Wearable Medical Devices

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ELP²
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Overview

Everyday between 500 to 1000 people die from preventable diseases

Overview

Wearable medical devices can help detect diseases in the early stages before they become chronic

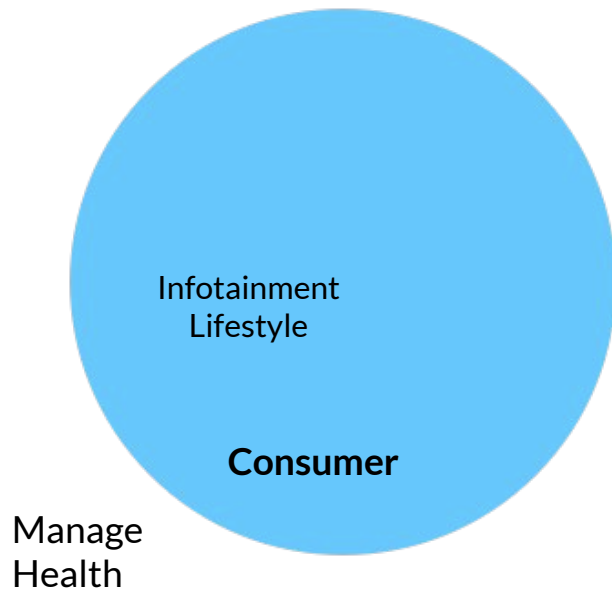Technology can help you live a healthier and longer life

Use Cases

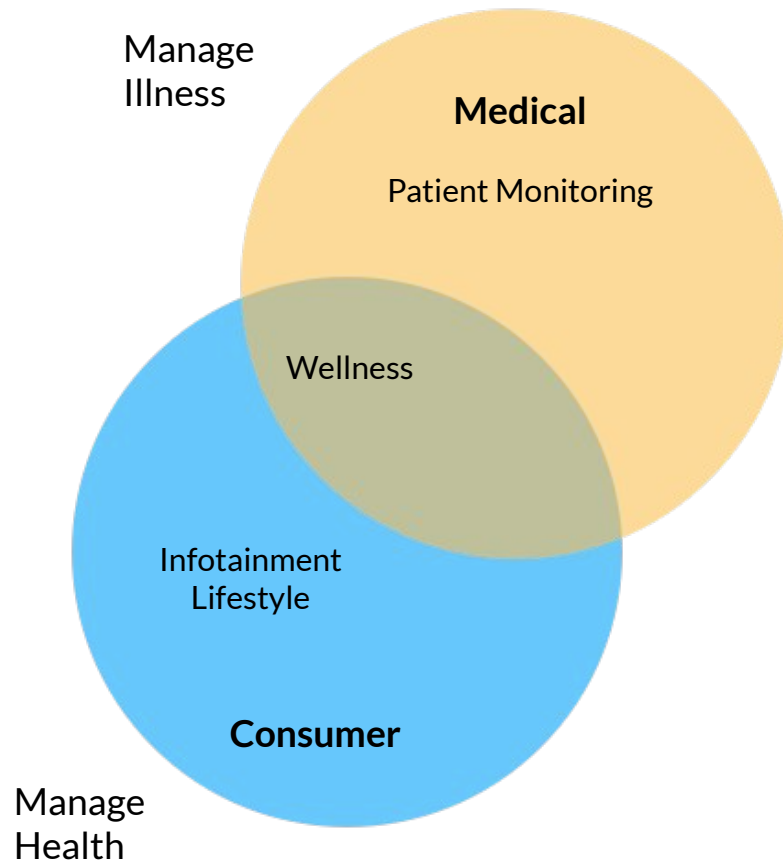Health monitoring devices have three main target customers

01 | Manage health

Infotainment
Lifestyle

Consumer

Manage
Health

Use Cases

Health monitoring devices have three main target customers

01 | Manage health

02 | Manage illness

Manage Illness

Medical

Patient Monitoring
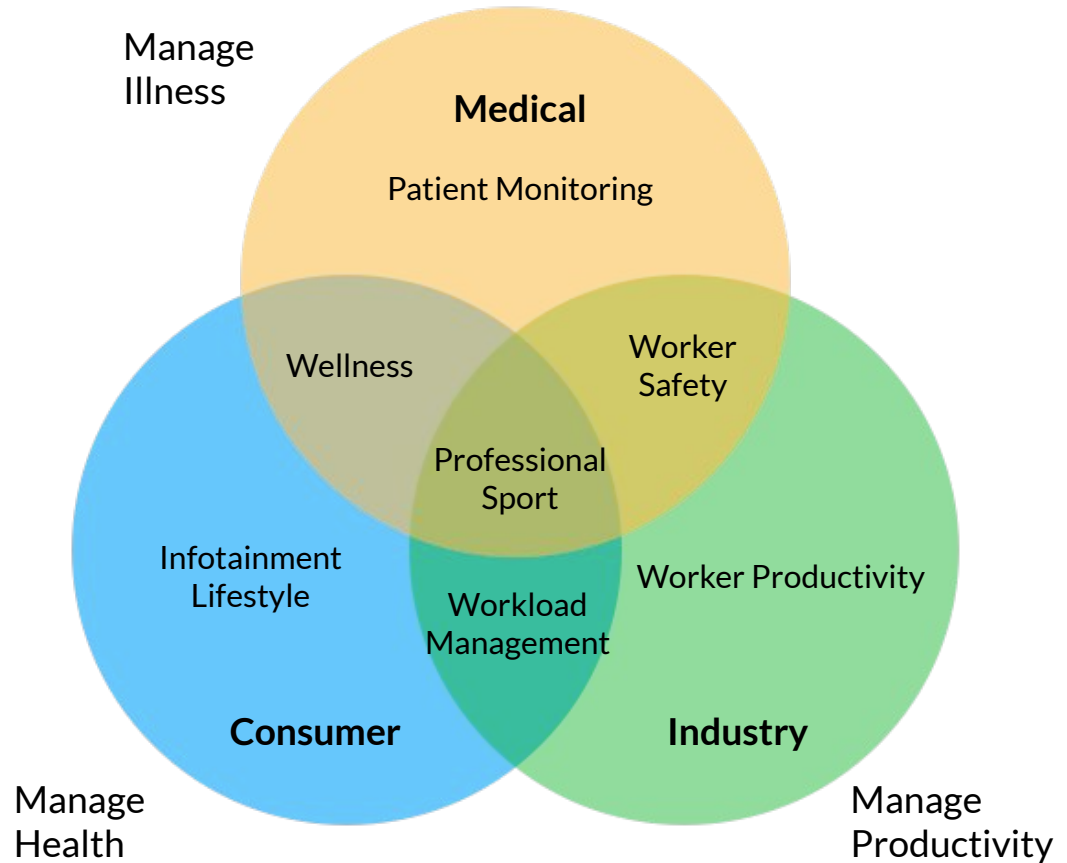
Wellness

Infotainment Lifestyle

Consumer

Manage Health

Use Cases

Health monitoring devices have three main target customers

01 | Manage health

02 | Manage illness

03 | Manage productivity

Manage Illness
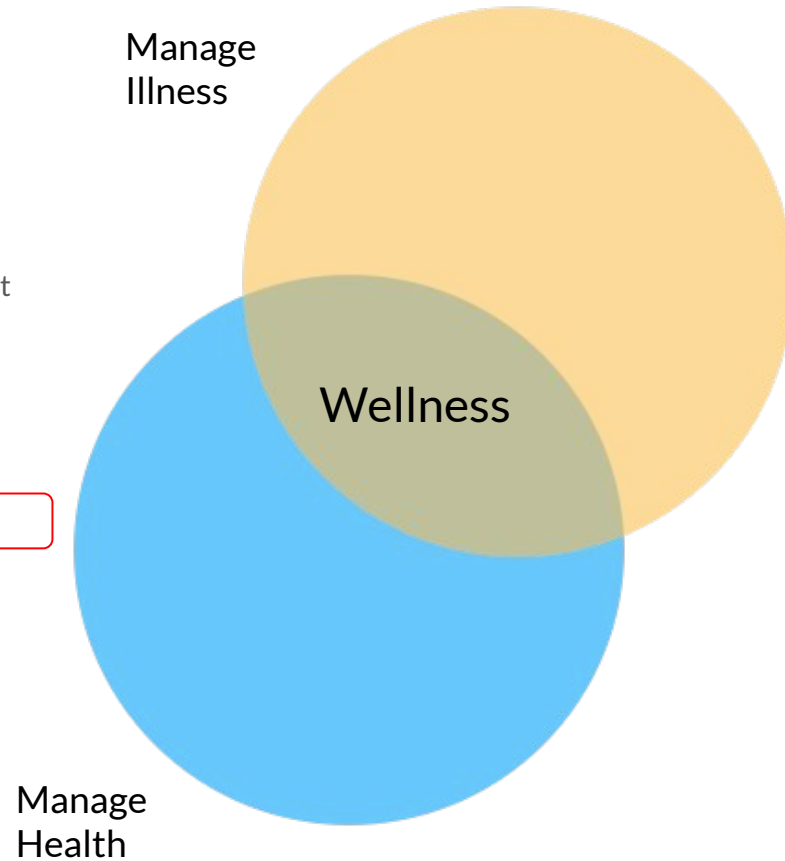
Medical

Patient Monitoring

Wellness

Worker Safety

Professional Sport

Infotainment Lifestyle

Workload Management

Worker Productivity

Consumer

Industry

Manage Health

Manage Productivity

Use Cases

We focused our research on the "Wellness" segment

01	Manage health
02	Manage illness
03	Manage productivity

Manage Illness
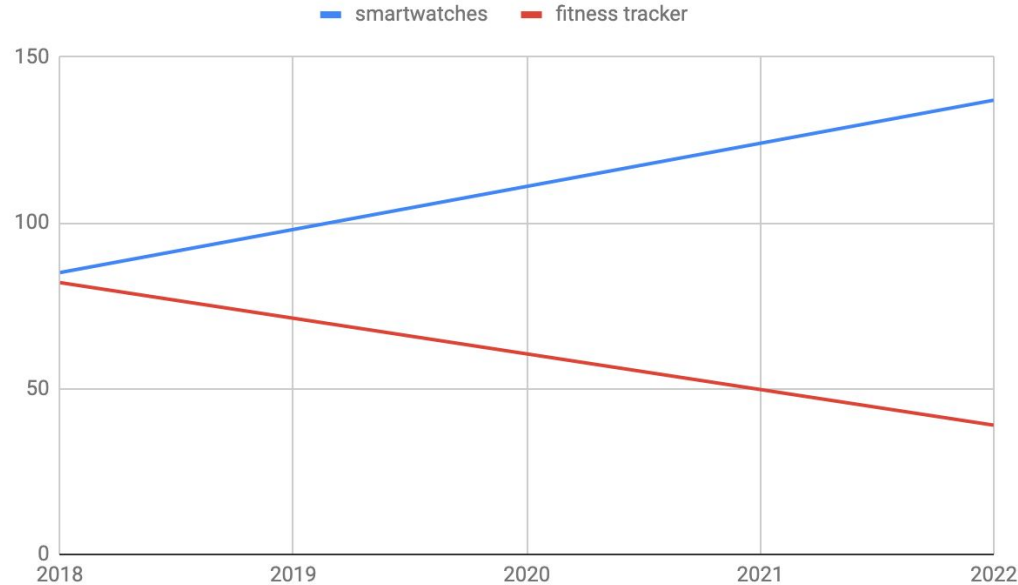
Wellness

Manage Health

Wearable Device Market Trend
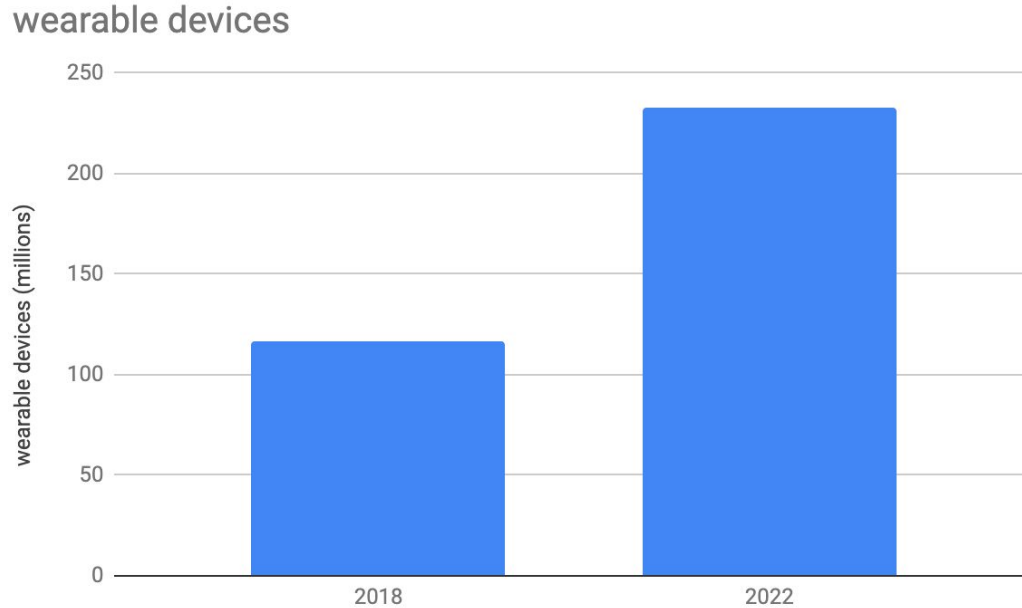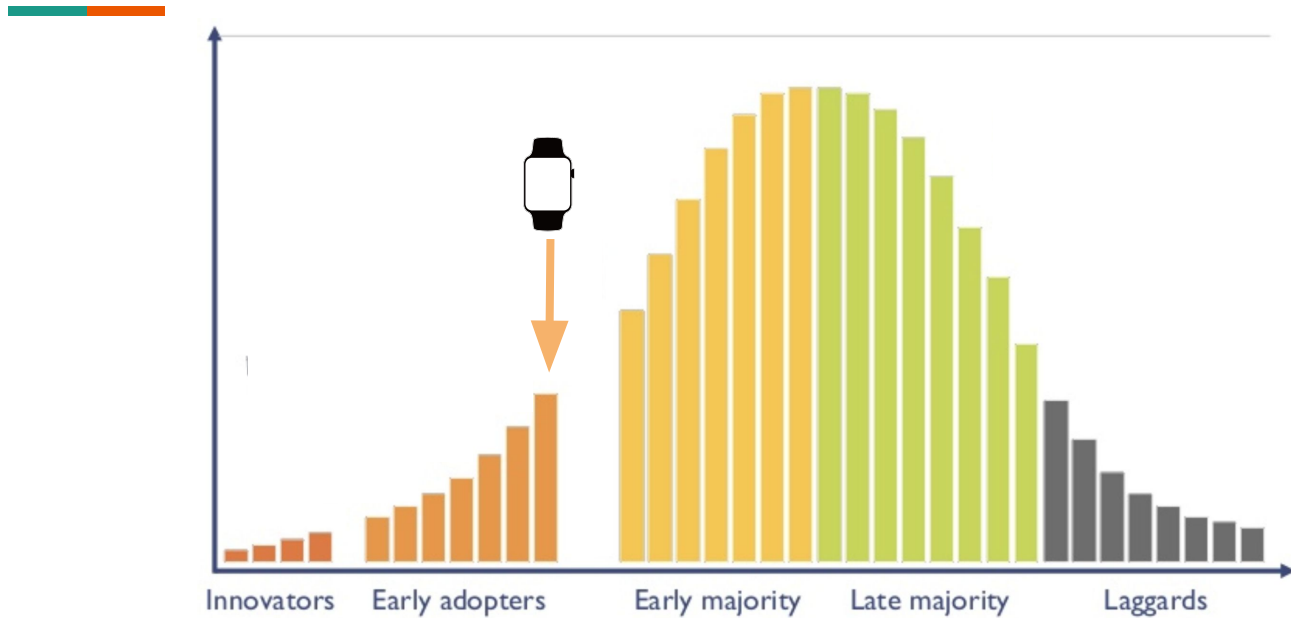
wearable devices

- Smart wearable device sales are projected to double by 2022
- $27 billion market with 233 million unit sales

Wearable Device Market Trend

- Smartwatches are forecasted to grow by 67% over the next four years
- Fitness trackers are forecasted to decline by 53% during the same four years

Wearable Device Adoption Curve

Innovators   Early adopters   Early majority   Late majority   Laggards
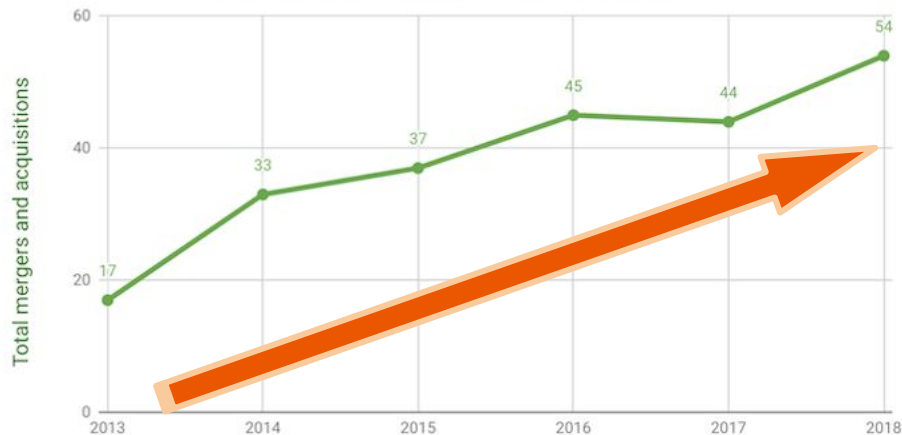
- ● Smart watch are in the late stage of the early adopter curve

Wearable Medical Device related M&A

Digital Health M&A Through the Years

- 54 acquisitions in 2018
- 13 totaling $7.6B

Devices ~$3.6B:
- Connected glucometers, automated insulin delivery wearable, connected respiratory devices.

Data ~$2.2B:
Patient communication app, EHR software, hospital notification, online virtual care platform, telemedicine.

Analytics ~$1.2B:
- Diabetes prediction algorithms, clinical decision support software, cloud based AI / data analytics.

- In 2018, industry's focus is with building the ecosystem
- Transition to analytics and apps/software expected once hardware matures

Challenges

Obstacles for adoption

1.   **Privacy**

What happens to your data?

Apple: Leader in Privacy Policy

- "What happens on your iPhone, stays on your iPhone"

- If customers upload their medical records to iCloud, data is encrypted and protected

- Your personal data is never shared without your permission

What happens to your data?

Xiaomi, on the other hand…

- Privacy policy allows it to collect user's personal information, financial details and more

- "Shares your Personal Information with a third party <u>without</u> your further consent"

Privacy policies

Global trend to mitigate concerns around security & data access of health information

- **USA**
  - New legislation holding third parties accountable to the same standards of privacy and confidentiality as where the data originated

- **Europe**
  - May 2018: GDPR goes into effect
    - Genetic and biometric data are added to the list of "sensitive" personal information
    - Data collection and processing requires user consent

Challenges

Obstacles for adoption

1. Privacy

2. **Regulations**

Regulations

Wearable technologies are turning into regulated medical devices

- **USA**
  - Food & Drug Administration (FDA)
    - Overhaul the medical device review process
    - Updates enabled devices to reach the market much sooner

- **Europe**
  - Major updates to the Medical Devices Regulation (MDR) classification rules & requirements for medical device software
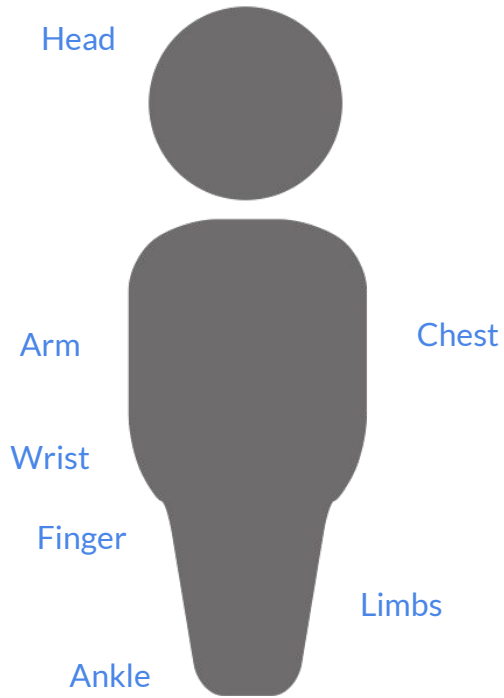
Regulations

Classification as a Medical Device

- Apple Watch ECG app granted De Novo classification by the FDA

- De Novo is a category for devices unlike anything else on the market

- Paves the path for future wearable devices to be cleared as medical devices

Ecosystem

Devices

Head

Arm

Chest

Wrist

Finger

Limbs

Ankle

Focus on consumers and devices

Large selection of different sensory devices

Devices are being designed for, and used on, every part of you body

They are even being incorporated into clothing and other clothing accessories, like belts

Ecosystem

Today

Devices

Head

Arm

Chest

Wrist

Finger

Limbs

Ankle
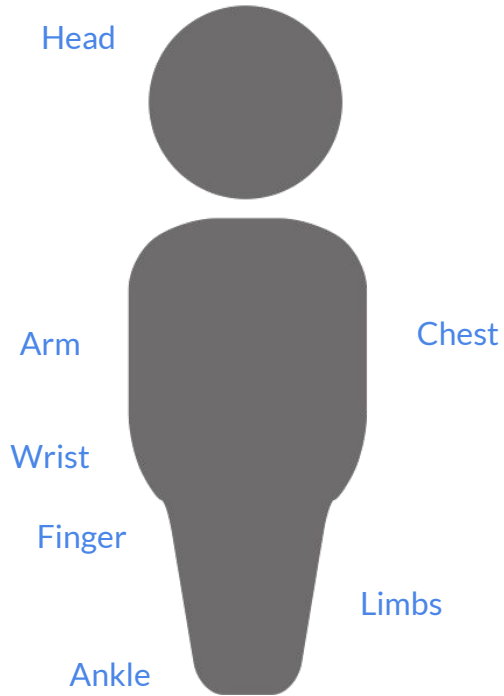
Ecosystem

Devices

Competition is this segment is very healthy, with well established consumer electronic companies, as well as a large number of startups

Some companies are focusing on specialized single function devices

Others are working on multi-sensory devices

Ecosystem

Data

Focus is starting to shift to the cloud
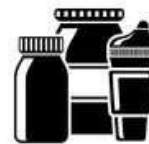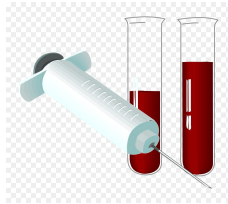
Aggregating data from all devices/sensors

Ecosystem

Tomorrow

Data

Data collection is also expanding to businesses

Ecosystem

Data

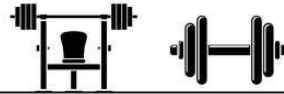Data collection is also expanding to businesses

- Launched Apple Heart Study initiative in partnership with Stanford Medicine

- FDA cleared Apple watch to perform medical diagnosis (ECG and Atrial fibrillation-detecting algorithm)
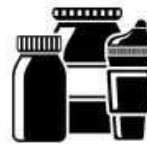
Ecosystem

Tomorrow

Data

Data collection is also expanding to businesses

Microsoft Azure

- Sept 2017- launch of a new healthcare division to use AI software to enter the health market

Ecosystem

Data

Data collection is also expanding to businesses

- Acquired DeepMind - AI platform to mine medical records for better/faster health services

- Verily - developing tools to collect and organize health data

- Cooperation with Fitbit and Google's Cloud for Healthcare - send health data to doctors for real-time data cand consultation
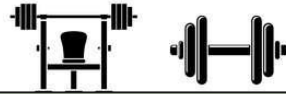
Google Cloud

Ecosystem

Data

Data collection is also expanding to businesses

- Created a healthcare group known as 1492, and it has been aggressively recruiting top talent in the medical healthcare business

aws

Ecosystem

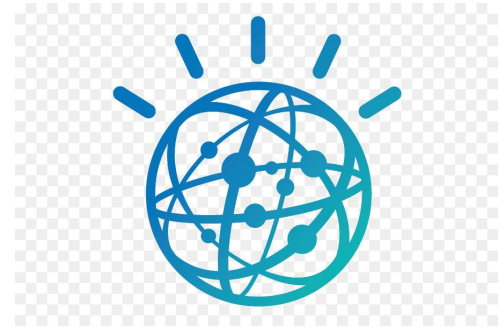Services

Future

Analyzes

The future is all about services

Remote doctors

Smart insurance plans

AI systems for early disease detection

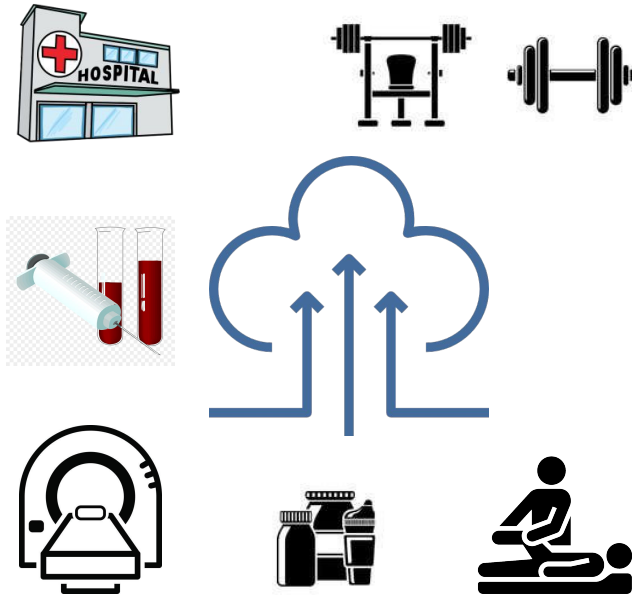AI systems to increase accuracy and speed of diagnostics

Ecosystem

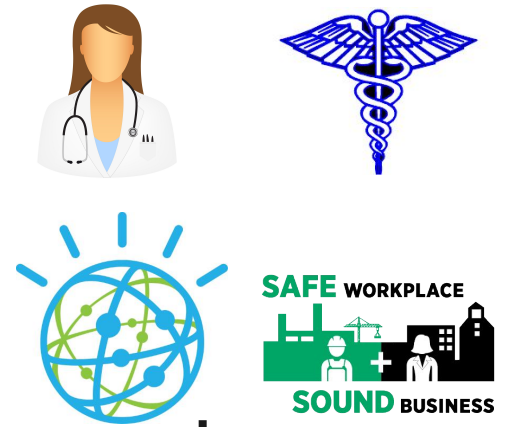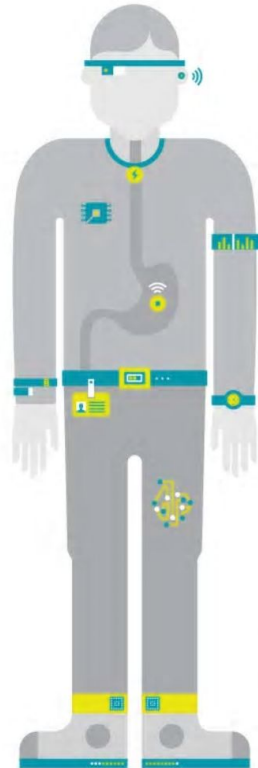Devices

Data

Analyze + Service

New Technology Trends

Seamless integration: advancements in sensor technologies

Beyond monitoring: performs tasks, such as administering medication

Nanotechnology: allows for sensors to be under the skin

Prediction

- We see Apple as a potential big winner in this space
  - they are creating the same building blocks for another ecosystem disruption
  - much like what iTunes did for music or the App Store did for mobile services

- Some analysts go as far as to predict that Apple healthcare revenue could reach $313 billion by 2027

Summary

- Health wearables have a real and positive effect on people's health
  - here to stay with tremendous growth and benefits

- The future is about data, with the cloud and AI software being the big winners
  - companies that develop device to support data-driven decisions will have the most success

- Major obstacles are regulations and privacy
  - Companies like Apple are leading the way in resolving these concerns

Thank you.

Mariya, Allie, Roberto, Toshio, Jinhan, Cris

Appendix

Business model

Direct to Consumer: device sales, services subscriptions

Applications: app sales and 3rd party app revenue share

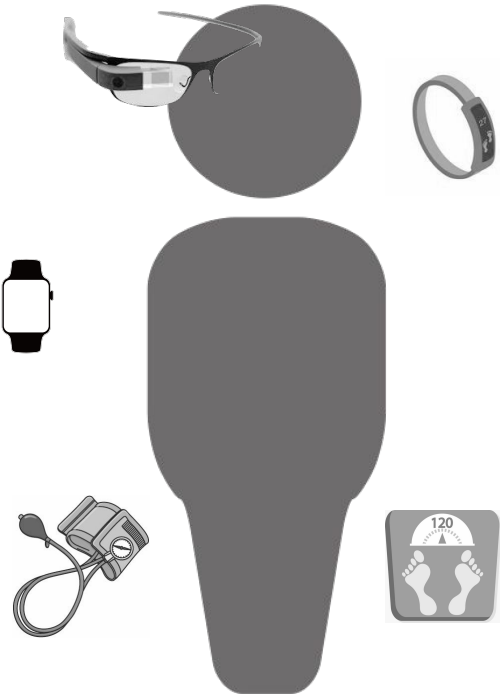**Data aggregator**: collect data from multiple sources (hospitals, Doctor's offices, Labs, various devices)

Services: clinical studies, disease detection, health monitoring, consultation

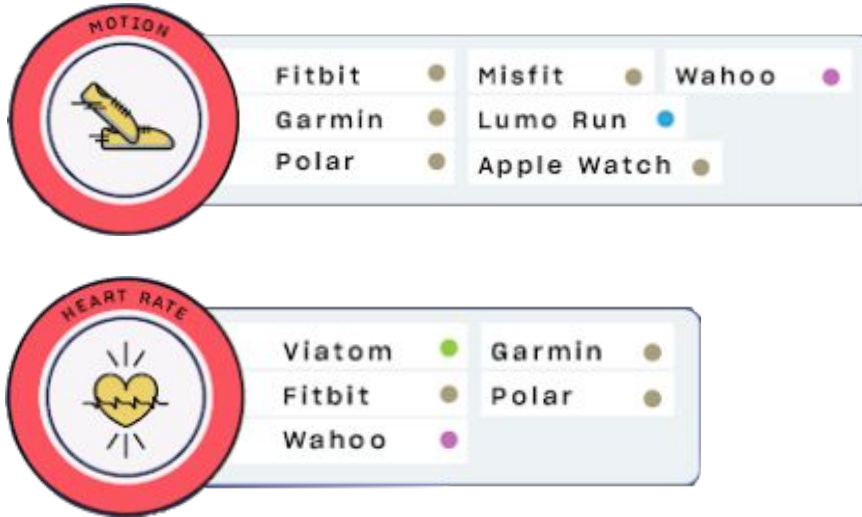**B to B**: insurance companies, businesses, pharmaceutical companies
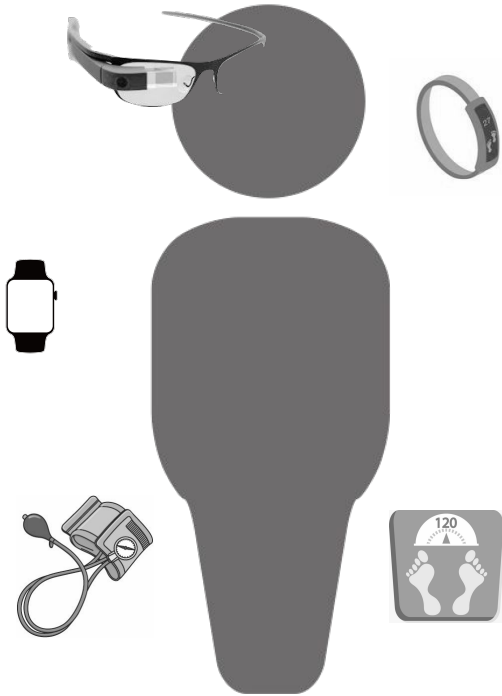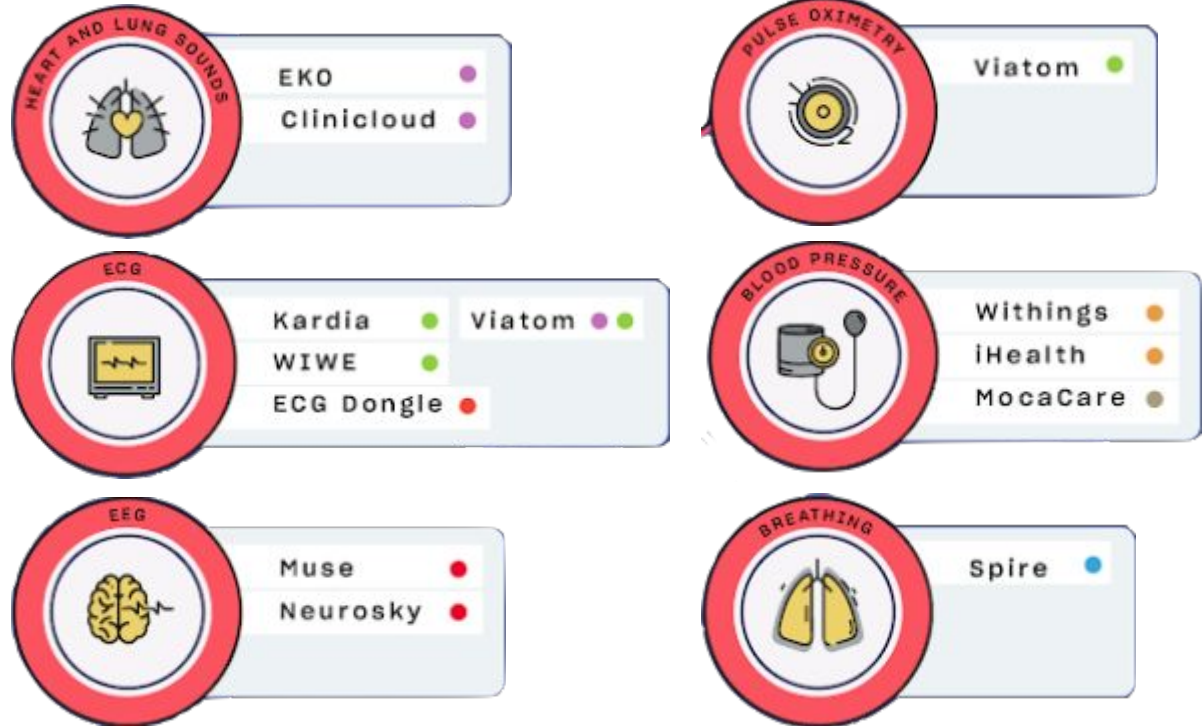
Ecosystem
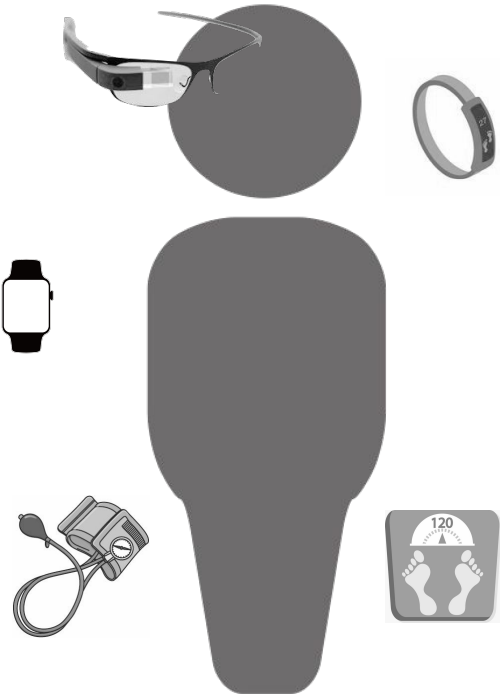
Sensors

Devices

MOTION

Fitbit ●	Misfit ●	Wahoo ●
Garmin ●	Lumo Run ●	
Polar ●	Apple Watch ●	

HEART RATE

Viatom ●	Garmin ●
Fitbit ●	Polar ●
Wahoo ●	

Ecosystem

Sensors

Devices

HEART AND LUNG SOUNDS
- EKO ●
- Clinicloud ●

PULSE OXIMETRY
- Viatom ●

ECG
- Kardia ●
- Viatom ●●
- WIWE ●
- ECG Dongle ●

BLOOD PRESSURE
- Withings ●
- iHealth ●
- MocaCare ●

EEG
- Muse ●
- Neurosky ●

BREATHING
- Spire ●

Ecosystem

Sensors

Devices

Challenges

Obstacles for adoption

1. Privacy

2. Regulations

3. Price

4. Social implications

•*Apple Privacy for Apple Watch*

- **_Your personal data should always be protected on your device and never shared without your permission…_**
- We also use techniques like **Differential Privacy** to improve user experiences while protecting the information you share with Apple. **Differential Privacy adds random information to your data before it's analyzed by Apple, so we can't link that data to your device.**

Using Blockchain in Healthcare ecosystem for Medical Information
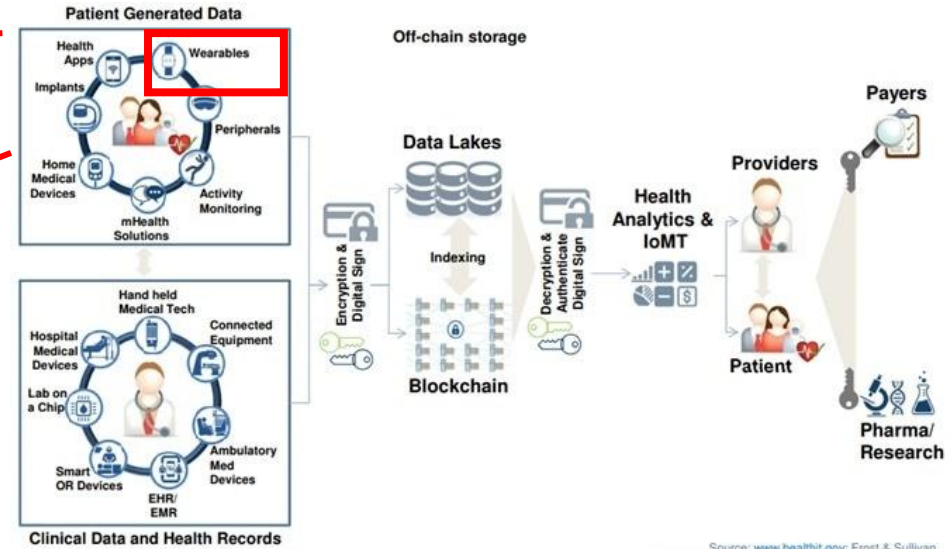
Source: www.healthit.gov: Frost & Sullivan

- Blockchain Technology is used health and medical information sharing between for service provider and Patient (or Wearable device users)
  - No personal information identified by encryption of health data in each wearable device level.

Wearable Device Market Size
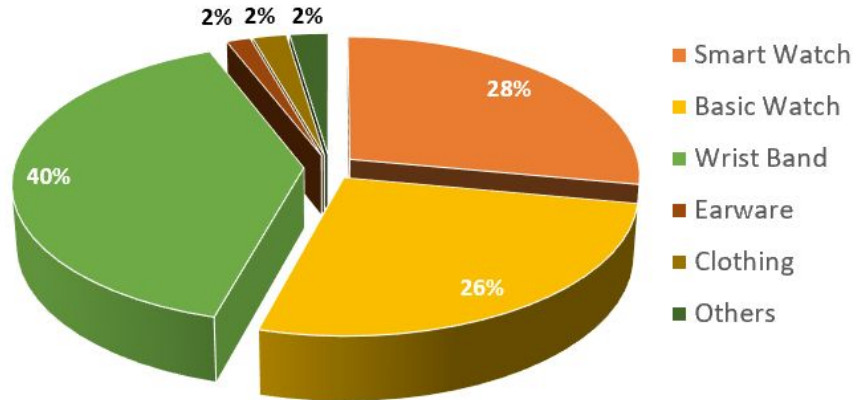

Wearable Applications Breakdown - 2012/2020
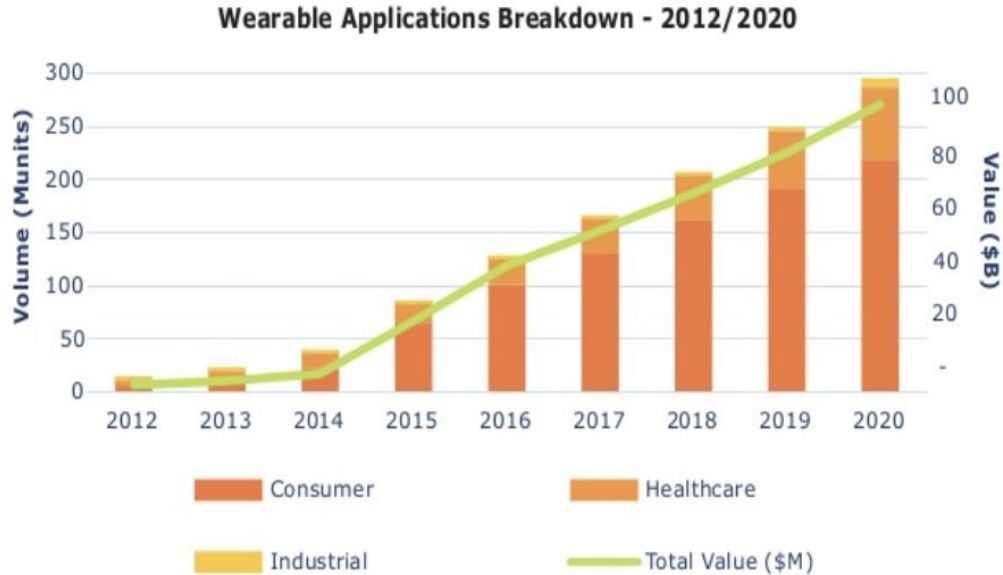
Source: Sensors for wearable Electronics & Mobile Healthcare Report. Jul 2015YOLE Development
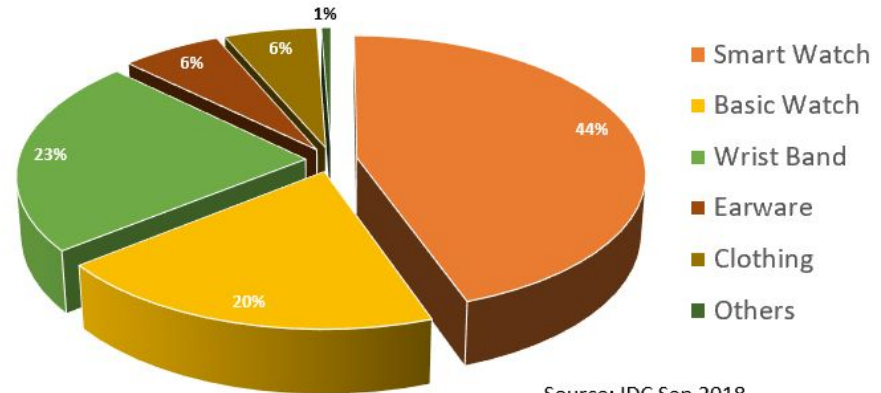
- Healthcare wearables picked up from 2014 and shows continuous growth
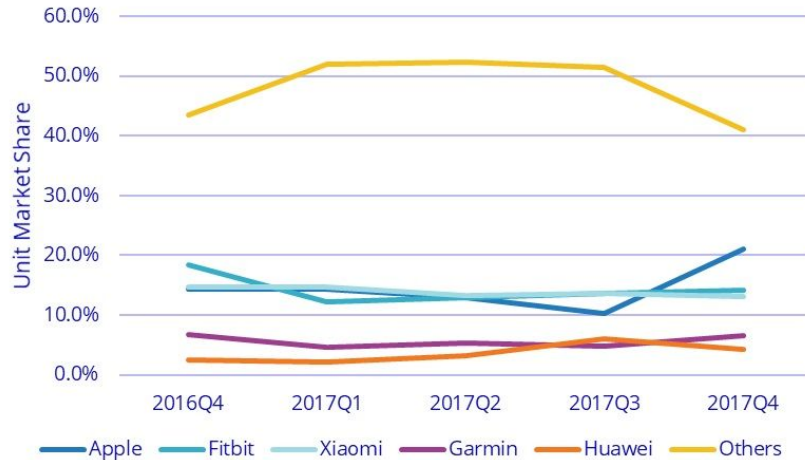
Wearable Device Market Trend

- Smart watch, Earware and Clothing device gains momentum in near future.
- Non smart wearables such as Fitness trackers at risk…

Biggest Players

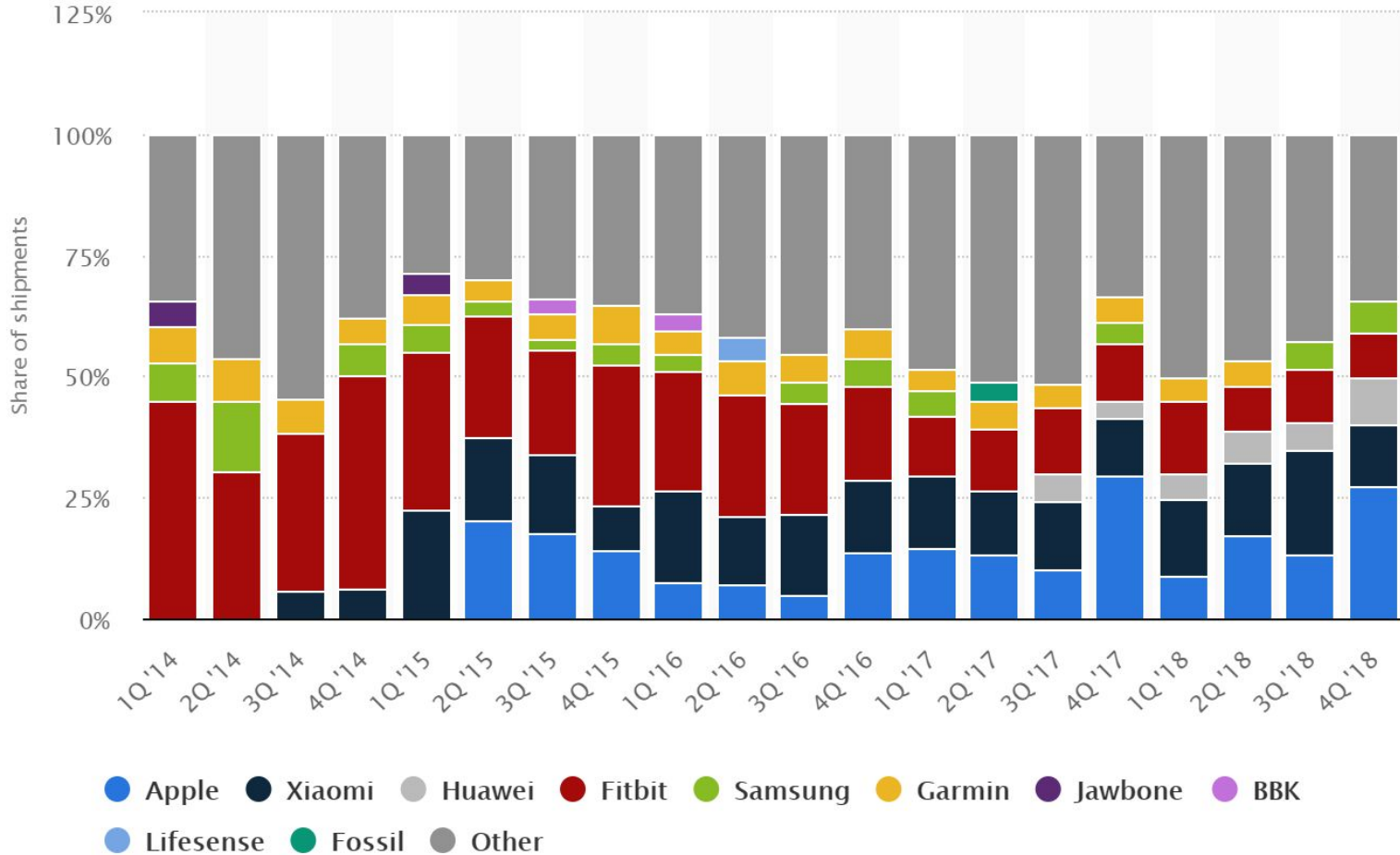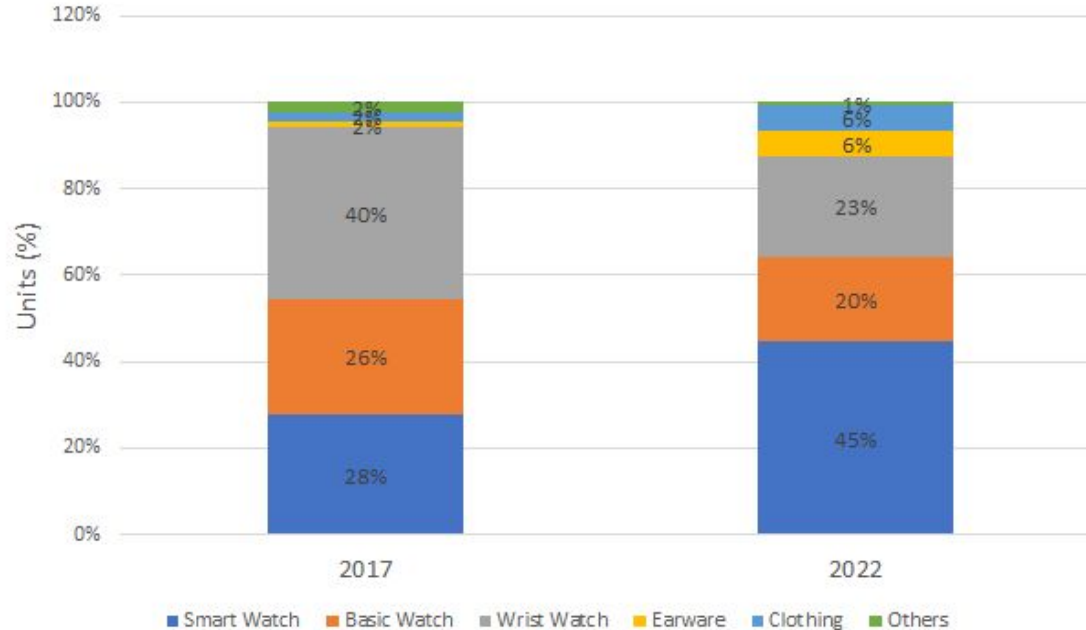Worldwide Top 5 Wearables Companies, 2017Q4 Unit Market Share

Source: IDC 2018

Apple leading the market and gaining market share.

- Apple: 21.0%
- Fitbit: 14.2%
- Xiaomi: 13.0%
- Garmin: 6.5%
- Huawei: 4.3%

- Others: 41.0%

Share of shipments

125%

100%

75%

50%

25%

0%

1Q '14 2Q '14 3Q '14 4Q '14 1Q '15 2Q '15 3Q '15 4Q '15 1Q '16 2Q '16 3Q '16 4Q '16 1Q '17 2Q '17 3Q '17 4Q '17 1Q '18 2Q '18 3Q '18 4Q '18

● Apple ● Xiaomi ● Huawei ● Fitbit ● Samsung ● Garmin ● Jawbone ● BBK

● Lifesense ● Fossil ● Other
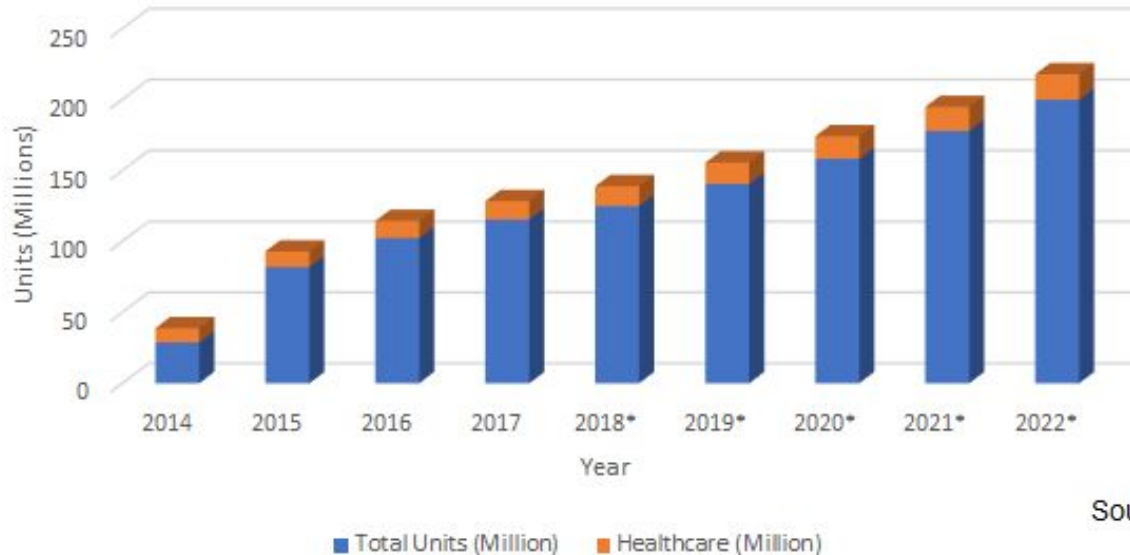
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- Non smart wearables such as Fitness trackers at risk...

Wearable Device Market Size

Wearable Health Market 2014-2022

Source: IDC, Sep 2018

- ● Healthcare wearables picked up from 2014 and shows continuous growth

Privacy policies

Global trend to mitigate security & data access concerns for health information

- **Japan**
  - New security guidelines for health information went into effect on May 2017

- **Indonesia**
  - As of Dec 2018, no medical data can be transferred outside of country