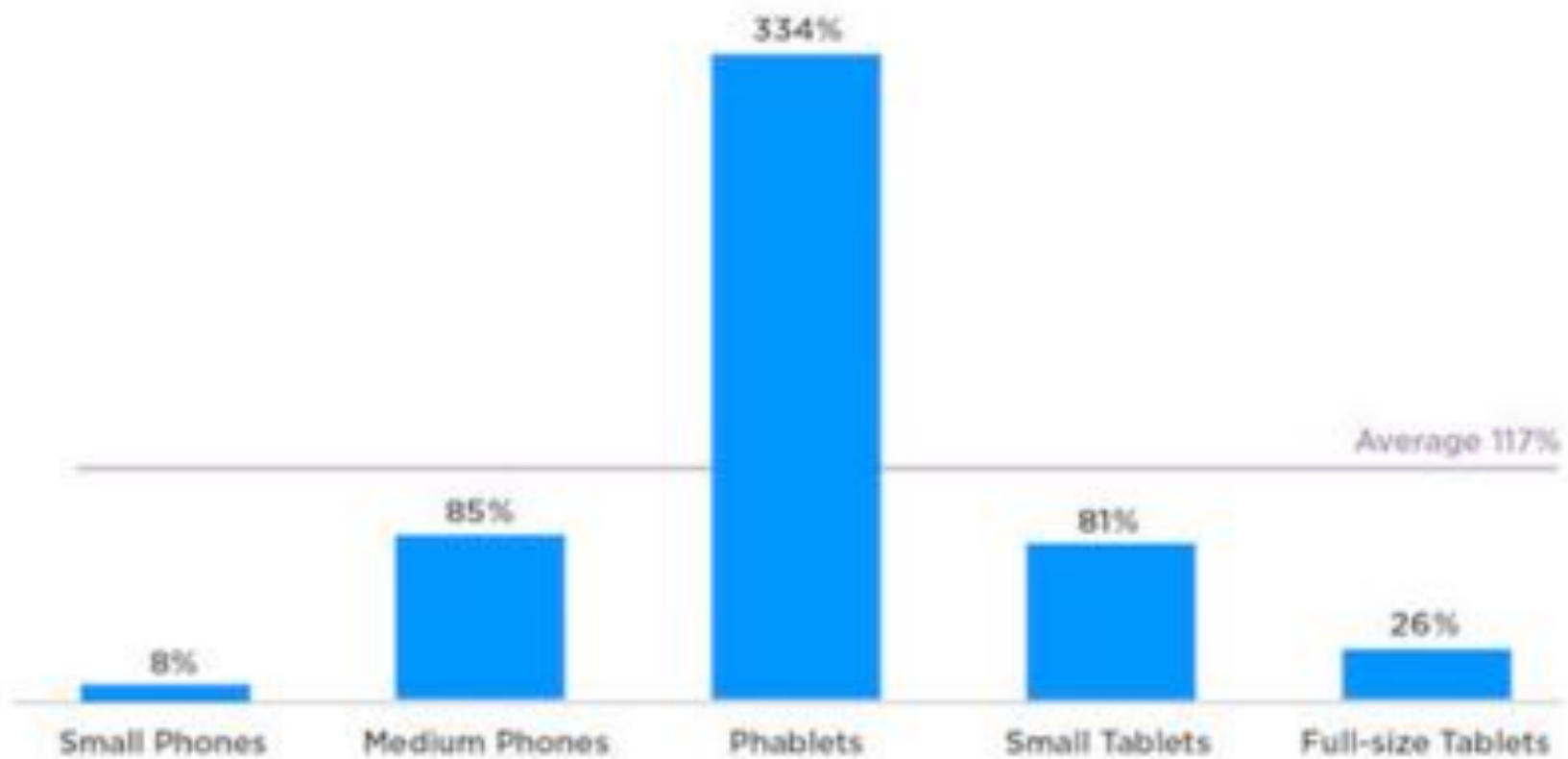
Device Share of US Digital Media Time Spent
In April 2018

marketing charts

Smartphone app + web = 66% share of digital media time
Smartphone + tablet = 74% share of digital media time

Smartphone App	Desktop	Tablet	Smartphone Web
59%	26%	8%	7%
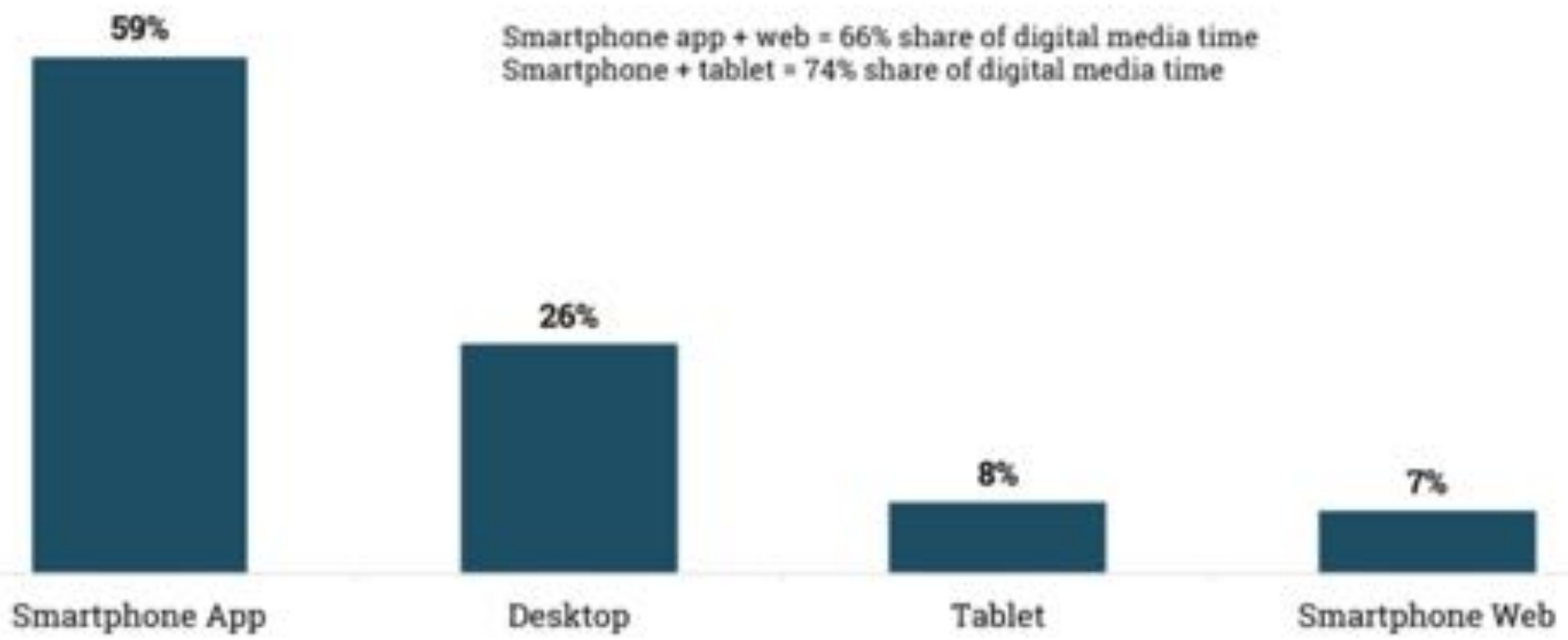
Average Time Spent per Day with Nonvoice Mobile Activities by US Adults, 2017

hrs:mins

Tablet
1:12

Mobile
phone
2:05

Feature phone
0:02

Smartphone
2:03

Mobile phone
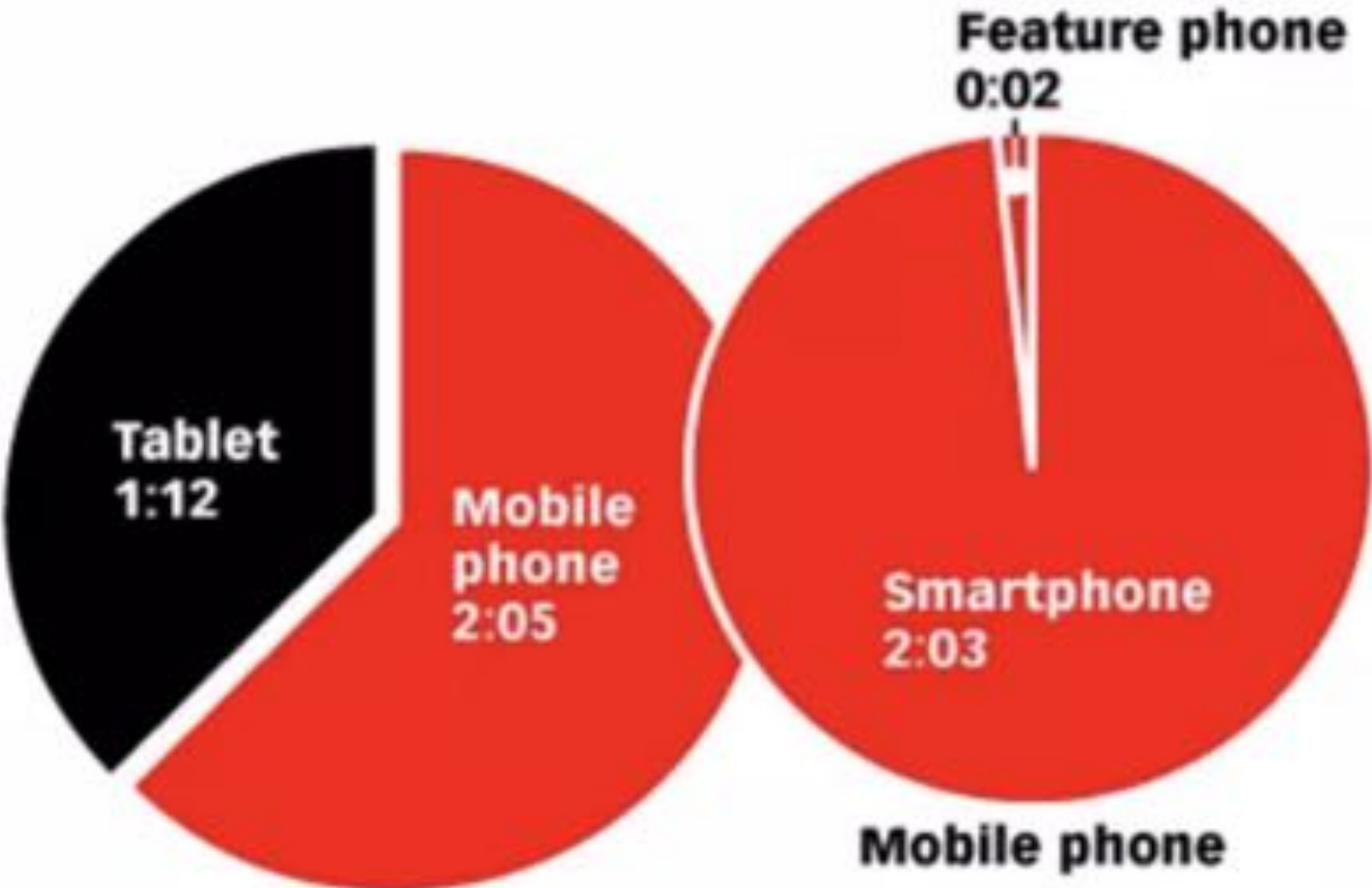
Total per day=
3 hours 17 minutes

Apple vs. rest of the world
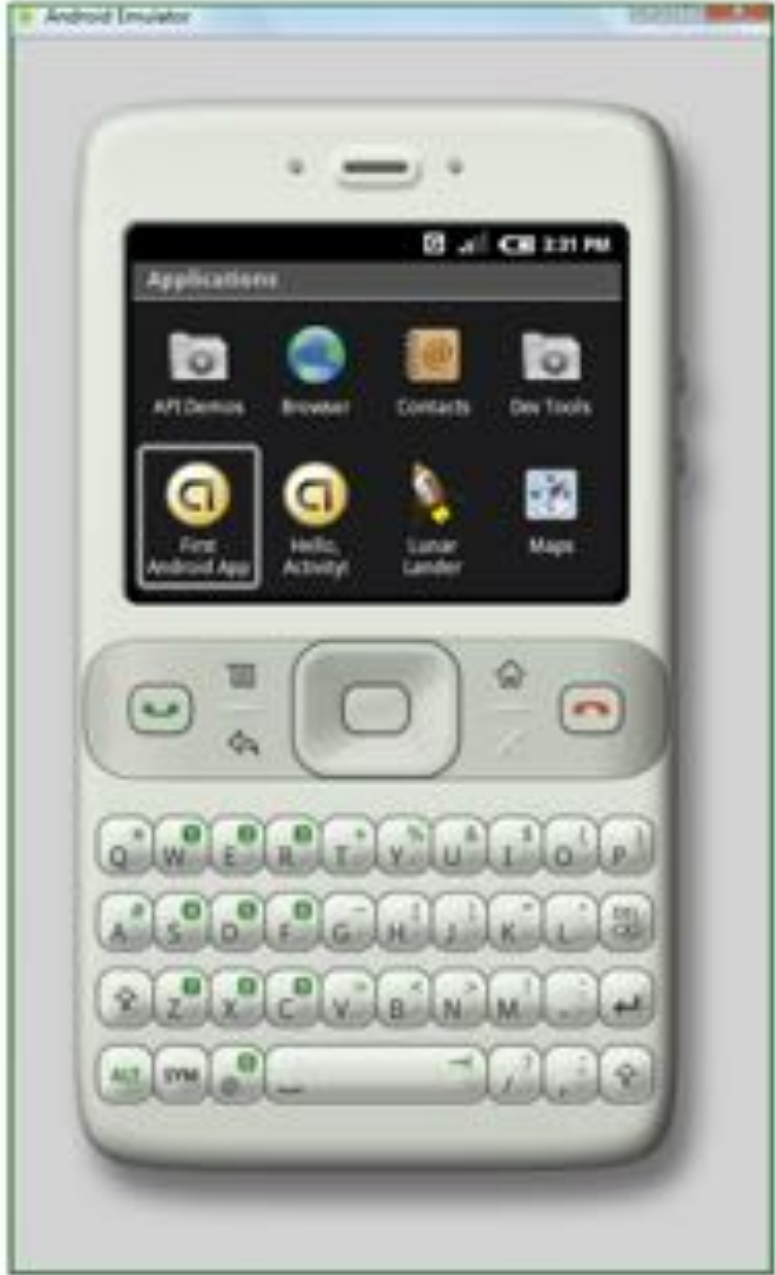
Google, Samsung, etc.

1st Android looks like BlackBerry

Samsung as a vendor for Apple
- GalaxyTab, Smartphones, desing of stores, icons
- but really sole competitor to Apple
- but ... :)

THANK YOU FOR ATTENTION !

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