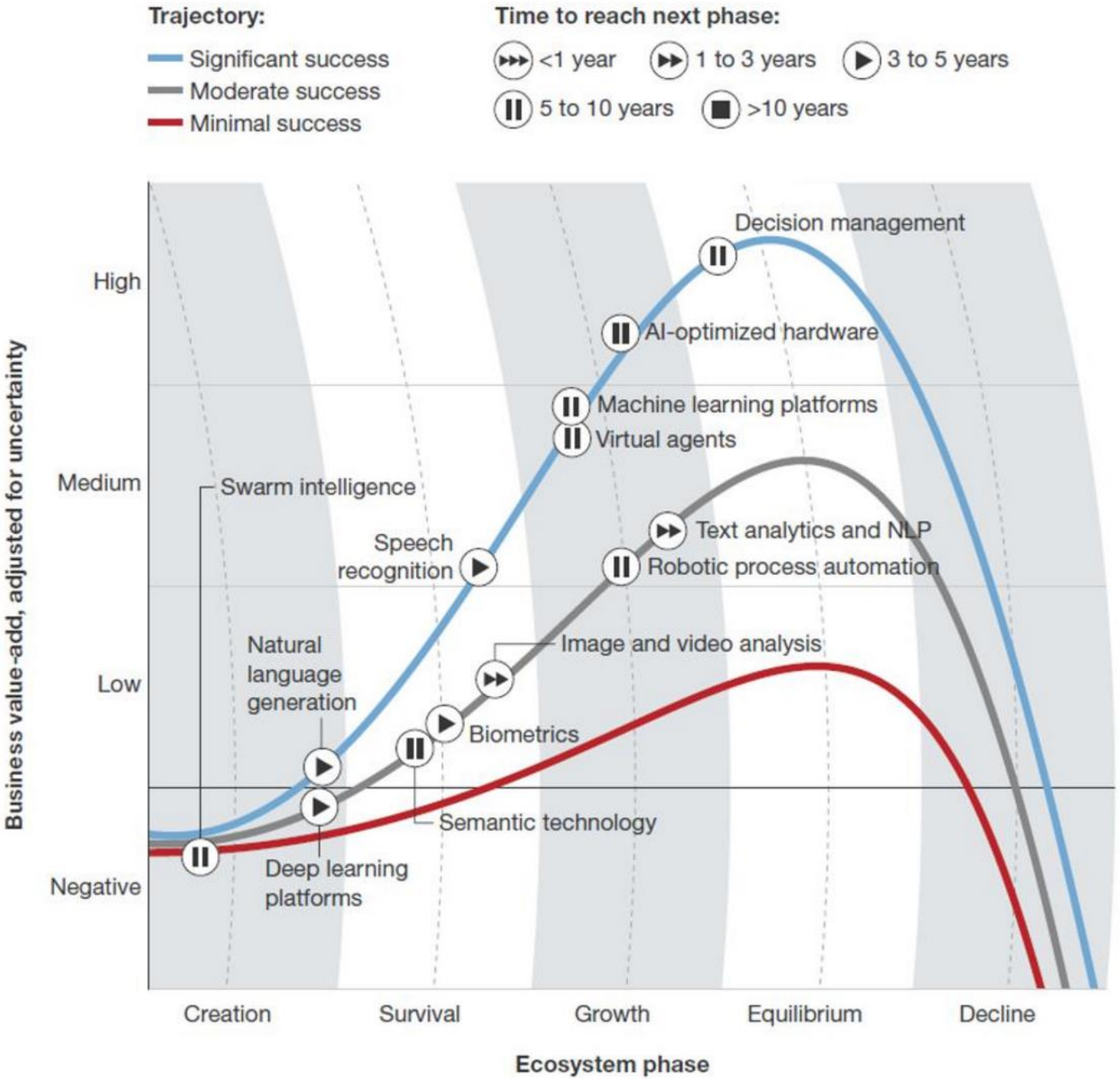
Trajectory:
Significant success
Moderate success
Minimal success
Time to reach next phase:
<1 year
1 to 3 years
3 to 5 years
5 to 10 years
>10 years
Business value-add, adjusted for uncertainty
High
Medium
Low
Negative
Decision management
AI-optimized hardware
Machine learning platforms
Virtual agents
Swarm intelligence
Speech recognition
Text analytics and NLP
Robotic process automation
Natural language generation
Image and video analysis
Biometrics
Semantic technology
Deep learning platforms
Creation
Survival
Growth
Equilibrium
Decline
Ecosystem phase

- "Near-term opportunities for cognitive systems are in industries such as banking, securities and investments, and manufacturing,"
- "In these segments, we find a wealth of unstructured data, a desire to harness insights from this information, and an openness to innovative technologies.
- Furthermore, the value proposition of cognitive systems aligns well with industry executives' chief priorities.
- For instance, cognitive technologies are being used in the banking industry to detect and combat fraud – consistently a top industry pain point. Meanwhile, in manufacturing, executives cite improving product quality as a top initiative.

http://www.nextbigfuture.com/2017/03/hottest-areas-in-artificial-intelligence.html?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+blogspot%2Fadvancednano+%28nextbigfuture%29&utm_content=FaceBook&m=1

# INFO5992 Understanding IT Innovations

## Week 3: Industry dynamics of Technological Innovation

A/Prof Jinman Kim

Semester 1, 2017

THE UNIVERSITY OF SYDNEY

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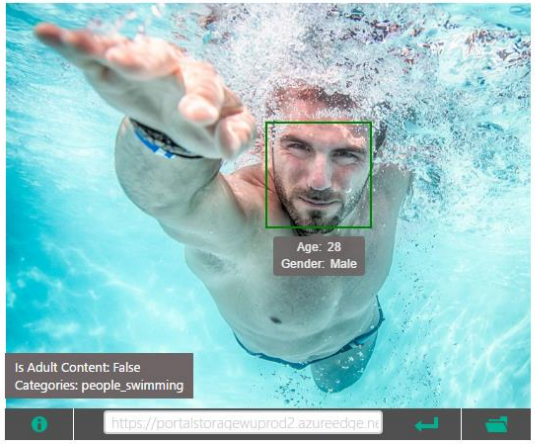
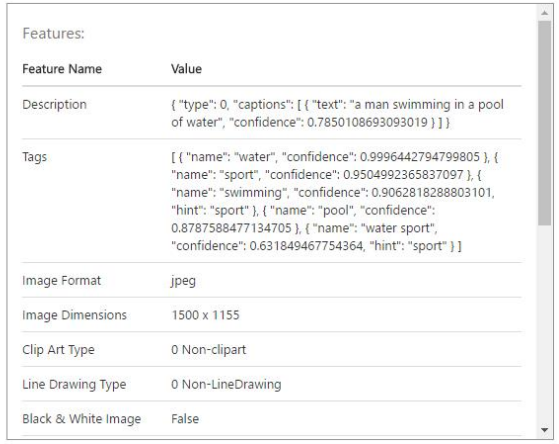
# UoS Outline

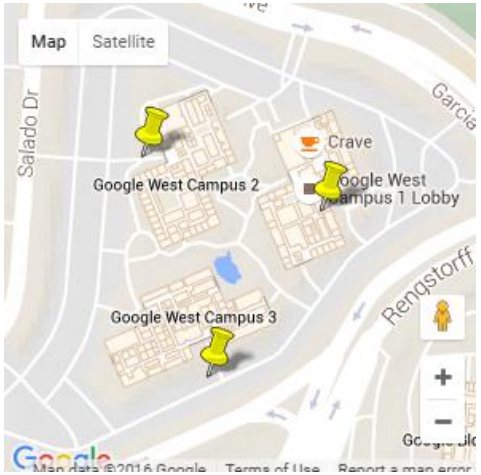
| Week | Lecture Topics | Activity |
|---|---|---|
| 1. 6 Mar | UoS Introduction; Definition of Innovation; Innovation System; Innovation in Australia | *N/A* |
| 2. 13 Mar | Introduction to Technological / IT innovation | ***Tute 1*** *– Massive Open Online Courses – Enabling technologies and Peer-review* |
| 3. 20 Mar | Dynamics of Technological / IT Innovation; Source of Innovation; Adoption of Technology; Dominant Design | ***Tute 2*** *– Design Dominance in the Smartphone market* |
| 4. 27 Mar | Disruptive Innovation; Industry Value Chain; Value Network analysis | ***Tute 3*** *– Innovative Tech Practice – Cognitive services*<br>*Group Presentation Introduction – Topics Released* |
| 5. 3 Apr | Distributed innovation I: Open / Closed innovation; Platform innovation; Web APIs; Crowdsourcing / crowdfunding | *Mid-semester Quiz*<br>*Group Presentation – Topic Selection*<br>*Individual Assignment Introduction* |
| 6. 10 Apr | Distributed innovation II: User innovation; Free and Open source software; Open Data | ***Tute 4*** *– Innovative Tech Practice – Open source Geolocation and Maps* |
| | ***Easter (Break)*** | |
| 7. 24 Apr | Innovation ecosystem; Sydney's innovation ecosystem | Group Presentations I – IT Innovation Case Studies<br>*Peer-review of Group Presentations* |
| 8. 1 May | Group Presentations II – IT Innovation Case Studies | *Peer-review of Group Presentations* |
| 9. 8 May | Group Presentations III – IT Innovation Case Studies | *Peer-review of Group Presentations* |
| 10. 15 May | Innovation in Industry sectors **(Lawrence – Microsoft* Dr Ashnil Kuamr)** | ***Tute 5*** *– Judging IT Innovation (Example in the Healthcare sector)* |
| 11. 22 May | Organisational Culture; Structure supporting innovation **(Bill Simpson – Data61)** | ***Tute 6*** *– Sharing Economy*<br>*Individual Assignment Submission* |
| 12. 29 May | Innovation by Start-up companies and Opportunities | ***Tute 7*** *– Business Model Canvas* |
| 13. 5 Jun | UoS Review | *UoS comments / questions* |

# Tutorials

- *Massive Open Online Courses – Enabling technologies and Peer-review*
- **Design Dominance in the Smartphone market**
- *Innovative Tech Practice – Cognitive services*
- *Innovative Tech Practice – Open source Geolocation and Maps*
- *Sharing Economy*
- Judging Innovation *(Example in the Healthcare sector)*
- Business Model Canvas



# Agenda

- Sources of innovation: Transforming creativity into innovation
- Diffusion of innovations
- Improvements in technology performance
- Modelling maturity and adoption of technology
- Product Category
- Design dominance:
  - What is it?
  - Why does it happen?
  - What factors influence a design becoming dominant?

- Case Study / Tutorial: Design Dominance in the Smartphone market

# Sources of innovation

Transforming creativity into innovation

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# Week1 Recap – Transforming creativity into innovation

- Innovation involves (1) a new idea that is (2) applied commercially.

- "Invention is the first occurrence of an idea for a new product or process while innovation is the first attempt to carry it out into practice."- Fagerberg, 2004
- Innovation is "Ideas successfully applied" – Dodgson & Gann, 2010.

- So, creativity by itself is not enough for innovation

- Innovation requires combining creativity with resources and expertise for building new products, services, processes or business models.

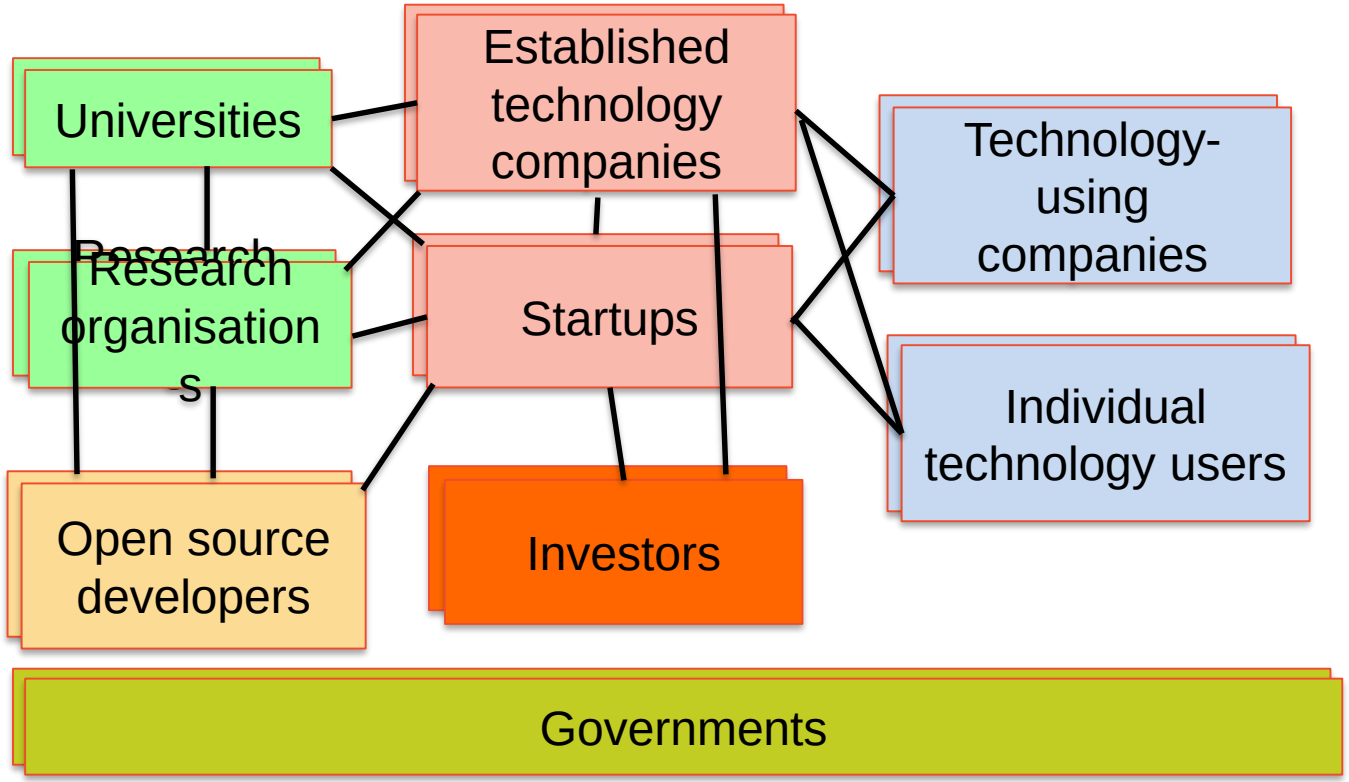
# Week2 Recap – Innovation as "Creative Destruction"

- Economy is in state of constant tumultuous change
- Innovation propels the economy
- Entrepreneurs within new firms drive innovation:
  - All companies react adaptively to change
  - Creative responses to change come **via innovative acts by entrepreneurs**
- Different forms of innovations:
  - New products; New organisations (e.g. mergers); New markets
  - Innovating firms emerge after **technological breakthrough**

# Transforming creativity into innovation

- This transformation happens in:
  - Established companies
    - Technology or product development in R&D departments
    - Process innovation throughout the company
    - Business model innovation in business units
  - Startup companies
  - Universities
  - Research institutions
  - Individuals
- It also happens through the interactions between them (e.g. distributed collaborative innovation – more on this in a later lecture).

# IT innovation ecosystem



# **Diffusion of innovations**
through society

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# Diffusion of innovation

**Everett Rogers**, Sociologist and communications scholar (1931 – 2004)

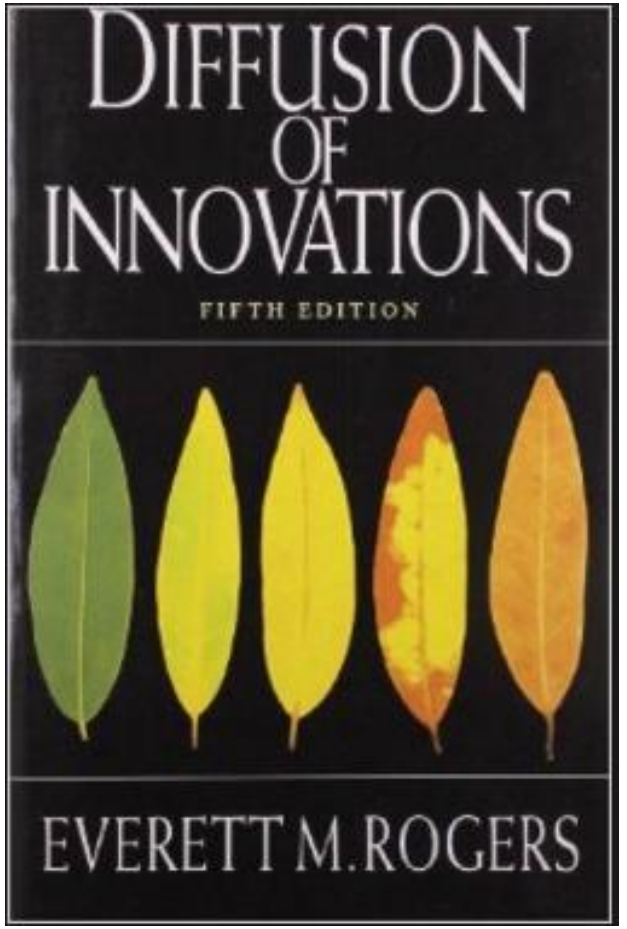
Hybrid seed corn

Image: burpee.com

- Originally a rural scholar studying agricultural innovations
- Interested in why some farmers adopted new innovations and some others didn't
- He noticed that some farmers did not adopt innovations even if economically sensible

# Diffusion of innovation

- Influential book: “Diffusion of Innovations” (1962), 5th edition (2003)
- “New ideas tend to follow a pattern in entering society” i.e. how they “diffuse” into society
- The concepts are still widely used by governments and companies in understanding, planning and influencing adoption of new products



# The Innovation-Development Process

Stages in the Innovation-Development Process:

(not always all used and not necessarily in this order)

1. Recognising a problem or need
2. Basic and applied research:
   - Scientific investigation (applied=addressing practical problem)
3. Development:
   - Putting a new idea into a form to meet the needs of users
4. Commercialisation:
   - Production, manufacture, packaging, marketing, distribution
5. Diffusion and adoption:
   - Spreading innovation through members of a social system
6. Consequences

*Source: Rogers (2003)*

# Diffusion of innovation

- **Definition:** "Diffusion is the process in which an innovation is communicated through certain channels over time among the members of a social system." (Rogers, 1962)

- "Diffusion is the process in which (1) **an innovation** is (2) **communicated through certain channels** (3) **over time** among (4) **the members** of a (5) **social system.**" (Rogers, 1995)

# Diffusion of innovation

A product innovation, process innovation, business model innovation etc

By word-of-mouth, TV, trade journals, Internet etc.

"Diffusion is the process in which (1) **an innovation** is (2) **communicated through certain channels** (3) **over time** among (4) the **members** of a (5) **social system**."

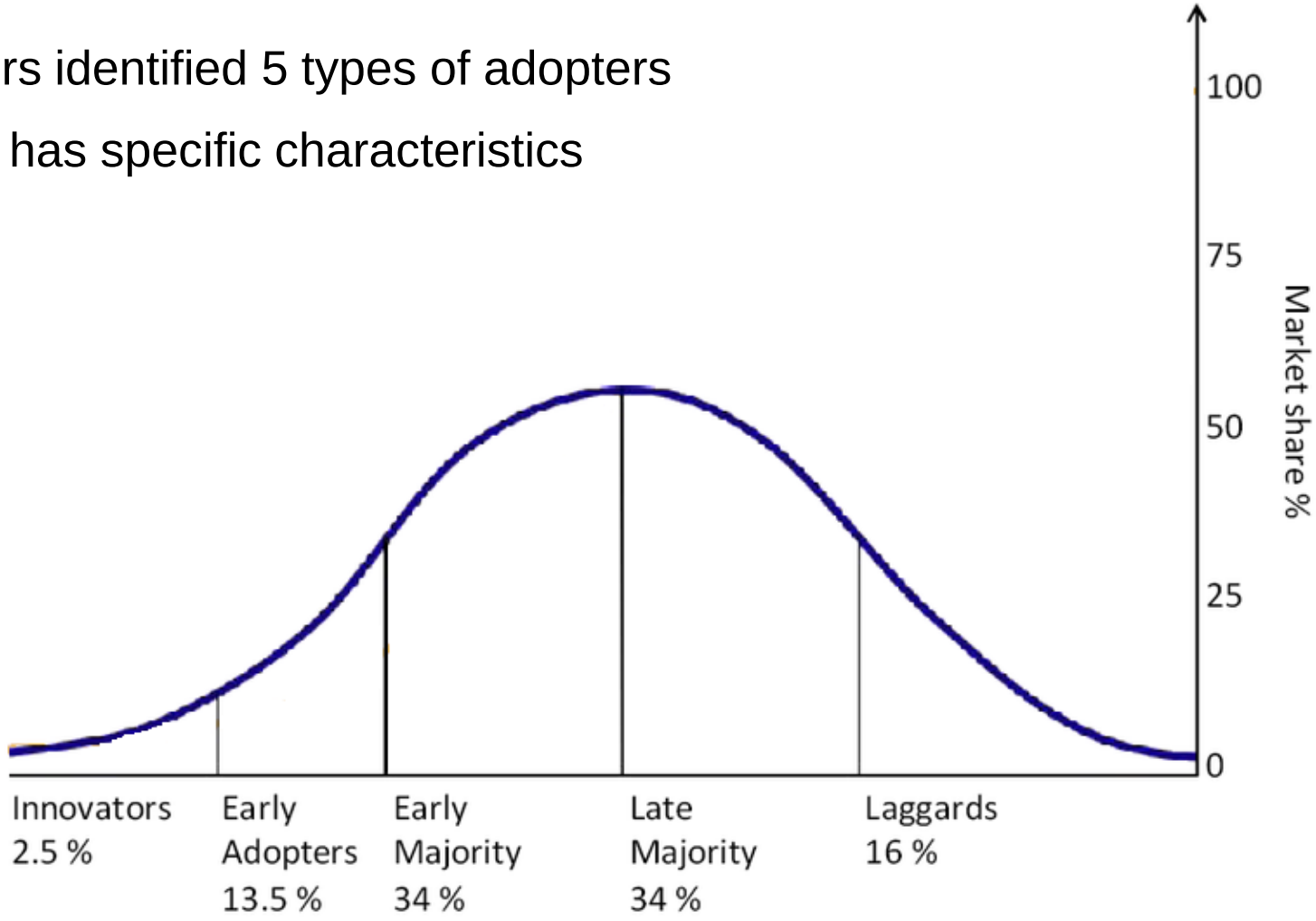
This is the "rate of adoption" of an innovation.

There are different types of people – some tend to adopt innovations early after initial availability, others later.

A social system has external influencers (eg media, govt) and internal influencers (eg opinion leaders)

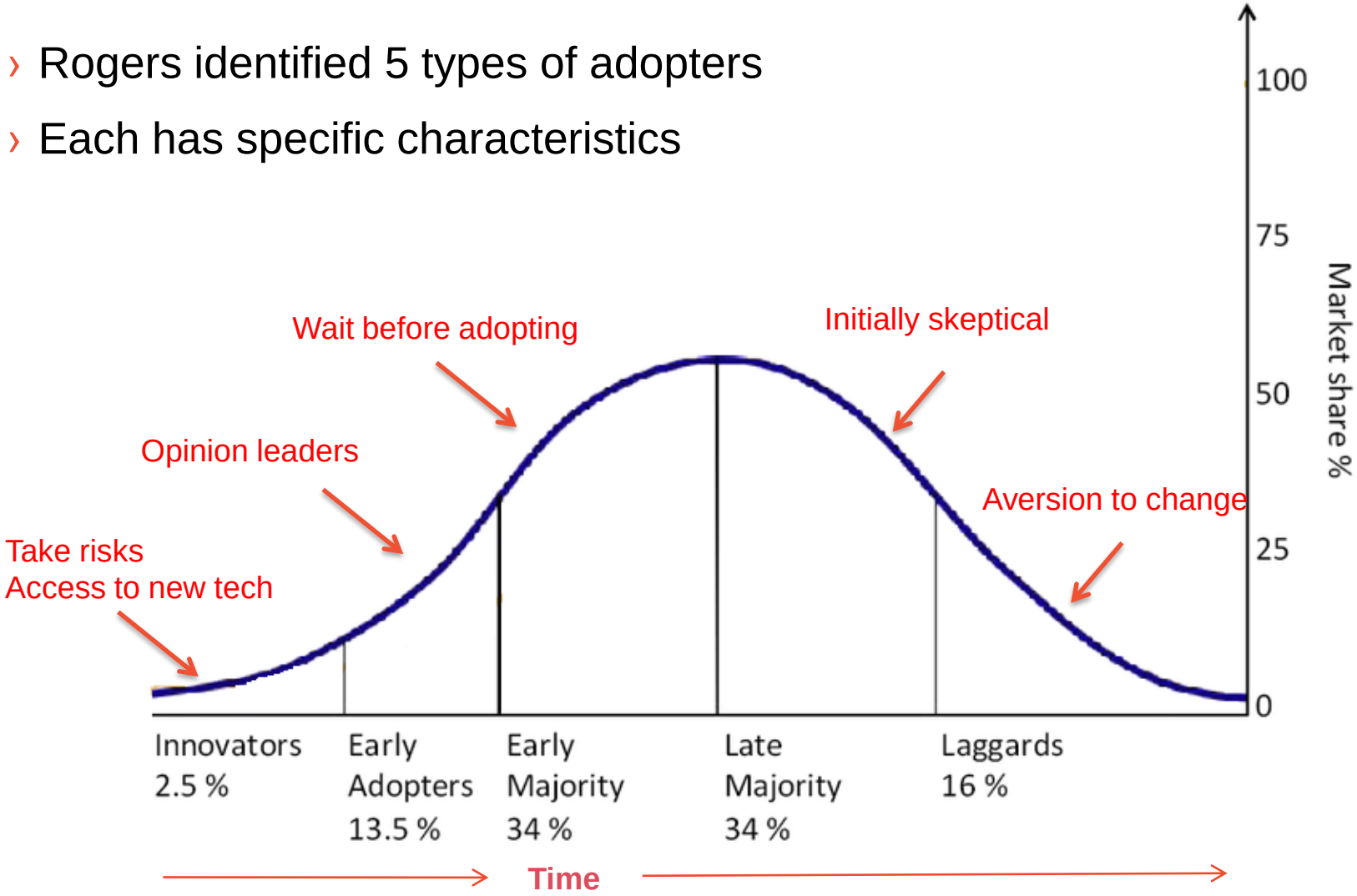
# Technology Adoption Lifecycle Model

- Rogers identified 5 types of adopters
- Each has specific characteristics



# Technology Adoption Lifecycle Model

- Rogers identified 5 types of adopters
- Each has specific characteristics



# "The Chasm"

- From "Crossing the Chasm" book by Geoffrey Moore
- Discusses how hard it is for companies making high-tech products to get from early adoption to mainstream and provides approaches to help

Geoffrey Moore,
High tech consultant

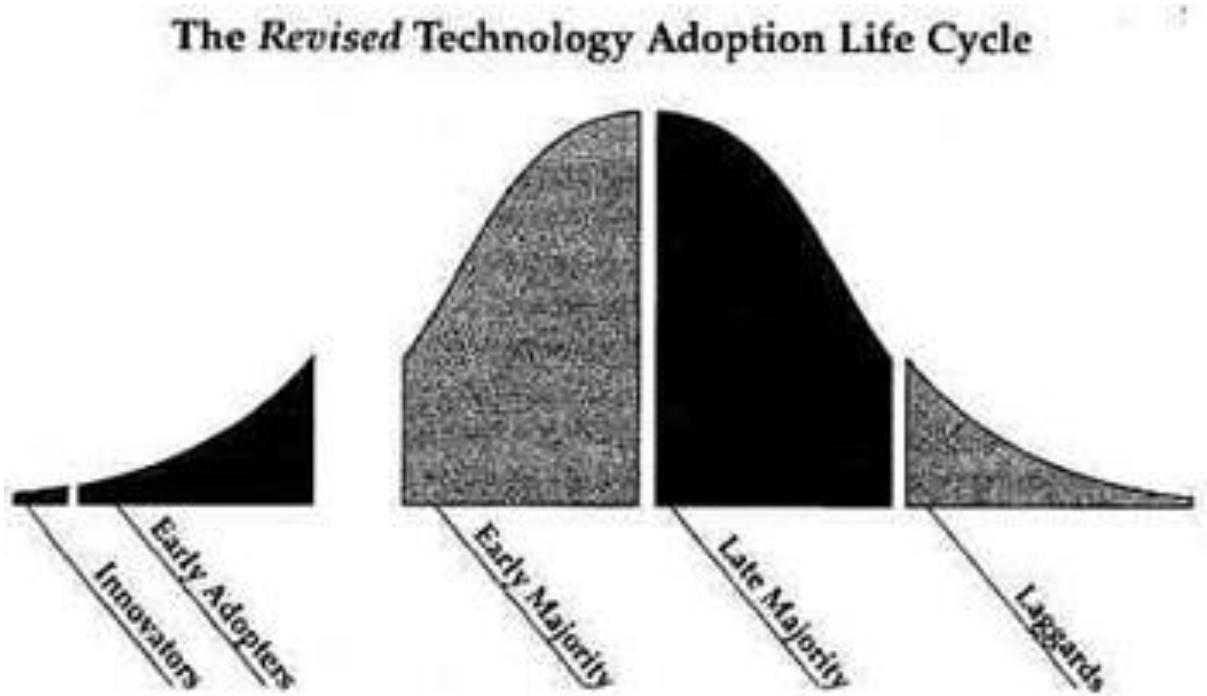
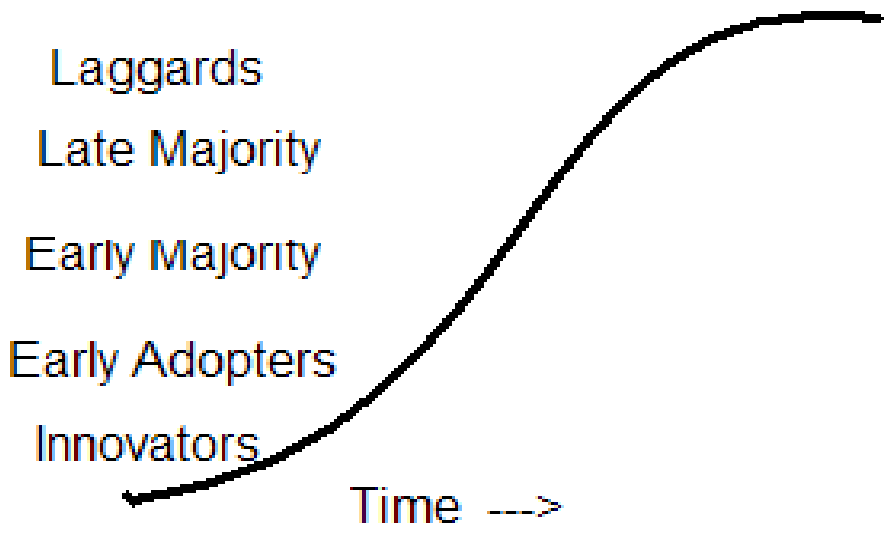



Figure from "Crossing the Chasm"

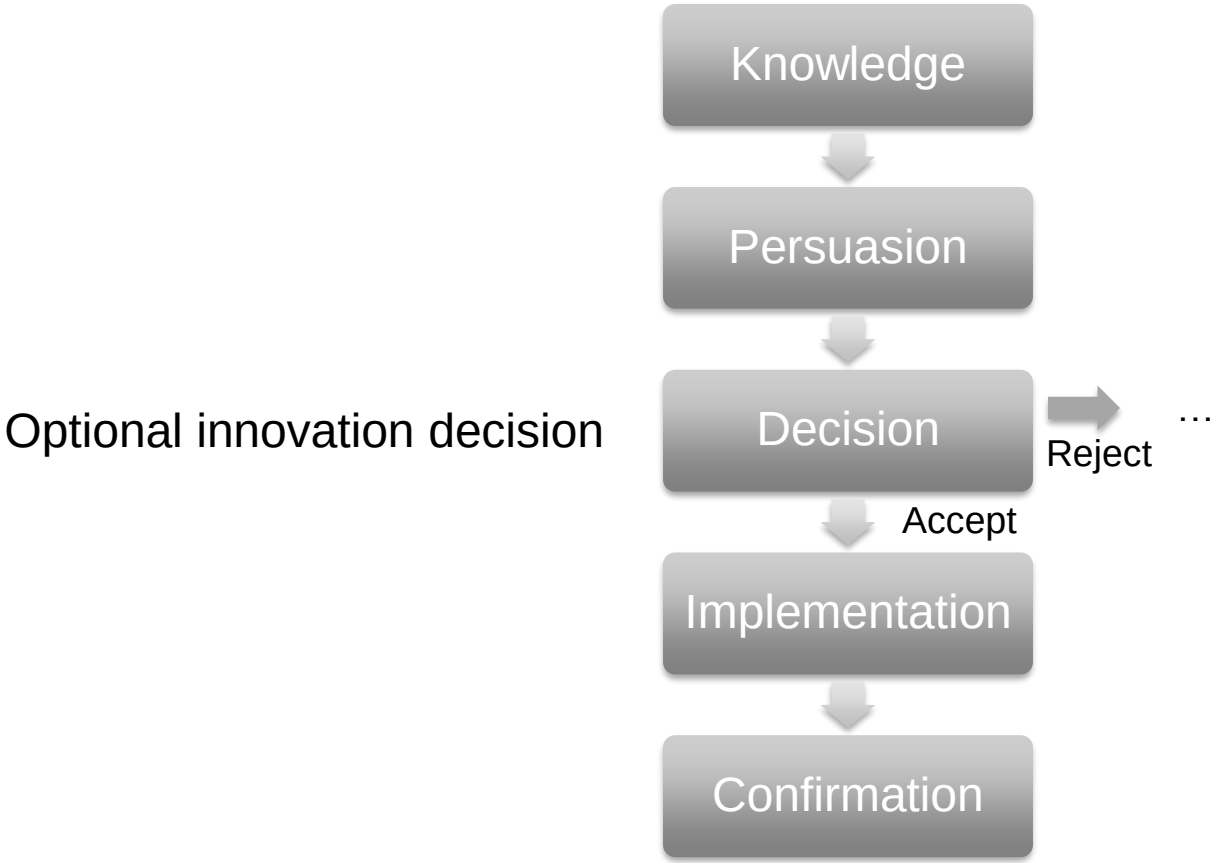
# Cumulative adoption curve

- Another way of representing the same information (cumulatively)
- This is known as a "technology adoption S-curve"



# The process of innovation adoption: Adoption by individuals

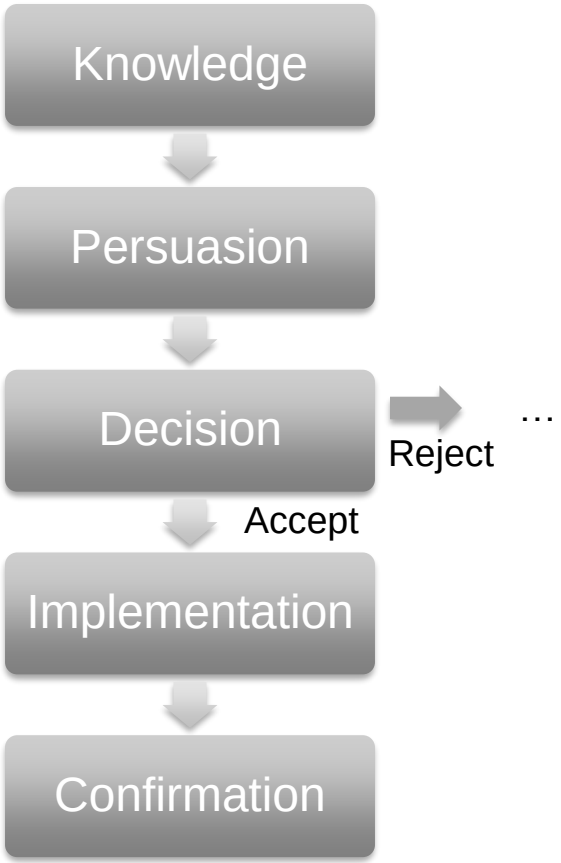
- From Rogers:
  - The adoption of an innovation by an individual:



# The process of innovation adoption: Adoption by organisations

– The adoption of an innovation by an organisation:

Collective innovation decision
Or
Authority innovation decision



# Rate of adoption of an innovation

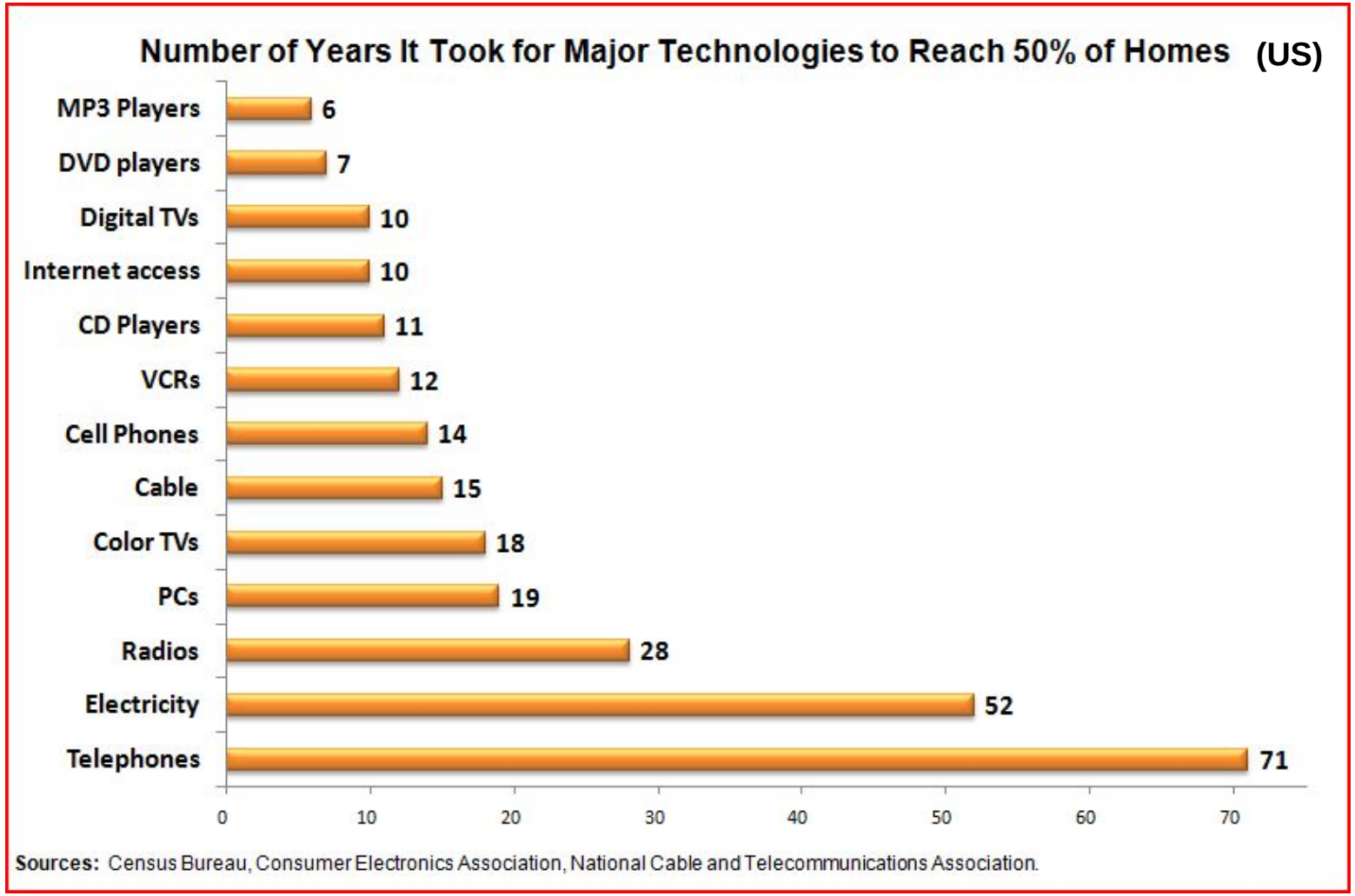
- Perceived attributes of innovations that determine rate of adoption:
  - Relative advantage – extent it is viewed as better than the idea it supercedes.
  - Compatibility – extent it is perceived as consistent with the existing values, past experiences, and needs of potential adopters.
  - Simplicity (vs Complexity) – extent it is perceived as simple to understand and use.
  - Trial-ability – degree it may be experimented with on a limited basis (low cost, "free trial offer").
  - Observe-ability – extent to which results of an innovation are visible to others, who imitate. (Rogers. 2003 p.12-16)
- Rate also affected by:
  - Extent of Change Agents' Promotion Efforts (eg marketing)
  - Other factors

*Source: Rogers (2003)*

# Rate of technology adoption

– Technologies being adopted faster now

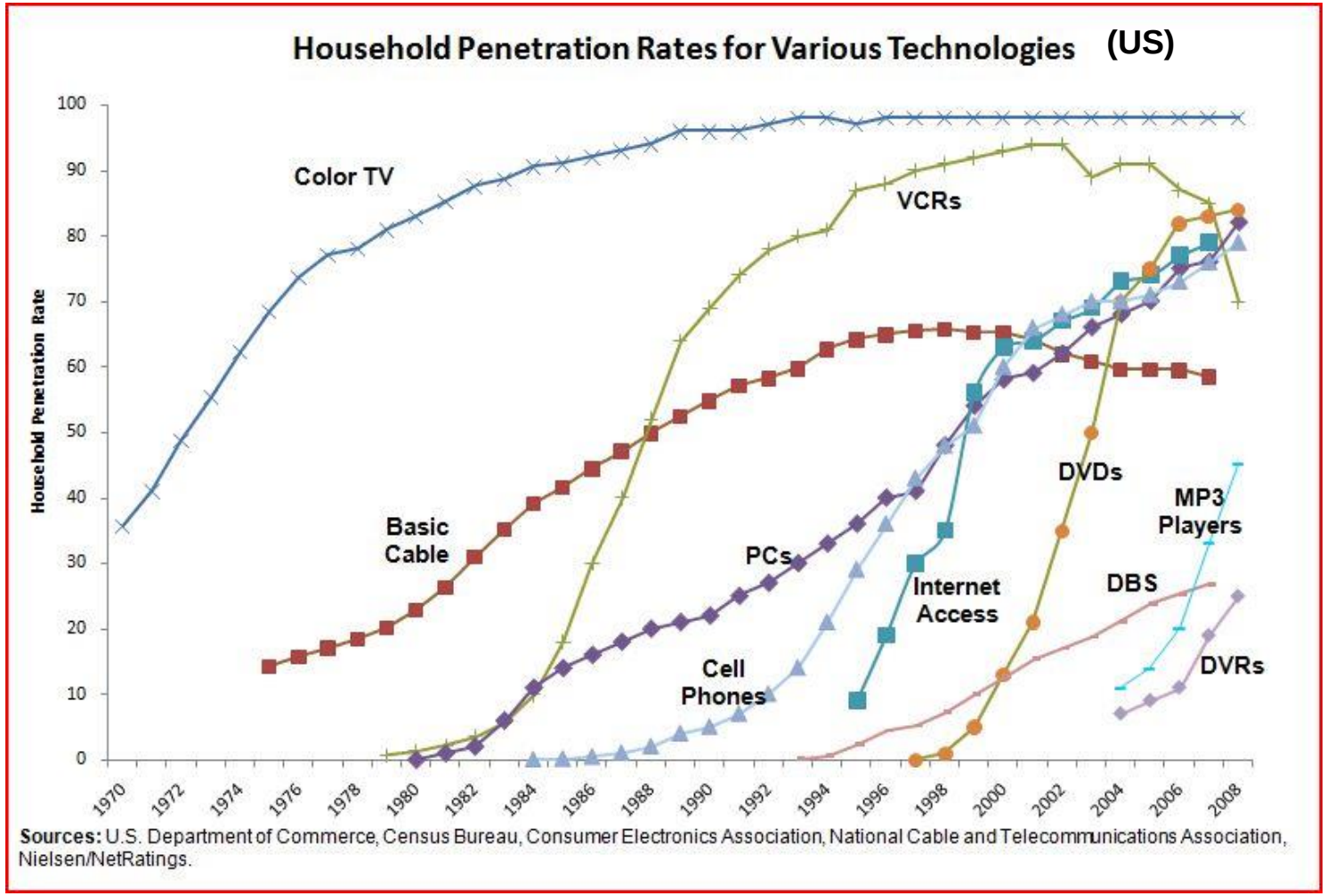




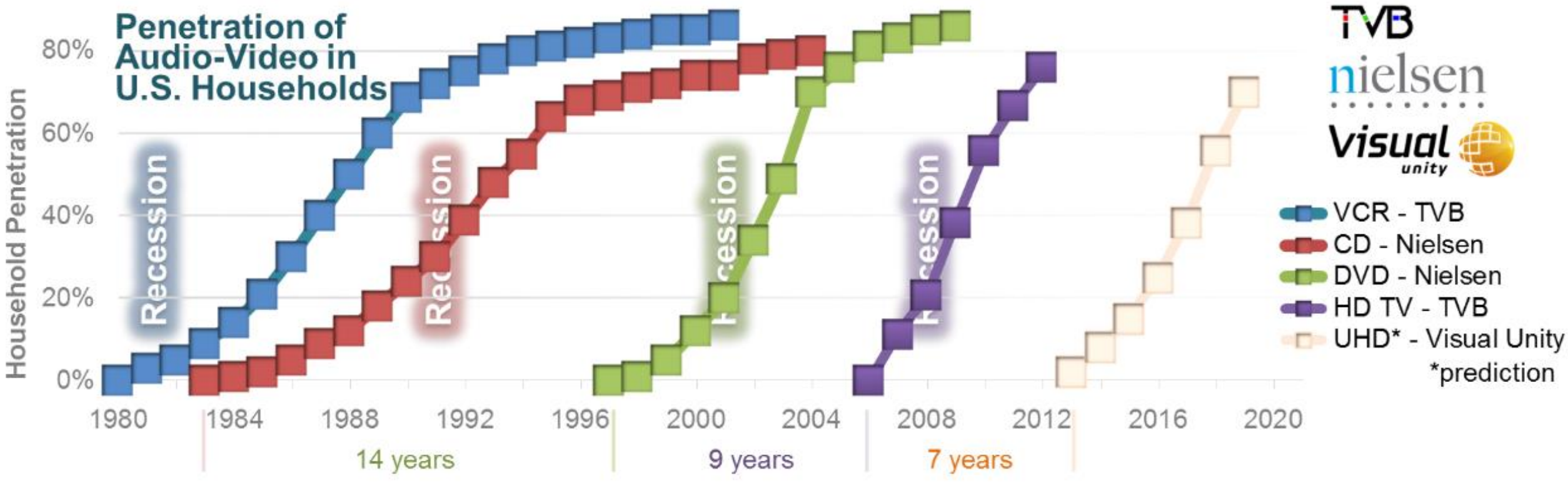
# Rate of technology adoption

- Technologies get to 50% penetration more quickly but often don't reach saturation due to other technologies replacing them (e.g see VCRs).





# Question Adoption rate of 4K TV?




Adoption rate for 4K TV https://dusil.com/2013/07/15/building-a-case-for-4k-ultra-high-definition-video/

# Innovations do not always diffuse successfully

- QWERTY keyboard layout:
  - Designed for typewriters (1873)
  - Common key pairs far apart so don't jam
  - But very slow for typists
- Dvorak keyboard layout:
  - Typewriters had improved so no longer jammed
  - People tried for a new keyboard design for faster typing
  - Dvorak layout design (1932)
  - Designed based on reducing finger movement
  - Trials showed significant improvements in speed
  - Despite advantages, has not been widely adopted


Key jam

image: pipeandgrumble.blogspot.com.au

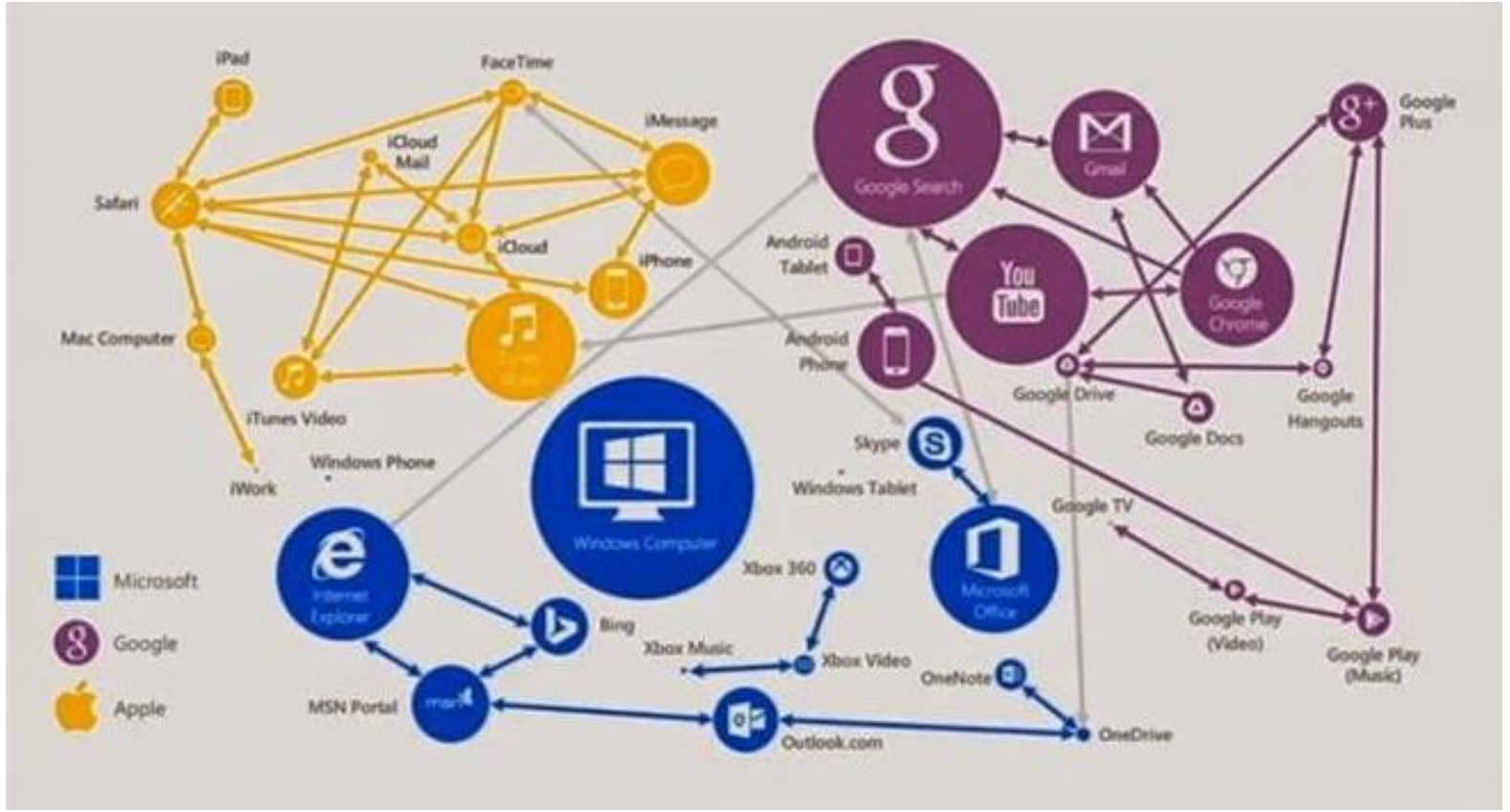
Dvorak keyboard

# Question?

- The Dvorak keyboard was found to allow faster typing.
- Why was it not widely adopted?

- ‘lock in”
- claims that the dominance of the QWERTY is due to market failure brought on by QWERTY's early adoption
- Retraining
- Standard
- Apple ecosystem ?

# Lock into an Ecosystem?




http://www.swedishtechinvestor.com/2015/04/the-battle-of-tech-ecosystems-amazon.html

- More in a later lecture!

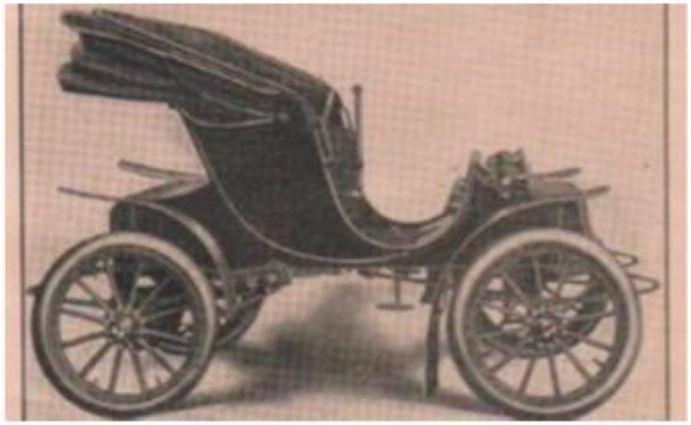
# The emergence of new product categories

# Emergence of new product categories: Example

Ford's Quadricycle (1896)

King's motocycle (1896)

Horseless carriage (1905)



Columbus electric buggy (1905)

# Emergence of new product categories: Example

Ford's Quadricycle (1896)

Describes the design
(4 wheels)

# Emergence of new product categories: Example

King's motocycle (1896)

From newspaper competition to name the product category

# Emergence of new product categories: Example

Horse-drawn carriage (1905)

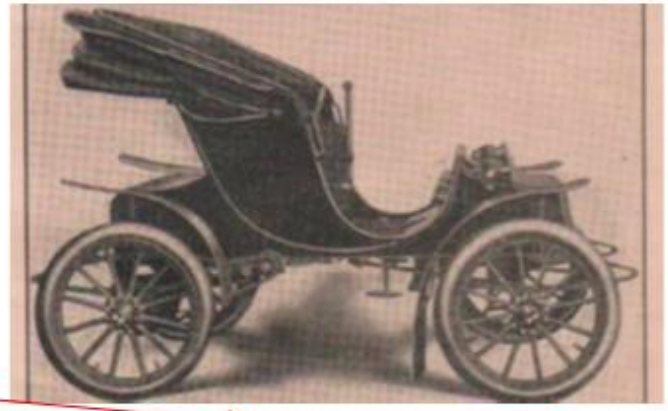
Horseless carriage (1905)

References the previous product category and emphasises what's different (no need for a horse)

# Emergence of new product categories: Example

Horse and buggy

References the previous product category and emphasises what's different (new technology)



Columbus electric buggy (1905)

# Emergence of new product categories: Example

All became the product category “automobile” (later “car”)

Horseless carriage (1905)

Columbus electric buggy (1905)

# Definition: Technology

- Definition of "Technology":
  - "the practical application of knowledge especially in a particular area"
    - (eg medical technology)
  - "a manner of accomplishing a task especially using technical processes, methods, or knowledge"
    - (eg new technologies for information storage)
    - http://www.merriam-webster.com/dictionary/technology

# Definition: Product Category

- "A product category is all the products offering the same general functionality."
  - http://kwhs.wharton.upenn.edu/glossary/

- A socially constructed partition of products that are perceived to be similar and in which firms choose to position their products
  - based roughly on an excerpt from the reading: "Perfect timing? Dominant category, dominant design, and the window of opportunity for firm entry"
  - http://onlinelibrary.wiley.com/doi/10.1002/smj.2225/full

# Emergence of product categories: Recent examples

Tablets

Smartphones

# Product categories emerging now


Fitness tracker?

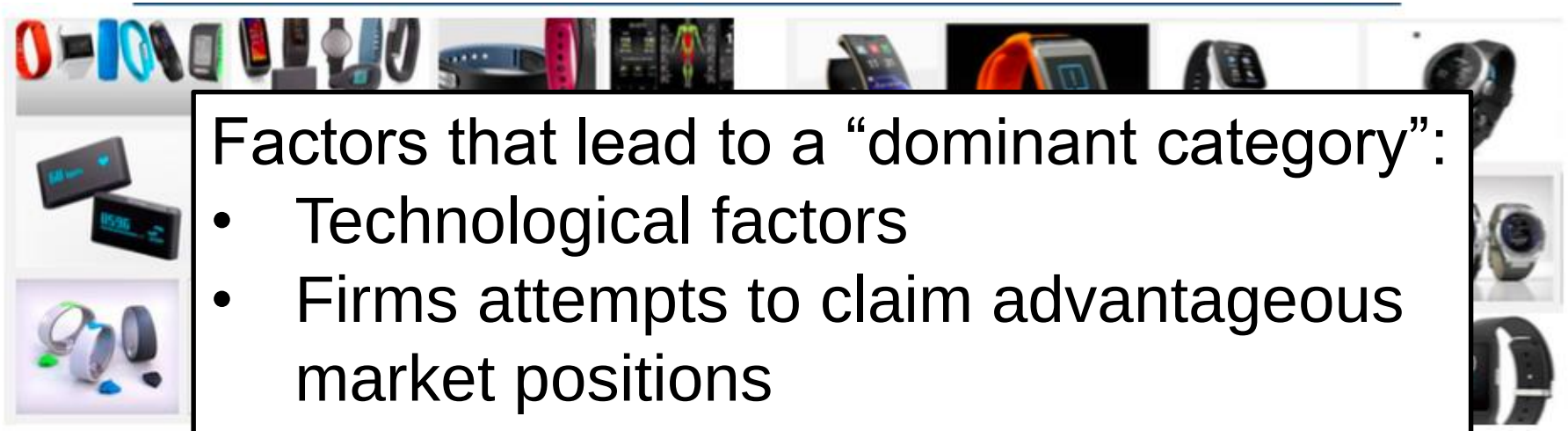
Smartwatch?

UBER

Ride-sharing apps?

Driverless cars/self-driving cars?

# Product categories emerging now



Factors that lead to a “dominant category”:

- Technological factors
- Firms attempts to claim advantageous market positions
- Stakeholders (eg customers, producers, critics, and regulators) making sense of emerging category

*Suarez et al (2015)*

UBER

Ride-sharing apps?

Driverless cars/self-driving cars?

# Dominant Design

# Example: The Personal Computer – The IBM PC

- Developed in < 1 year in a "skunkworks" project at IBM's Boca Raton Florida facility.
- Had rapid development cycle because of use of "off the shelf" parts for disk drives, processors, memory, operating system etc.
  - Processor was from Intel
  - Operating system from Microsoft
- IBM published the bus (connects internal components of a computer) and BIOS (basic input/output system) specifications:
  - This was to drive generation of add-ons…
  - … but also enabled competitors to make “compatible” PCs

# The IBM PC

The first IBM PC (the 5150 released in 1981)

*Source: http://www.vintage-computer.com/ibm_pc.shtml*

# The IBM PC

- 1981: First IBM PC released
- 1982: First roughly IBM compatible PC released (Columbia's MPC)
  - Used many of the same components as the IBM PC (but higher specification)
  - Used the published bus interfaces and wrote own BIOS
- By the end of 1982, Eagle Computer and Compaq had released compatible PCs
- With companies able to make their own PCs including BIOSes and being able to license the OS from Microsoft, IBM had many competitors producing similar products at lower cost
- By 1986, IBM compatible PCs had >50% of market share
- By 1990, IBM lost its lead in PC sales
- Despite losing on PC sales, IBM realised the opportunity of the scale of the market and was successful in licensing patents related to various components of the PC

# Some factors leading to dominance of the IBM PC architecture

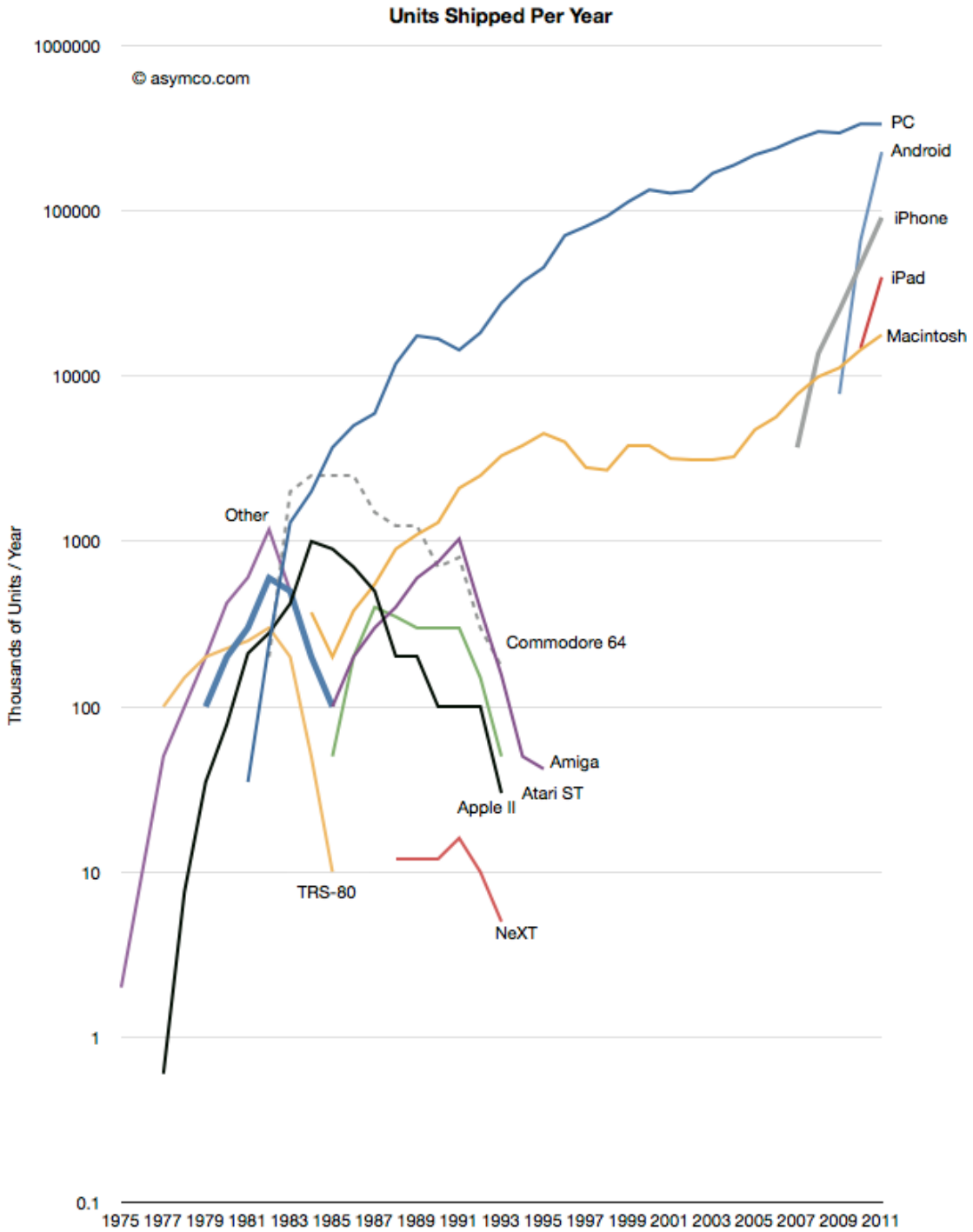
- The IBM PC architecture became the dominant design even though the IBM PCs and compatibles were not the most advanced personal computer
- Some factors in its initial rise to dominance:
  - **Open architecture with (mostly) specified interfaces**
  - Easily available components
  - Many different vendors with compatible system so a lot of competition on price
  - Software compatibility across a large range of vendors

# The difficulty of displacing a dominant design: The NeXT vs the IBM PC


- 1985: Steve Jobs resigned from Apple
- Formed NeXT with 5 other ex-Apple staff
- Made a powerful computer with high processing, memory and graphics.
- 1988: The NeXT Computer was released.
- Far more technologically advanced than IBM Compatibles and Macs of the time.
- Poor sales.

- Could not compete with the installed base and complementary product value of IBM-compatible PCs.

- 1993: Stopped hardware production; focused on software (their Unix-based NeXTStep operating system).
- 1996: Apple bought NeXT.
- Steve Jobs became interim CEO and later CEO.
- NeXTStep later became Mac OS X

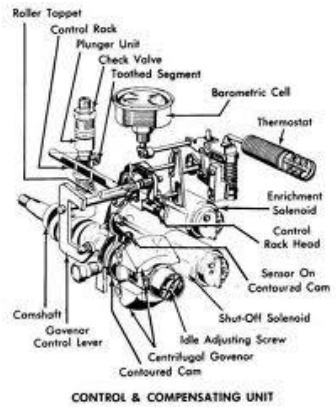


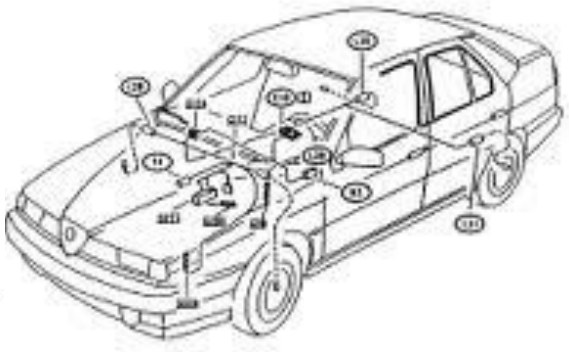

http://www.asymco.com/2012/01/17/the-rise-and-fall-of-personal-computing/

# The concept of Design Dominance

James M. Utterback, Engineering & Technology Mgmt at MIT

- Came from a study of the automotive industry in the 1970s (by Utterback and Abernathy)
- Their model allows explanation and prediction of the dynamics of **product and process innovation** in the industry
- A "Dominant Design" is the design around which the industry settles.



# The concept of Design Dominance

1. When a new product is first introduced, it is usually “made-to-order”
2. If the product attracts significant market share (through whatever path – technological superiority, good marketing etc), it forces imitation by competition
3. Competitive products are released
4. There is pressure to reduce costs in components leading to commoditisation of components (for mass production)
5. This requires there to be a “dominant design” with components fitting within this design
6. The dominant design may be established by the first company to release a product, a later arrival or by a standards body (e.g., ISO and IEEE)
7. The dominant design becomes a base for the whole industry
8. This design may become a De facto standard or De jure

# The phases of Design Dominance

- Utterback and Abernathy talked about two phases in reaching design dominance:
  - The fluid phase:
    - Uncertainty about the technology and its market
    - Firms experiment with different product designs
  - The specific phase (i.e. innovations are specific to the dominant design):
    - There is a stable architecture (dominant design) for the technology
    - Firms focus on incremental innovations to improve components
    - Firms focus on process innovations to produce them efficiently and effectively

# Dominant Designs in IT

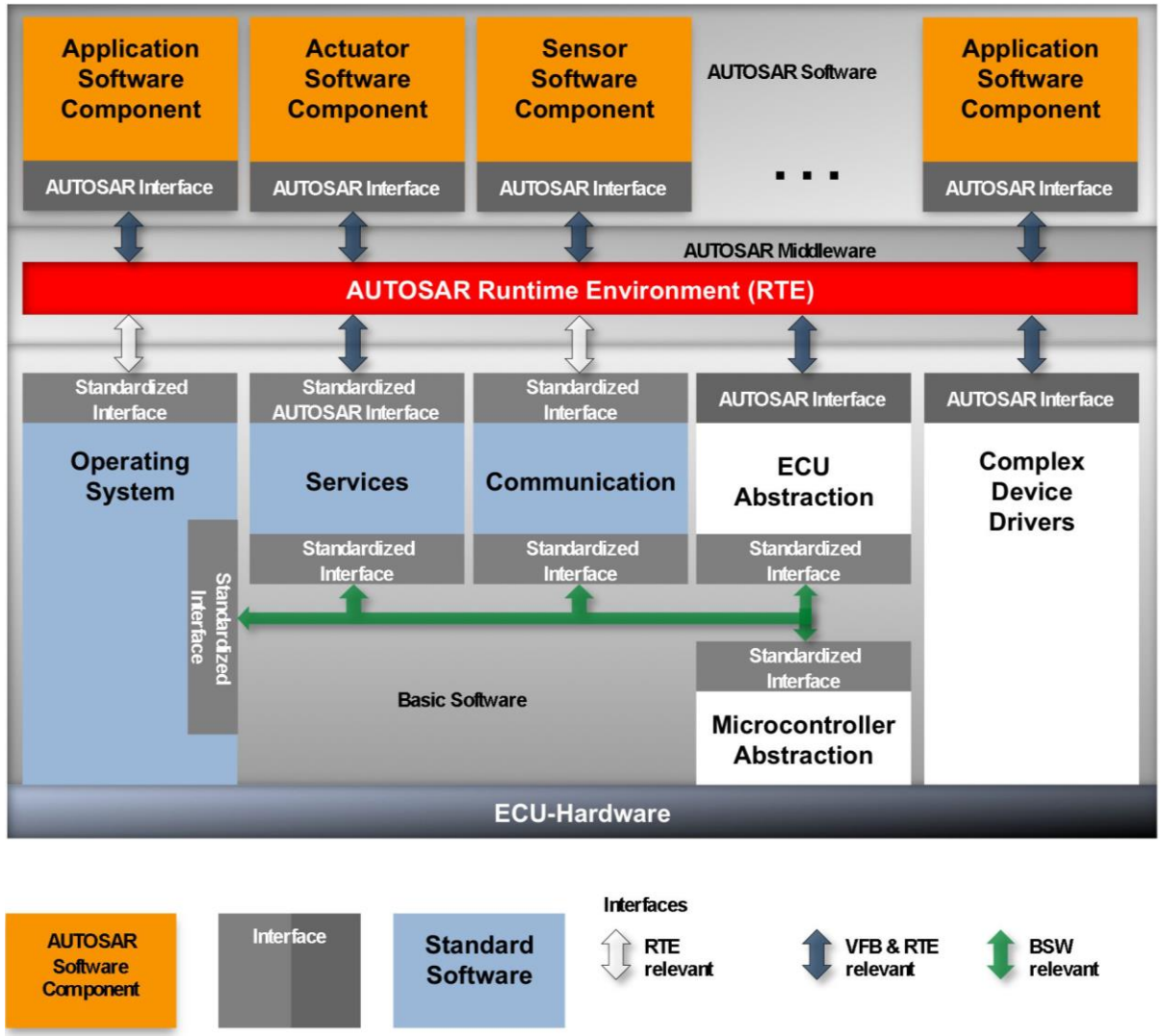
- The concept was traditionally used for industries creating physical products (eg cars, glass, cement)
- Principles also apply to software development:
  - The software industry and software users benefit from using common designs

# Examples of dominant designs in IT

- IBM PC Architecture
- WIMP (window, icon, menu, pointing device)
- Internet protocol stack (TCP/IP, etc)
- The core web standards (HTML, HTTP, URL)
- LAMP (Linux, Apache, MySQL and Perl/PHP/Python)
- Relational Database Management Systems
- **Apple iPhone application architecture**
- **The Android architecture**

- **Note: Dominant Designs are not specific products, they are architectures.**

# And still cars…
# (but now the software on them)




AUTOSAR:
AUTomotive Open
System ARchitecture

# Design Dominance and Technology Cycles

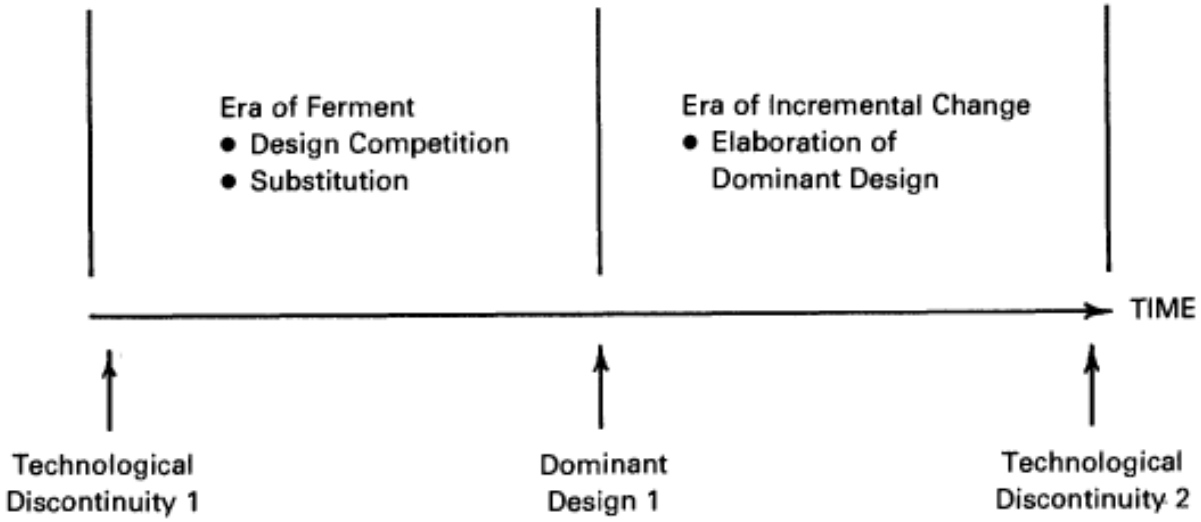
Michael L. Tushman, Business Management at Harvard Business School

- Further developed in the 90s (Anderson and Tushman)
- Work based on studies of the US minicomputer industry (etc)
- A new technology may cause a "technological discontinuity" in the industry leading to a new cycle
- They showed that technological discontinuities were competence-enhancing or competence-destroying for particular companies

*Source: Anderson and Tushman (1990)*

# Design Dominance and Technology Cycles

**Figure 1. The technology cycle.**




Note: If time is short between technological discontinuities, no dominant design emerges

*Source: Anderson and Tushman (1990)*

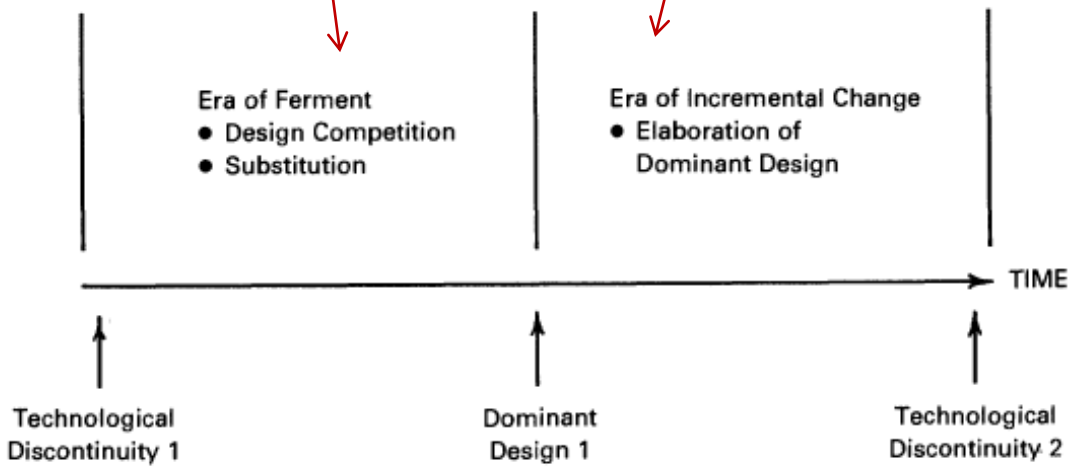
# Design Dominance and Technology Cycles

- In the cases studied by Anderson and Tushman, they found that:
  - The dominant design was never in the same form as the original innovation
  - The dominant design was not the leading edge of the technology
  - The dominant design had the features that met the needs of the majority of the market
  - Example: The IBM PC (and clones) were not the most advanced or the cheapest technology at the time it rose to dominance.

# Design Dominance and Technology Cycles

Companies focus on:
- Custom solutions
- Experimentation with different product designs

Companies focus on:
- Increased market penetration
- Improved product functionality (incremental product innovation):
- Improved production efficiency (process innovation)




The Technology Cycle

*Source: Anderson and Tushman (1990)*

# Design Dominance and Technology Cycles

- During the "era of incremental change", firms typically focus on:
  - Increased market penetration
    - Segment the market offering different models at different price points
  - Improved product/component functionality (incremental product innovation):
    - New features and increased performance (faster, more scalable, etc)
  - Improved production efficiency (process innovation):
    - Lower production prices through simplification of components or process innovation
- This continues until the next technological discontinuity.

# Design Dominance and Technology Cycles

- The era of incremental change accounts for most of the technological process.
- Anderson and Tushman noticed that during the era of incremental change, firms often:
  - stopped investing in learning about alternative designs; and
  - focused on developing competencies related to the dominant design.
- This helps to explain why firms entrenched in a dominant design often don't recognise or react to discontinuous technologies:
  - Eg Microsoft's and AOL's apparent slowness in identifying and acting on the importance of the Internet

# Standards for dominant designs

- Sometimes standards are used to encourage or maintain a dominant design in an industry
- Standards may be defined by:
  - a formal standards organisation ("de jure"); or
  - wide public acceptance or market forces ("de facto")
- Standards may be for controlling:
  - Quality (products/services have required characteristics); or
  - Compatibility (products/services can be used with other products/services)
    - Compatibility standards can be:
      - Sponsored (a party or parties hold a proprietary interest in a particular technology and in the adoption of it by others); or
      - Non-sponsored
-

# De jure and defacto standards

| De jure standards | |
|---|---|
| **Standards authority** | **Example standards** |
| W3C (World-wide Web Consortium) | HTML, URL, CSS, XML |
| ISO (International Organisation for Standardisation | MPEG, CD data format, Office Open XML, computer languages |
| ANSI (American National Standards Institute) | C |
| IETF | TCP, IP, HTTP, JSON |
| Industry consortia | USB, BluRay |

| De facto standards | |
|---|---|
| **Company** | **Example Standards** |
| Microsoft | Word Doc formats; PowerPoint formats |
| Adobe | PDF (later became de jure standard), Flash |
| IBM | PC architecture |
| Community (with guidelines set by Sun) | Java |
| Community (with guidelines set by Google) | OpenSocial |

# Why Dominant Designs Are Selected

- **Market forces: Increasing returns to adoption**
  - For many technologies (especially in IT), the more a technology is adopted, the more valuable it becomes to the industry because of:
    - **Learning effects:**
      - The industry gains knowledge in all aspects of the technology
    - **Network effects:**
      - The benefit of using a technology increases with the number of users.
- **Government regulations**
  - Sometimes, the government sees the importance of a technology for a nation and regulates a specific dominant design (eg for TV, mobiles)

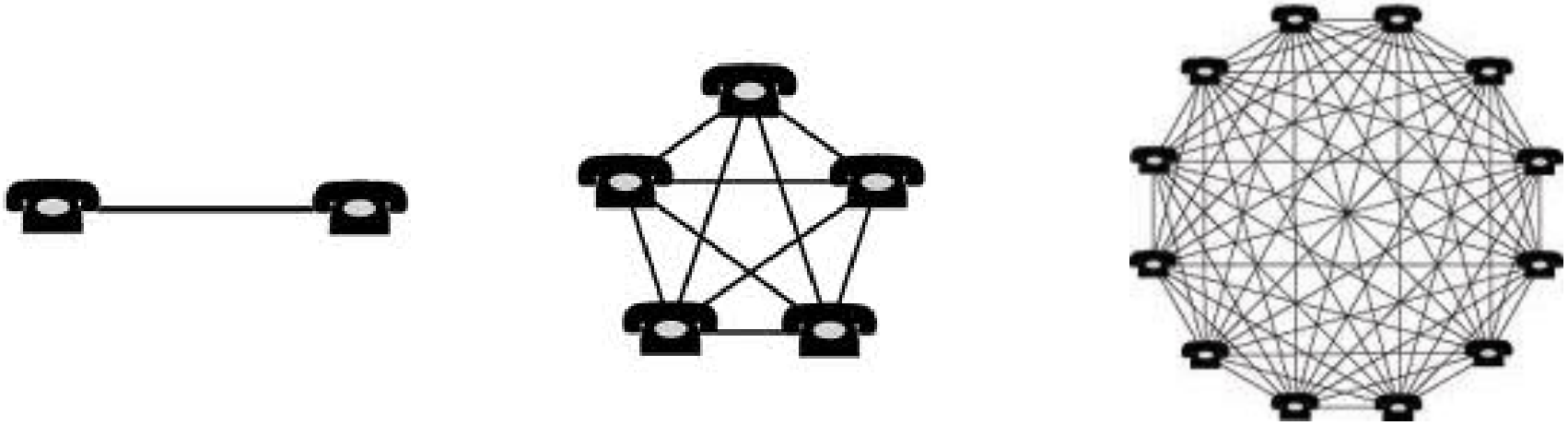
# Why Dominant Designs Are Selected:
# 1) Learning Effects

- **Learning effects include:**
  - When a design is dominant, there is greater use of the technology
  - Greater use leads to greater knowledge accumulation about that technology
  - Greater knowledge enables a fast rate of improvement of the technology
  - Company structures and culture are based around the technology

*Source: Schilling (2013)*

# Why Dominant Designs Are Selected:
# 2) Network effects

- **Network effects**
  - For technologies with network effects, the benefit from using a technology increases with the number of other users
    - eg railways, telephone, Facebook, Skype



# Why Dominant Designs Are Selected: 2) Network effects

- Popularised in IT by Robert Metcalfe:
  - Co-inventor of Ethernet, Co-founder of 3Com
- Rationale for buying network interface cards:
  - Cost of cards = N
  - Value of cards = $N^2$
- Known as "Metcalfe's Law"

# Types of network effects

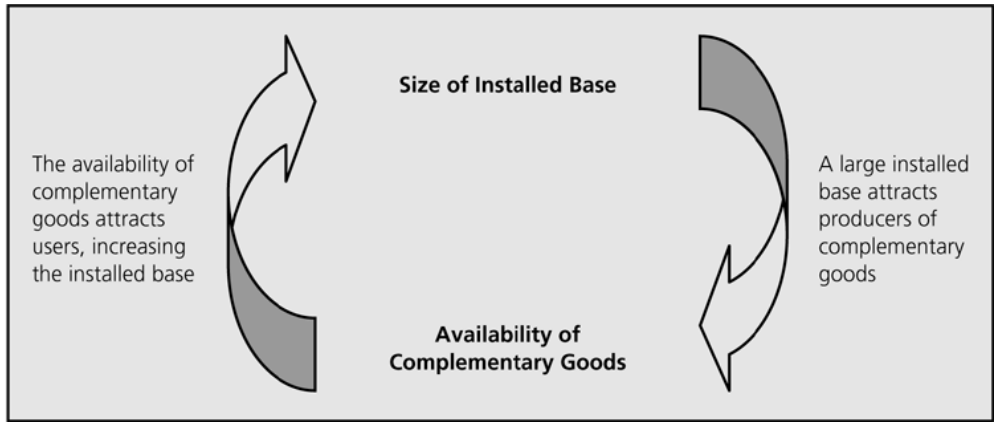
- Direct network effects:
  - Increase in usage leads to direct increase in value
  - eg Email, Telephone, Twitter
- Indirect network effects:
  - Increase in usage leads to increase in value of complementary goods leading to increase in value of the original technology
  - eg PC Architecture gained value from value of compatible software
- Two-sided network effects:
  - Increase in usage by one set of users increases value to another set
  - eg marketplaces (such as eBay, Airbnb), reader/writer software
- Local network effects:
  - Increase in use of local networks (within a larger network) leads to increase in value
  - Eg Instant Messaging, Facebook

Source: Arun Sundararajan http://oz.stern.nyu.edu/io/network.html

# Why Dominant Designs Are Selected: The self-reinforcing cycle

- A technology with a large installed base attracts developers of complementary products;
- A technology with a wide range of complementary products attracts users;
- An increase in the number of users is an increased installed base.
- This leads to a self-reinforcing cycle:

**FIGURE 4.2**
**The Self-Reinforcing Cycle of Installed Base and Availability of Comple-mentary Goods**




*Source: Schilling (2008)*

# Why Dominant Designs Are Selected: The self-reinforcing cycle

- This cycle is deliberately used by companies:

- *"The more applications you have available for a platform, the more people will want to use that platform, the more people that want to use that platform, the more software vendors will want to write to that platform."*

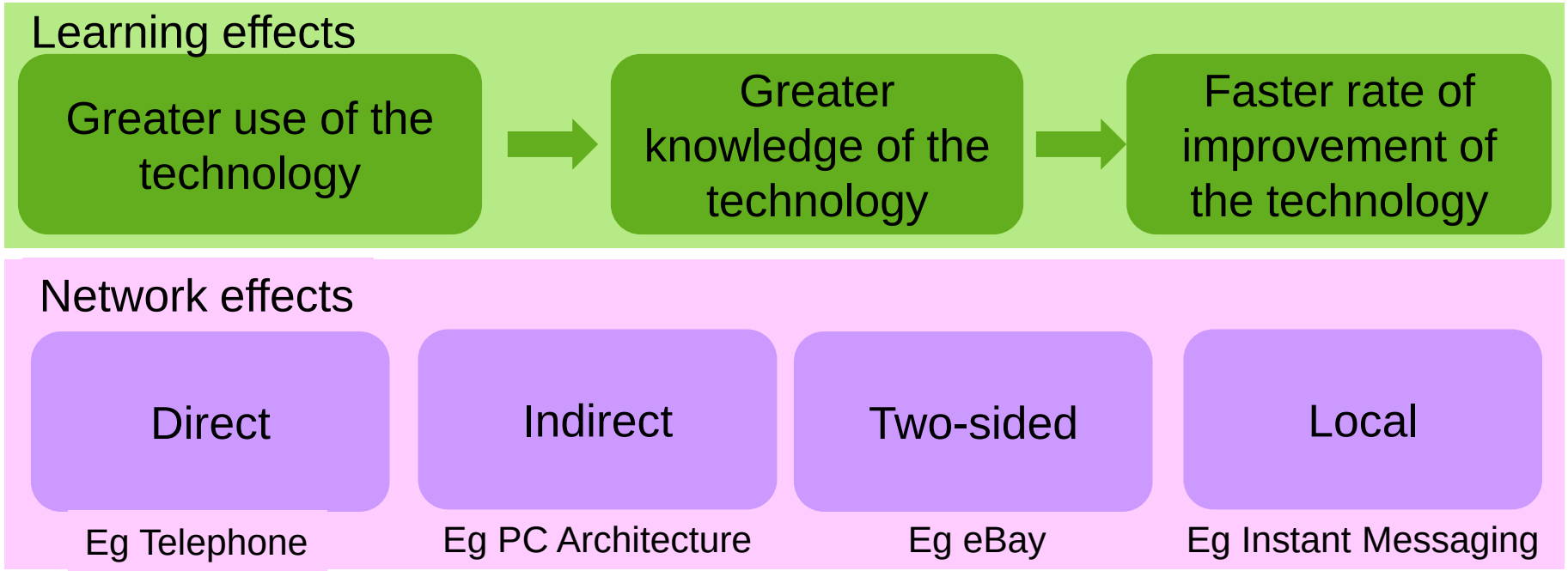
  B.J. Whalen (Microsoft Product Manager)

# Why Dominant Designs Are Selected:
# 3) Government regulation

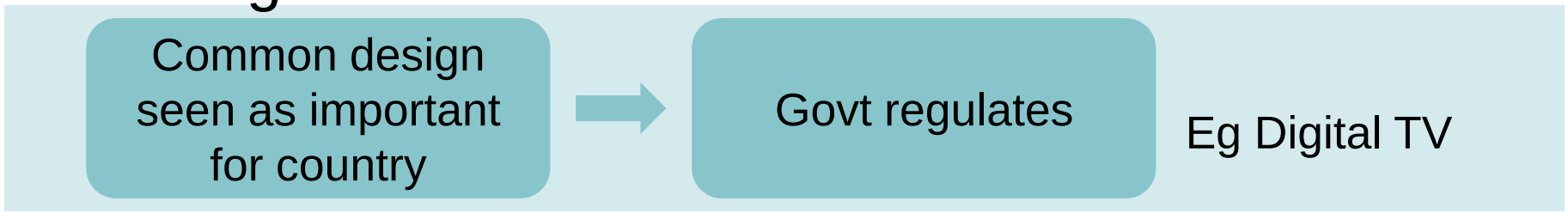
- **Government Regulation**
  - There are often strong consumer or economy benefits of having a single dominant design
  - Rather than wait for market forces, sometimes government organisations step in and impose a standard
  - Examples:
    - Digital TV in Australia (using the DVB-T standard)
      - compare with the standard for an HD media format which was not imposed by government but was left to market forces to sort out (Blu-ray vs HD DVD)
    - GSM (General Standard for Mobile communications) for telecommunications:
      - This was established in the EU early for all mobile communications whereas in US, there was a long battle between different technologies (which has left many problems).

# Summary:
# Why Dominant Designs Get Selected

- Market forces




- Govt regulations



# Dominant Design Strategy – Fast Second

- Move fast and arrive first in a new market?
- But… organizations that end up capturing new markets – the consolidators – are those that time their entry so they appear just when the dominant design is about to emerge
- *A fast second strategy*

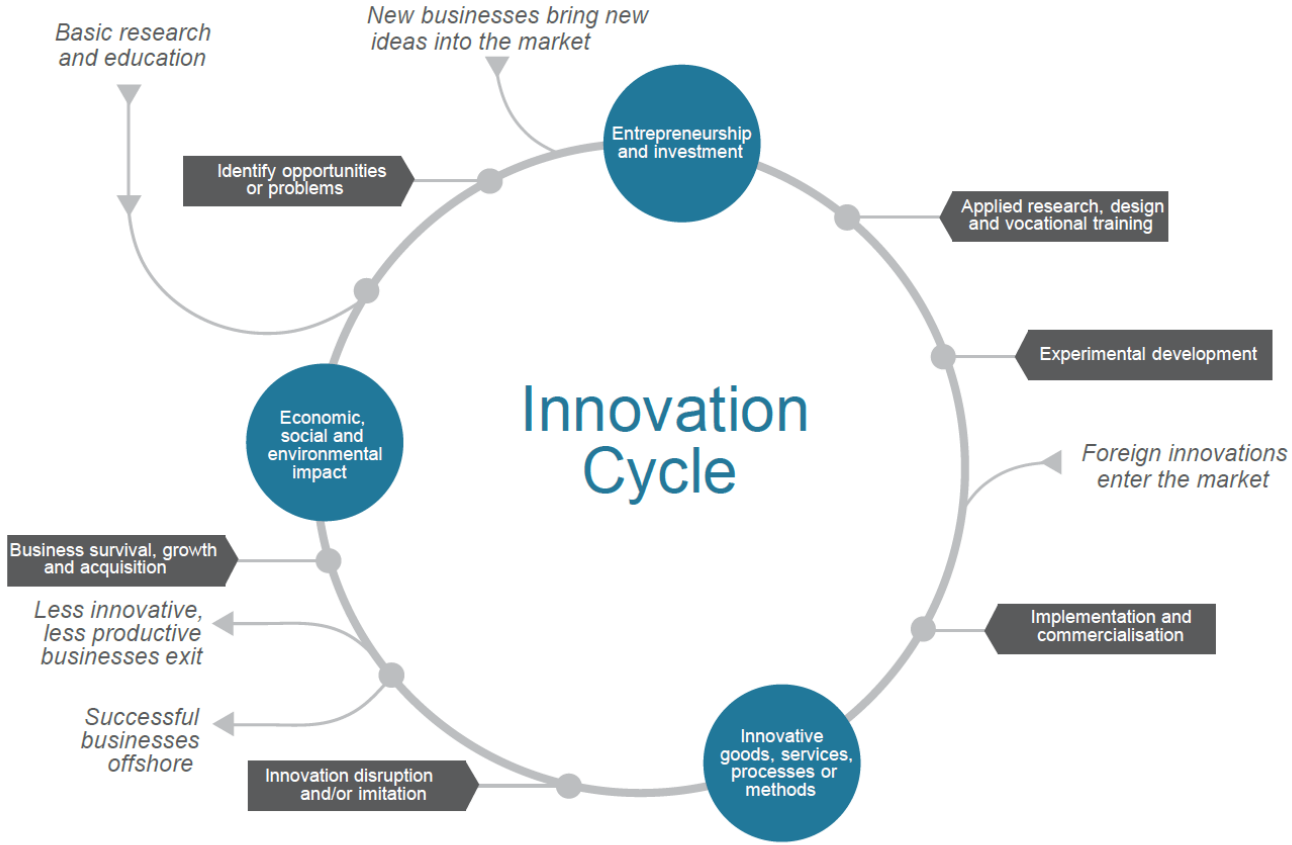
Constantinos C. Markides and Paul A. Geroski, 'Fast Second', Harvard Management Update, HBR, 2008

# First, Second, and Fast Second

- First mover – getting into market quickly and hoping that your product becomes the dominant design
- Second mover – waiting for the dominant design to be completely established and accepted in the market and then producing 'me-too' product under that standard
  - Competing on low cost and low price and trying to be better than the competition (little innovation)
- Fast second – waiting for the dominant design to begin to emerge and the moving to be part of it (that is, helping to create it)
  - Established firms with technology to protect. Not in their best interest for new technology to become established, but once it seems likely, try to become leaders in the new market.
  - Timing – has to be ready to move as any first mover…. Continue to run its core business and waiting to see whom the first mover will be

# The Australian Innovation System Report

- Where do you think Diffusion fits?
- How about Dominate design?
- Around 'Innovation disruption and/or imitation




*Source:* Department of Industry, Innovationand Science (2016)

http://www.industry.gov.au/Office-of-the-Chief-Economist/Pages/National-Innovation-Map.html
http://www.innovation.gov.au/Innovation/Policy/AustralianInnovationSystemReport/

# Summary

- There are patterns in the way that different technologies get adopted by people, companies and society
  - Companies use knowledge of the diffusion of innovations in planning new technologies/products and knowing when to adopt new products
- There are patterns in the way that new product categories emerge
  - Companies use knowledge of this to influence product categories
- Many industries (especially IT) experience strong pressure to select a single (or few) dominant design(s).
- There are factors which influence which technology becomes dominant.
  - Companies use knowledge of these factors in planning new technologies/products and knowing when to adopt new products

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  - Philip Anderson and Michael L. Tushman, "Technological Discontinuities and Dominant Designs: A Cyclical Model of Technological Change," *Administrative Science Quarterly*, vol. 35, Dec. 1990, pp. 604-633.
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# Tute 2

## Dominant Design in the Smartphone Market

THE UNIVERSITY OF SYDNEY

# Personal Digital Assistants &Tablets

- The concept of a personal digital assistant had been around for decades (mostly in science fiction)
- Most people in the computing industry thought that it was just a matter of time before they were popular – but when?

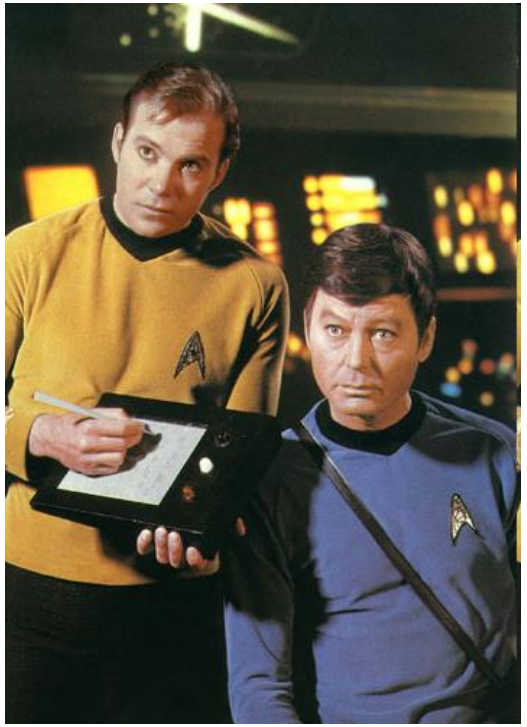


*Photo copyright: Cine Text/Allstar*

# The emergence of Personal Digital Assistants (PDAs)

- 1990: Tech components cheap enough to make PDAs feasible
- 1990-1994:
  - Many companies developing PDAs:
    - Established companies (eg Apple, IBM, HP, Motorola)
    - Start-ups (eg GO Corporation, EO Inc, Momenta)
  - Operating systems:
    - Competing OSes in early 90s:
      - GO's "PenPoint OS"
      - Apple's "Newton OS"
      - Microsoft's "Pen for Windows"
      - Others
- The name "PDA" was first used by Apple

Apple Newton MessagePad 100 (1994)

EO Personal Communicator (1994)

*Source: Schilling 2nd ed (2008)*

# Enabling technologies for PDAs

- Handwriting recognition
  - (needs to be accurate)
- High performance functionality
  - (need high processor power and memory)
- Effective connectivity
  - (eg connect wirelessly to other devices)
- Support for lots of applications
  - (needs to have widely used OS)
- Long battery life
  - (while still being small form factor)

# The expected success of PDAs

- 1993 prediction by Forrester Research:
  - 298,000 will be shipped in 1993
  - 4 million/year by 1996
- Industry observers:
  - 1994 will be the "Year of the Pen"
  - Observers thought that there would be a big battle for OS design dominance: (like the one for the desktop OS)
- Microsoft's approach:
  - 1993: Announced it would release the "WinPad"

**But…**

*Source: Schilling 2nd ed (2008)*

# Early PDAs were not successful

- The actual situation:
  - Sales well below projections - many products failed
  - Slow uptake so many PDA companies ran out of money by 1994
- Example: GO Corporation:
  - Low sales
  - Bought out by AT&T
  - Spent US$75 million of venture capital investment
  - Stopped operating in July 1994
- Example: Apple Newton:
  - Low sales
  - Officially discontinued: Feb 1998
  - Spent US$500 million on Newton and MessagePad
- AT&T, Compaq, IBM, Motorola, NCR, Toshiba stopped PDAs
- Total money spent trying to start the PDA business: US$1b

# Enabling technologies for PDAs

- Handwriting recognition
  - (needs to be accurate)
- High performance functionality
  - (need high processor power and memory)
- Effective connectivity
  - (eg connect wirelessly to other devices)
- Support for lots of applications
  - (needs to have widely used OS)
- Long battery life
  - (while still being small form factor)

- X Only 95% accuracy or less

- X Wireless modems same size as PDA, So most PDAs needed cables for syncing

- X Large number of operating systems – none had large number of applications

- X Original Apple MessagePad took AAA and had low battery life (later used 4 X AA so could get 24 hours but large and heavy)

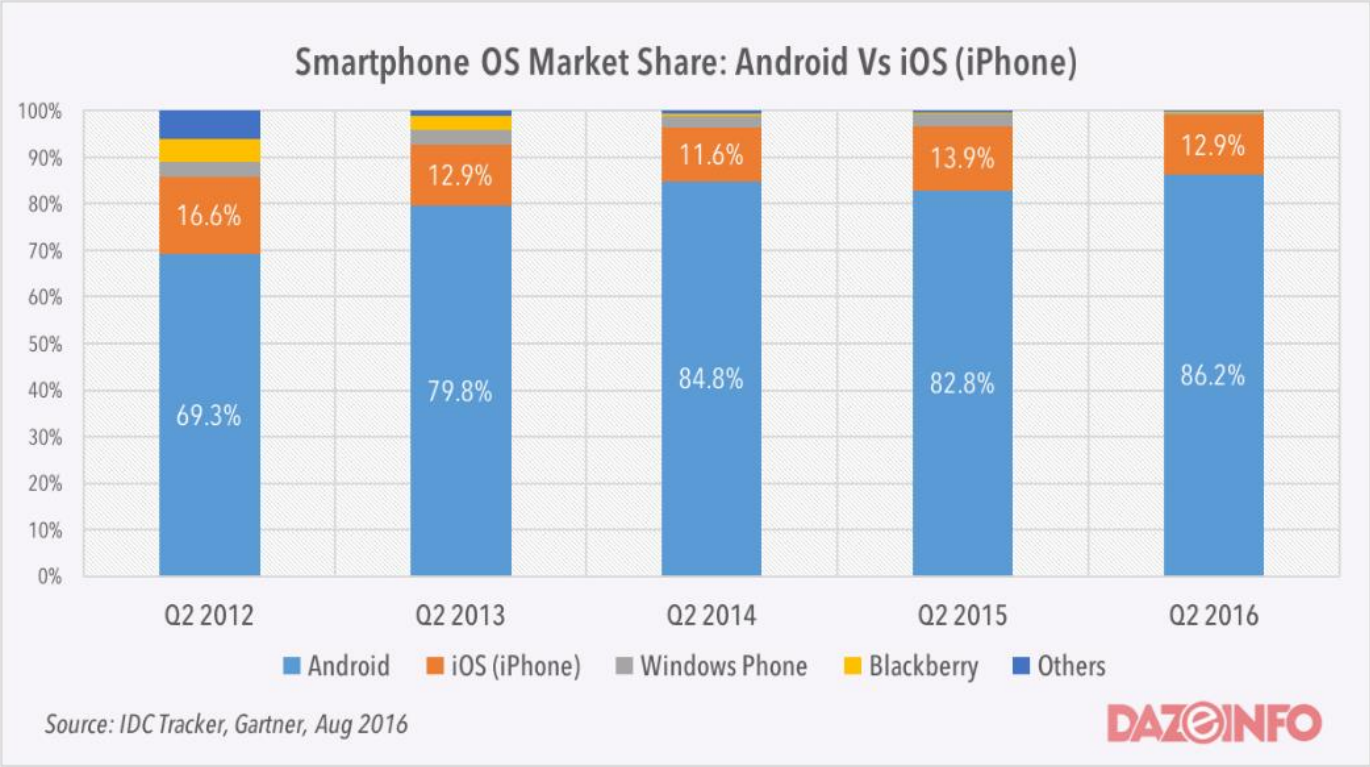
# Example – Windows Mobile


http://www.slideshare.net/nikitakova/windows-phone-introduction

# Example – Windows Mobile .....


http://www.brighthub.com/computing/windows-platform/articles/1295.aspx

# Death of MS Phone?




https://dazeinfo.com/2016/08/30/android-smartphone-os-apple-ios-market-share/

- Windows 10's Smartphone Failure Is Microsoft's Greatest Opportunity

- "The OS is no longer the key to bringing customers on board, the key is getting them into your cloud and having them continue to use it no matter where you are"

# Google Daydream

- Google's strategy of using a phone – attempting to become the dominant design


https://vr.google.com/daydream/

# Tutorial 3

- The Android architecture is becoming the clear dominant design in the smartphone OS market. What are the main reasons that led to the dominance?
- In the short article, Android's strategy for the VR is following similar principles. Do you think this strategy will become the dominant design in the VR space? You may think about this in the context of concepts learned in the class including
  - 'architecture', 'standards', 'network effect' and 'self-reinforcing cycle'.
- In the long article, the conclusion made is that '*product differentiation still characterizes the competition among manufacturers and a dominant design has not yet emerged*'.
  - Do you agree with the assessment? What has changed since the paper was published in 2015?
  - If we continue to follow the concepts in the paper into the smartphone market of 2016, is there an emergence of a dominant design?
  - Does the article follow the design dominance technology cycle?


https://www.forbes.com/sites/gordonkelly/2017/03/16/apple-iphone-8-new-design-leak/#67d9bc251a75