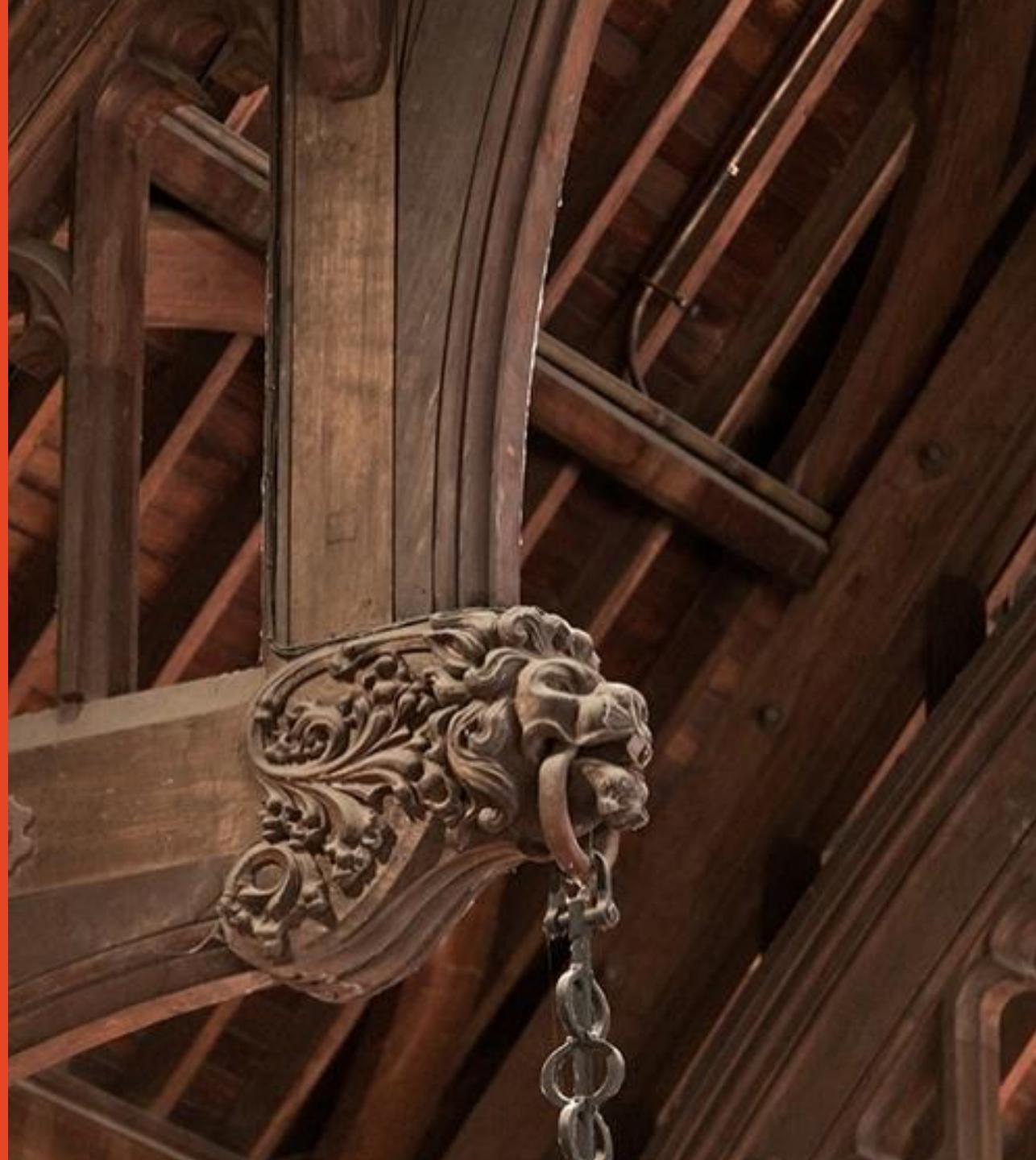


INFO5992 Understanding IT Innovations

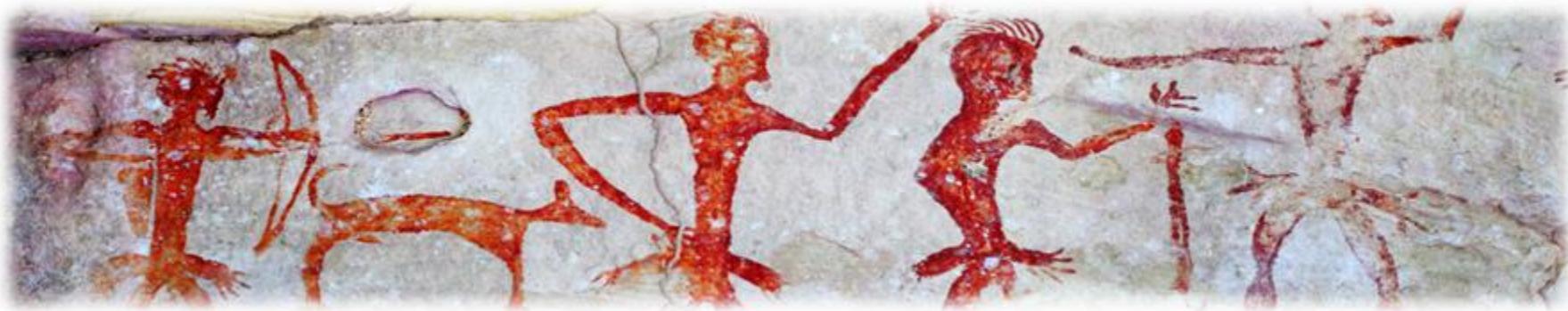
**Week 2: Innovation Frameworks I –
Dynamics of IT Innovation & Dominant
Design**

Semester 1, 2025



Acknowledgement of Country

I would like to acknowledge the Traditional Owners of Australia and recognise their continuing connection to land, water and culture. I pay my respects to the first nations people and their Elders, past, present and emerging.



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UoS Semester Outline

Week		Learning Outcomes	Lectures
Module 2: Innovation Framework			
Week 01	L01, LO2, LO3	Unit of Study Introduction, Administrivia, Definition of IT Innovation, Importance of Innovation to a Country, General Purpose Technologies, Overview of Emerging Technologies	
Week 02	LO4, LO5	Innovation Frameworks I: Dynamics of IT Innovation, Dominant Design	
Week 03	LO6	Innovation Frameworks II: Disruptive Innovation, Innovator's Dilemma, Value Chain & Value Network	
Module 2: Development of Key Intellectual Property in the Modern Age			
Week 04		Introduction to Open Innovation and Closed Innovation Distributed Innovation I: Product Platforms, Web APIs	
Week 05	LO7	Distributed Innovation II: Crowdsourcing, Free and Open- Source Software, Open Data	
Week 06		Distributed Innovation III: Platform Ecosystems, User Innovation	
Module 3: Commercialisation Process and Business Strategies for Emerging Technologies			
Week 07		Commercialisation I: Startup vs Traditional Companies, Lean Startup Methodology and Agile Development	
Week 08	LO8	Commercialisation II: Customer Development Process, Value Proposition Canvas	
Mid semester break			
Week 09	LO8, LO9	Commercialisation III: Innovation Management, Business Model Canvas Commercialisation IV: Capital & Fundraising for IT Innovation	
Week 10	LO11, LO12	Organisational Cultures and Structures Supporting Innovation, Judging IT Innovation	
Module 4: Innovation At-Scale			
Week 11	LO10	Innovation Ecosystem: Silicon Valley and Australia	
Week 12	N/A	Course Review Innovation Pitch Presentation	
Week 13	N/A	Innovation Pitch Presentation	
Final Exam			

Agenda – Week 2

Section One (1st Half)

Dynamics of IT Innovation

1.1 Diffusion of Innovation

1.2 Technology Adoption Lifecycle Model

1.3 Gartner Hype Cycle

Section Two (2nd Half)

Dominant Design

2.1 Product Category

2.2 Design Dominance & The Technology Cycle

2.3 Factors leading to Dominant Design

- Market Forces
- Government Regulation

2.4 Market Entry Strategies

2.5 Case Study: Dominant Design in the Smartphone Market

Dynamics of IT Innovation

Section 1

Diffusion of Innovation

Section 1.1

Diffusion of innovation



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



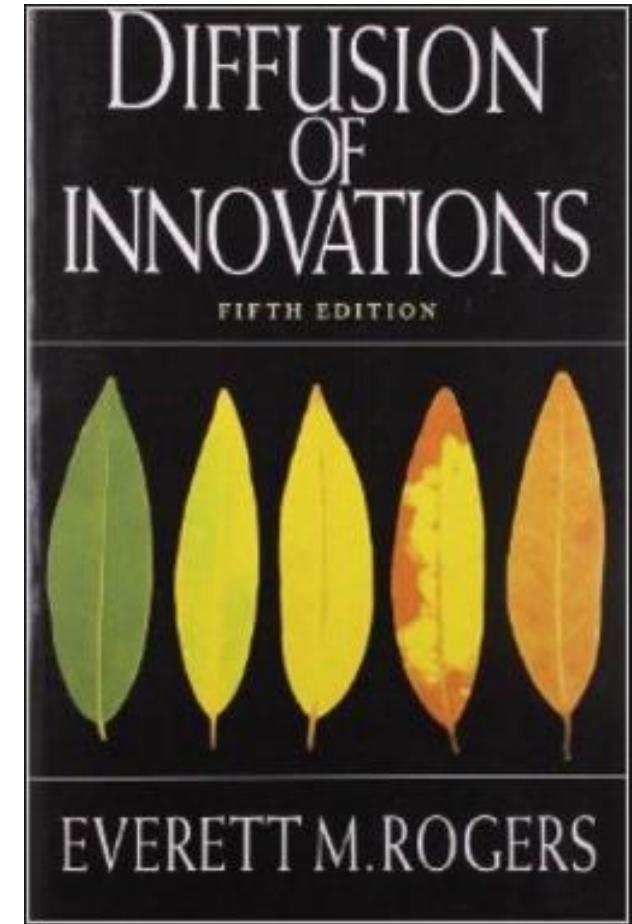
Hybrid seed corn

Image: burpee.com

- Originally a rural scholar studying agricultural innovations
- Interested in why some farmers adopted new innovations and some others didn't e.g., hybrid seed yielded 25% more crops and resistant to drought
- 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



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

- **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, Social Media, 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 (e.g. media, govt.) and internal influencers (e.g. opinion leaders)

“Tech Influencer”

A technology influencer is someone who has a significant impact on the technology industry and its trends through their work, expertise, or social media presence. These individuals can be bloggers, social media personalities, industry leaders, or even celebrities with a passion for technology.

It's a Career!

Top 15 Tech Influencers in 2024 (Web Link)

Marques Brownlee

The most popular

To kick-start this top 10, it's Marques Brownlee AKA "MKBHD" (his initials + high-definition). It's impossible not to include him when writing about top tech influencers. **Marques started his tech review videos in 2009** when he was still studying. Now he's got **billions of views via YouTube and Instagram** and has become a bit of an online tech star.

You'll always learn something new in his videos. Whether it's to be kept up to date with the latest tech, have product features "Explained", or see **his interviews with celebrities such as Bill Gates and Elon Musk**. Or there's also funny behind the scenes of reviews, videos of him breaking devices to show how they work, and for the more nostalgic ones a "Retro Tech" YouTube playlist dedicated to the forlorn analog days.

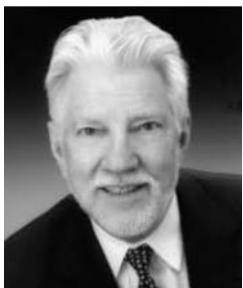


Technology Adoption Lifecycle Model

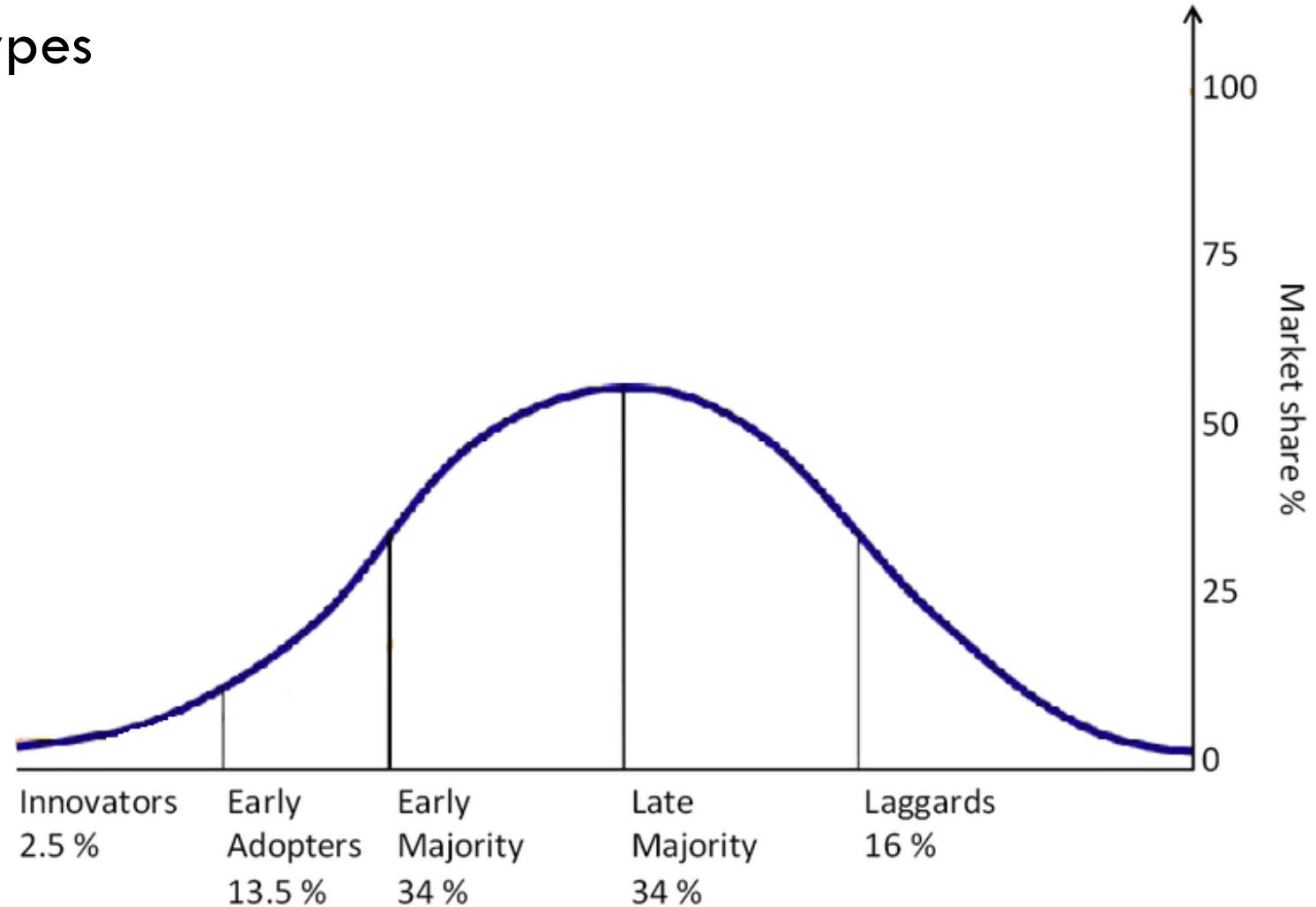
Section 1.2

Technology Adoption Lifecycle Model

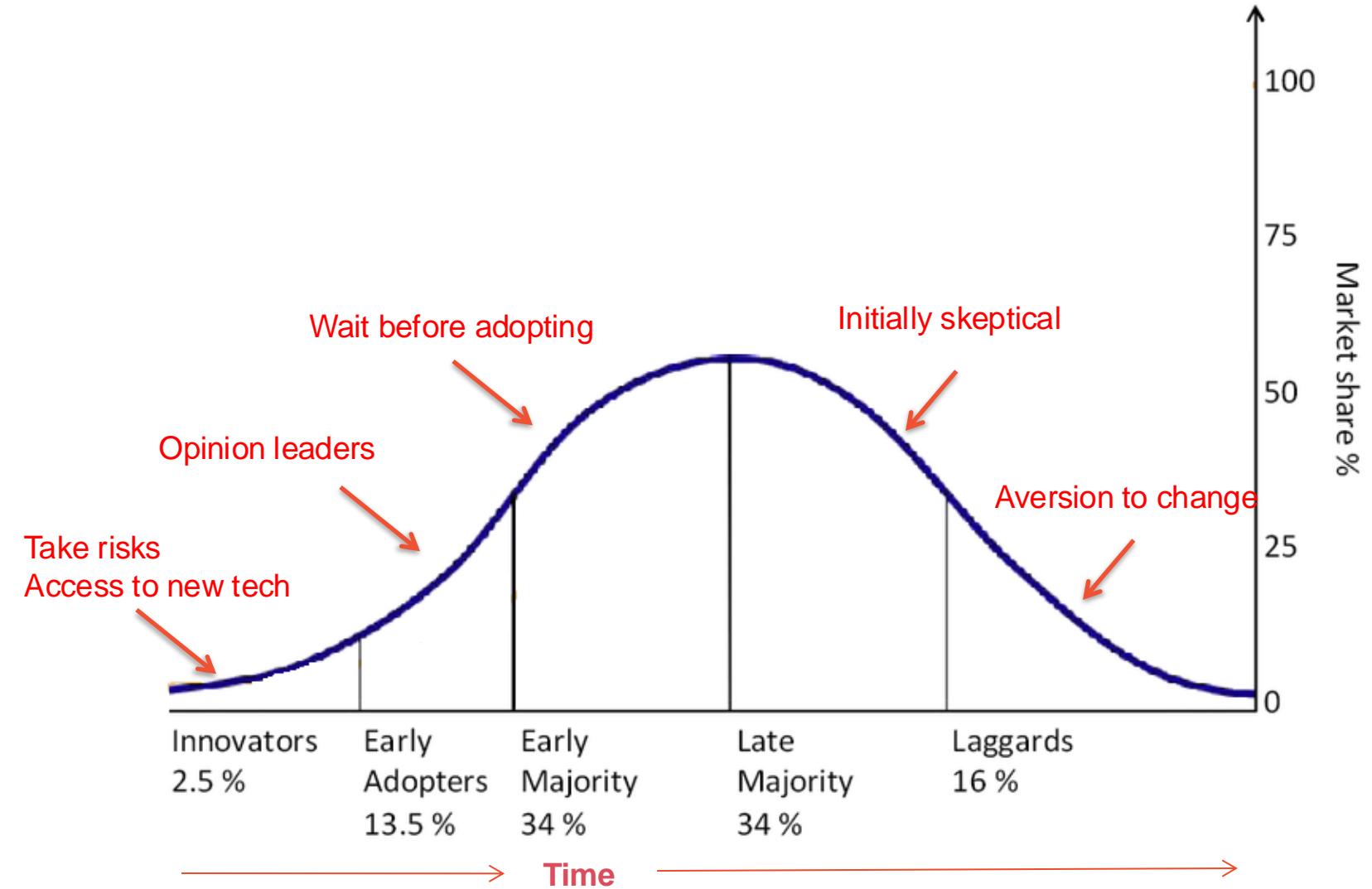
- Rogers identified 5 types of adopters
- Each has specific characteristics



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



Technology Adoption Lifecycle Model



“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
- If the chasm can be crossed, then there is a **greater opportunity** for dominance in the market



Geoffrey Moore,
High tech consultant

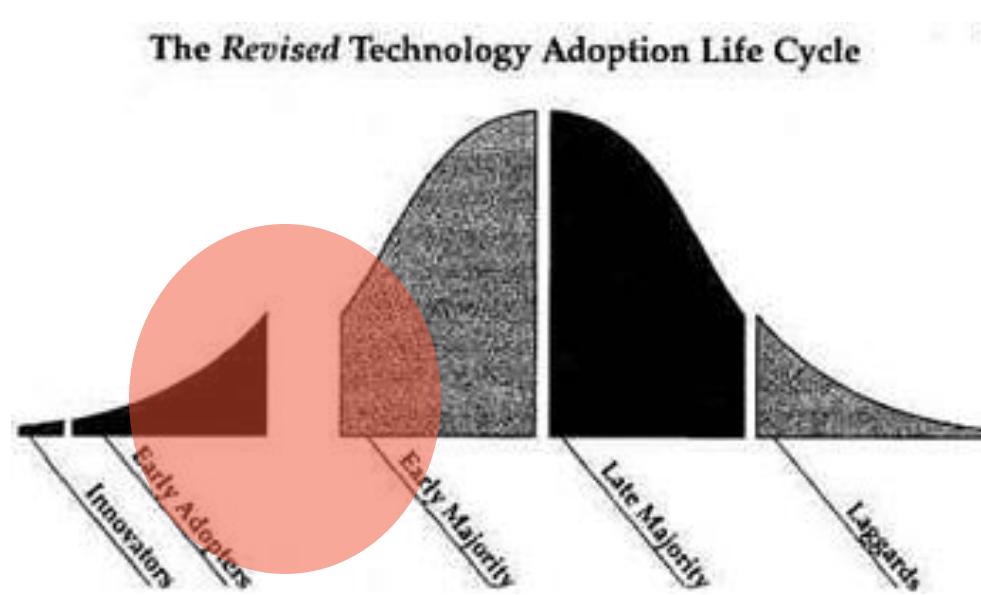
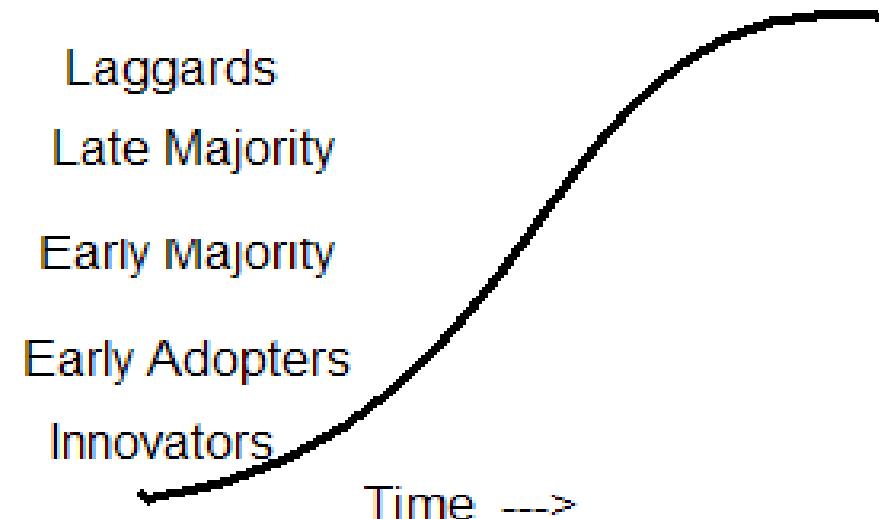


Figure from “Crossing the Chasm”

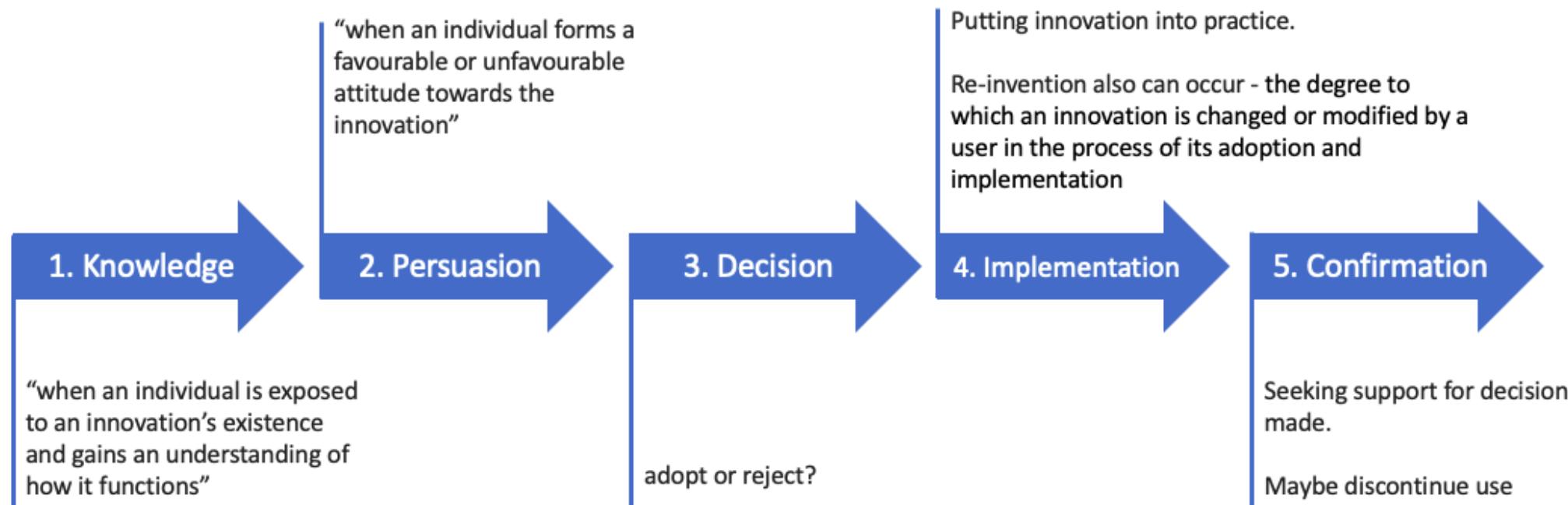
Cumulative adoption curve

- 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 or Organisations

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



Rate of adoption of an innovation

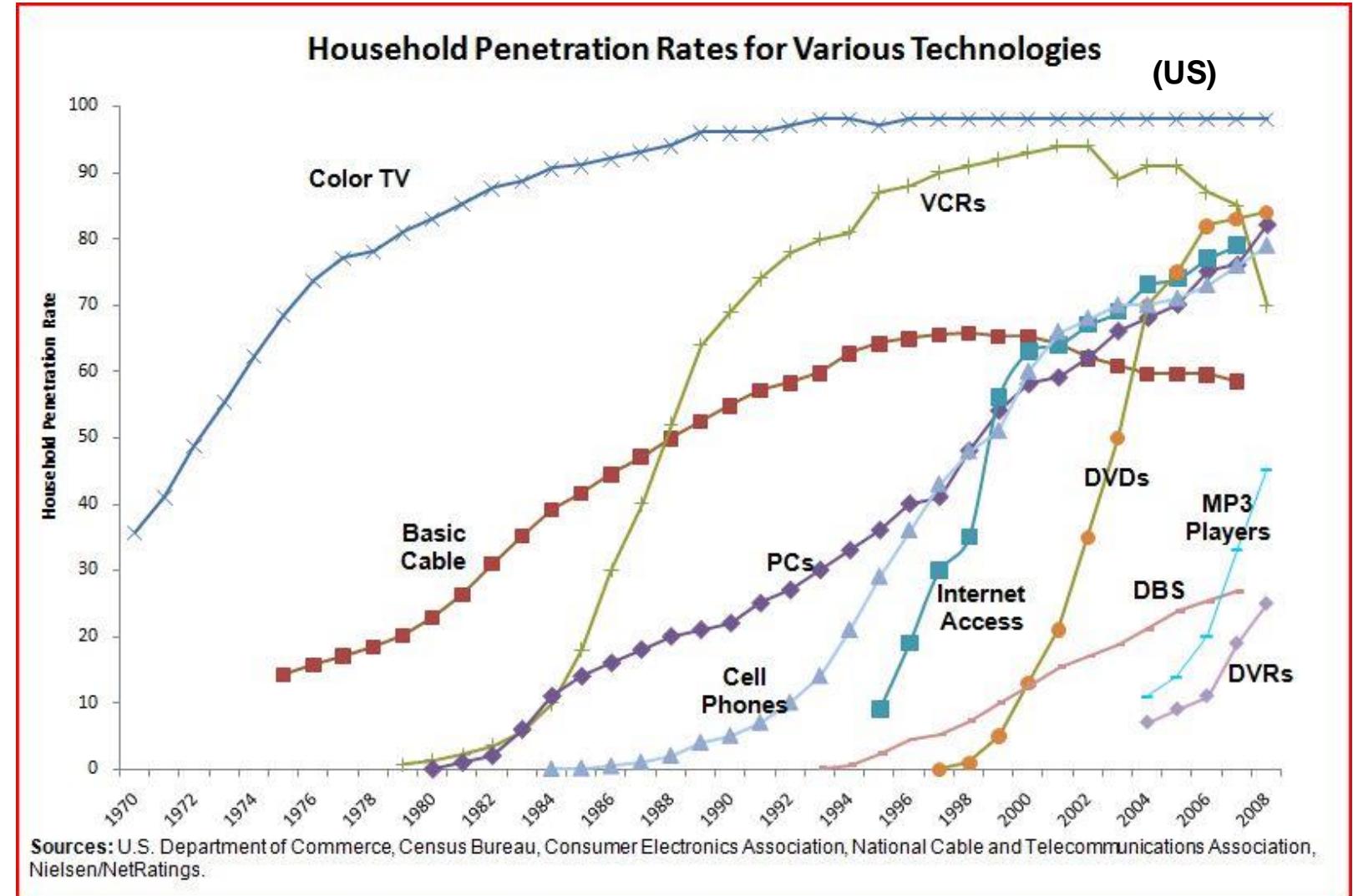
- Perceived **attributes of innovations** that determine the **rate of adoption**:
 - Relative advantage – the extent to which it is viewed as **better** than the idea it supersedes.
 - Compatibility – the extent to which it is perceived as **consistent** with the existing values, past experiences, and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

Source: Rogers (2003)

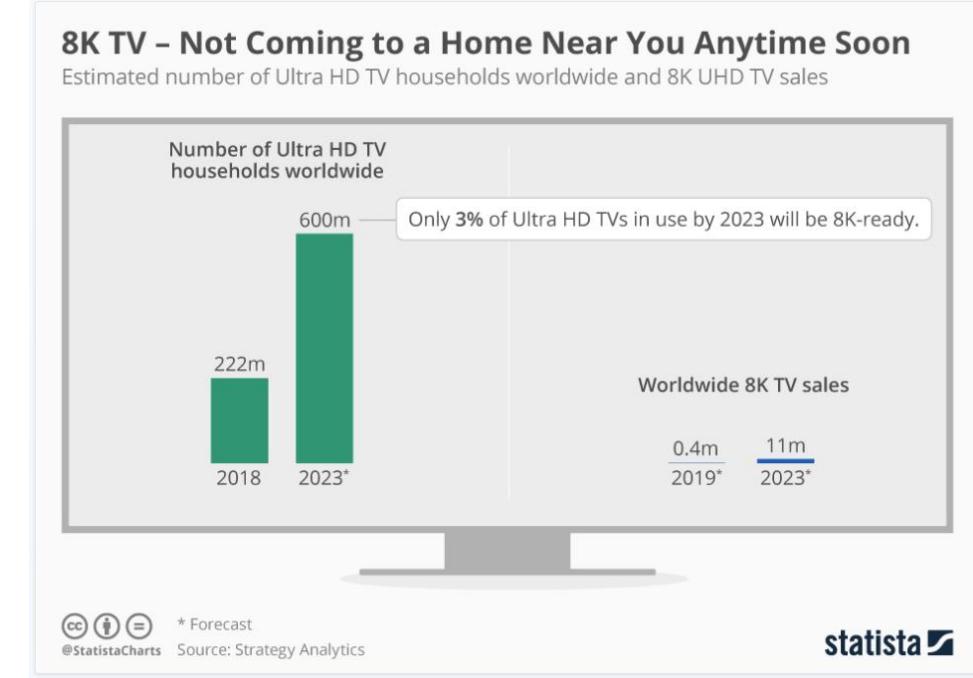
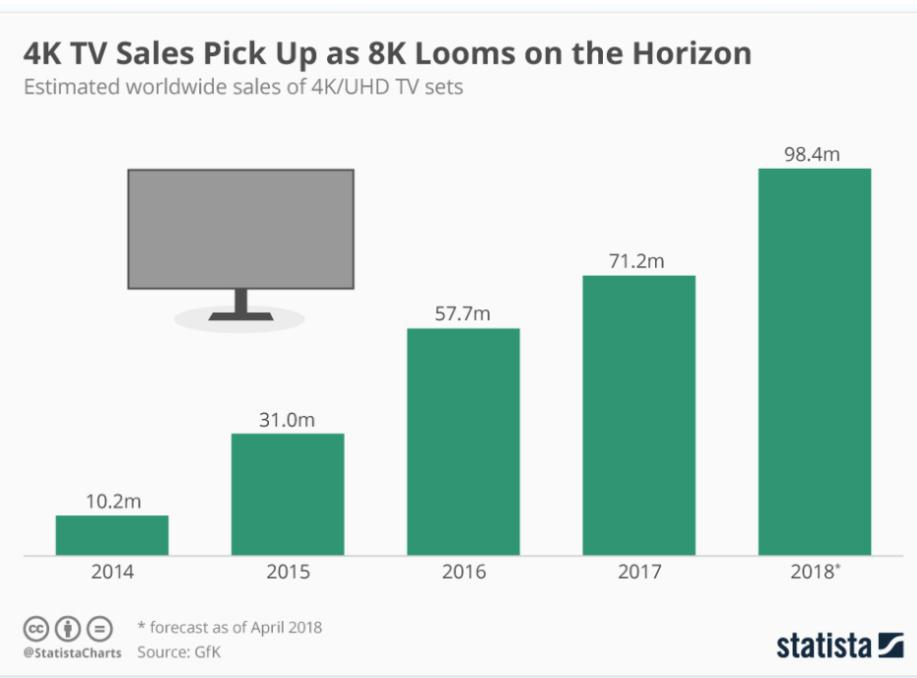
Rate of technology adoption

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

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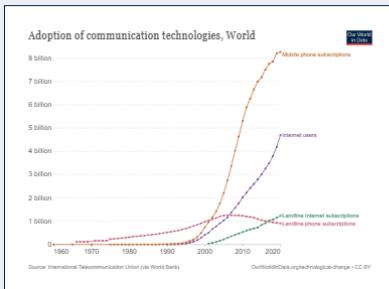


Question: Adoption rate of 4K TV? 8K?

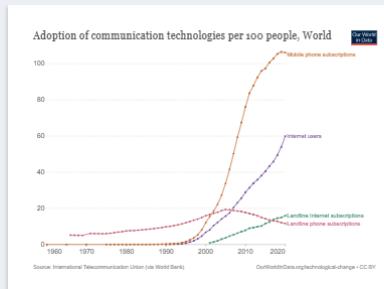


- Now that 4K TV has reached mainstream adoption, the industry has already set its eyes on the next big thing.
- Samsung, LG and Sharp all unveiled their first forays into the age of 8K television at the consumer electronics show IFA in Berlin in Sept 2018.

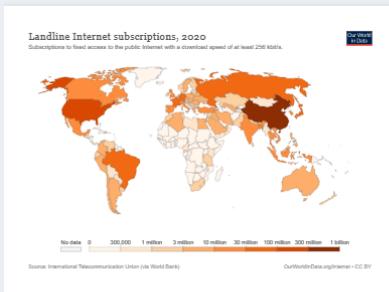
✓ Interactive charts on Technology Adoption



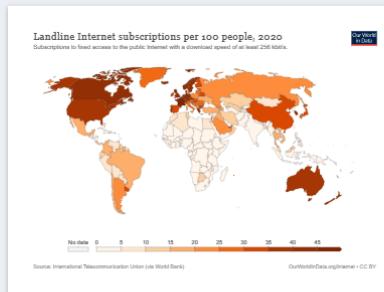
Adoption of communication technologies Absolute numbers



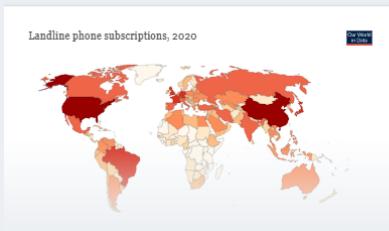
Adoption of communication technologies per 100 people



Landline Internet subscriptions



Landline Internet subscriptions per 100 people



Technology Adoption - Our World in Data (Feb'25)

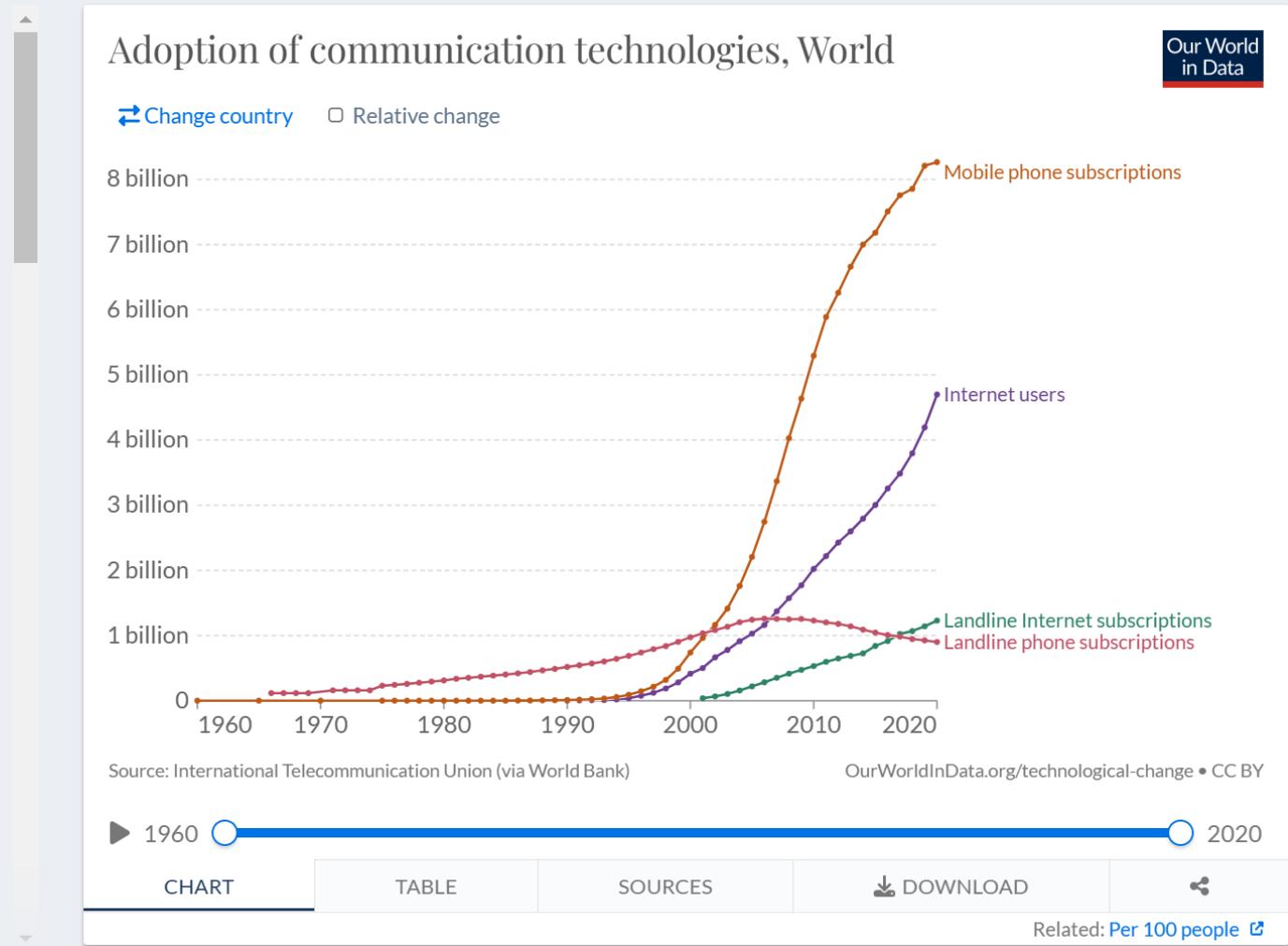


Chart 1 of 19

Interactive Charts (Feb'25)

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**

QWERTY KEYBOARD																
~	!	@	#	\$	%	^	&	*	()	-	=	Delete			
.	1	2	3	4	5	6	7	8	9	0	-	=				
Tab	Q	W	E	R	T	Y	U	I	O	P	{	}				
Caps	A	S	D	F	G	H	J	K	L	:	"	,	Enter			
Shift	Z	X	C	V	B	N	M	<	>	?	/	,	Shift			
Ctrl		Alt									Alt		Ctrl			

<http://www.computerhope.com>



Key jam

image: pipeandgrumble.blogspot.com.au

Dvorak keyboard

!	@	#	\$	%	^	&	*	{	}	{	}					
"	<	>	P	Y	F	G	C	R	L	?	=					
:	,	,	A	O	E	U	I	D	H	T	N	S	=			
			;	Q	J	K	X	B	M	W	V	Z				

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
- Do 4K / 8K TVs have the same problems?
- What do you need to consider for ChatGPT and similar chatbots?

Gartner Hype Cycle

Section 1.3

What is a Gartner Hype Cycle and Why is it useful to know about it??

- The Hype Cycle was first introduced by the Gartner research and advisory firm in 1995. They publish an annual ‘hype’ cycle that looks at **what technologies are emerging and their status in their life cycle.**
- It has since become a widely recognised framework for **understanding the evolution of new technologies.**
- It is helpful to understand what is coming – and what its potentials are

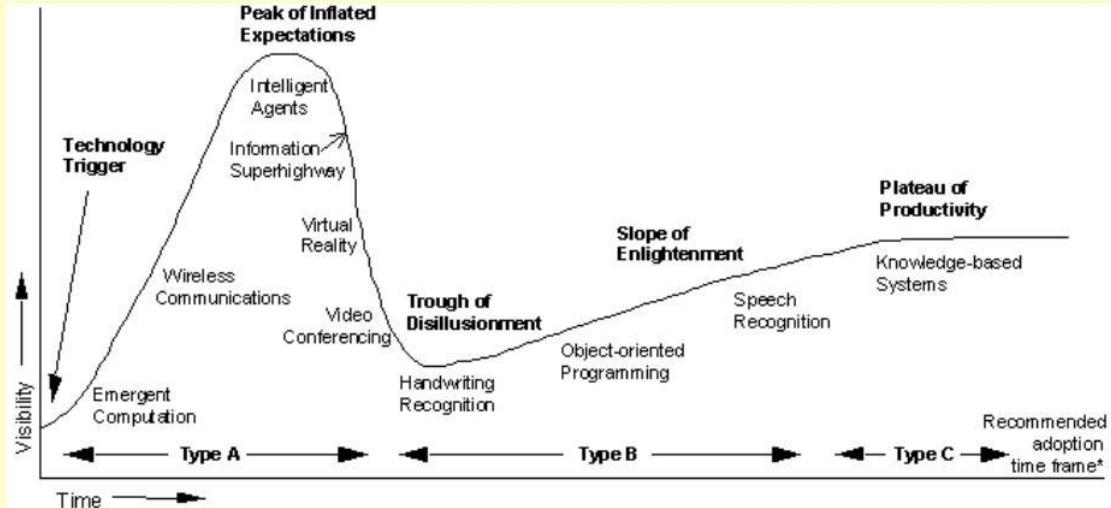
How is Hype measured?

- Hype of an Emerging Technology is based on **expert analysis** and **qualitative assessments** of the maturity and **potential** of specific technologies.
- It typically **relies** on:
 - Search Volume
 - Trending in Social Media
 - Funding and Investment
 - Media coverage

Gartner Hype Cycle - Historical data

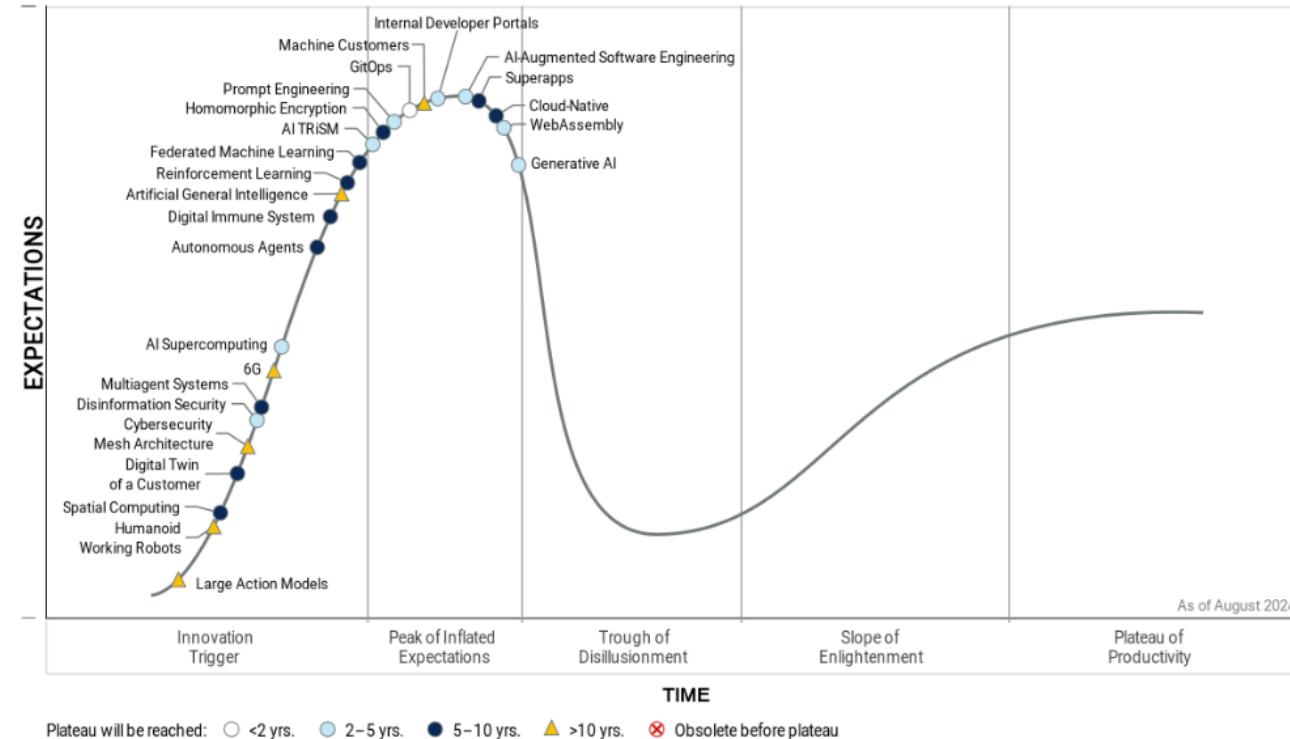
Gartner Hype Cycle for 1995

http://www.gartner.com/DisplayDocument?doc_cd=130115



* The recommended adoption time frame may be swayed in either direction for a technology with a particularly high or low level of potential impact within an organization. For example, a Type B company may wait until the Plateau of Productivity to invest in a technology that will result in only marginal efficiency improvements. On the other hand, a Type C company may be prepared to weather some of the learning experiences of the Slope of Enlightenment for a technology that will have a major impact on its core business processes.

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Gartner

[2024 Gartner Hype Cycle for Emerging Technologies \(Feb'25\)](#)

Five phases of a technology's life cycle

#	Phase	Description
1	Innovation Trigger	Innovation Trigger: A potential technology breakthrough kick things off. Early proof-of-concept stories and media interest trigger significant publicity. Often no usable products exist and commercial viability is unproven .
2	Peak of Inflated Expectations	Early publicity produces a number of success stories – often accompanied by scores of failures. Some companies take actions; many do not.
3	Trough of Disillusionment	Interest wanes as experiments and implementations fail to deliver . Producers of the technology shake out or fail. Investments continue only if the surviving providers improve their products to the satisfaction of early adopters.
4	Slope of Enlightenment	More instances of how the technology can benefit the enterprise start to crystallize and become more widely understood . Second- and third-generation products appear from technology providers. More enterprises fund pilots ; conservative companies remain cautious.
5	Plateau of Productivity	Mainstream adoption starts to take off. Criteria for assessing provider viability are more clearly defined. The technology's broad market applicability and relevance are clearly paying off.

Gartner Hype Cycle - Historical data

Hype Cycle for Emerging Technologies, 2020

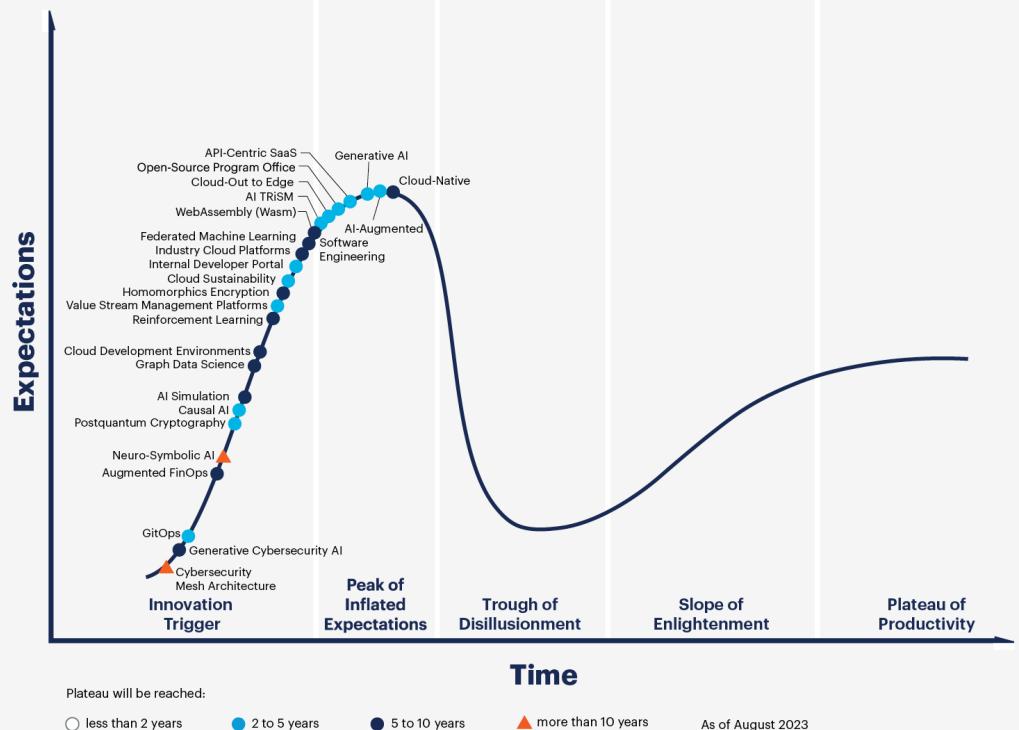


gartner.com/SmarterWithGartner

Source: Gartner
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Gartner

Hype Cycle for Emerging Technologies, 2023



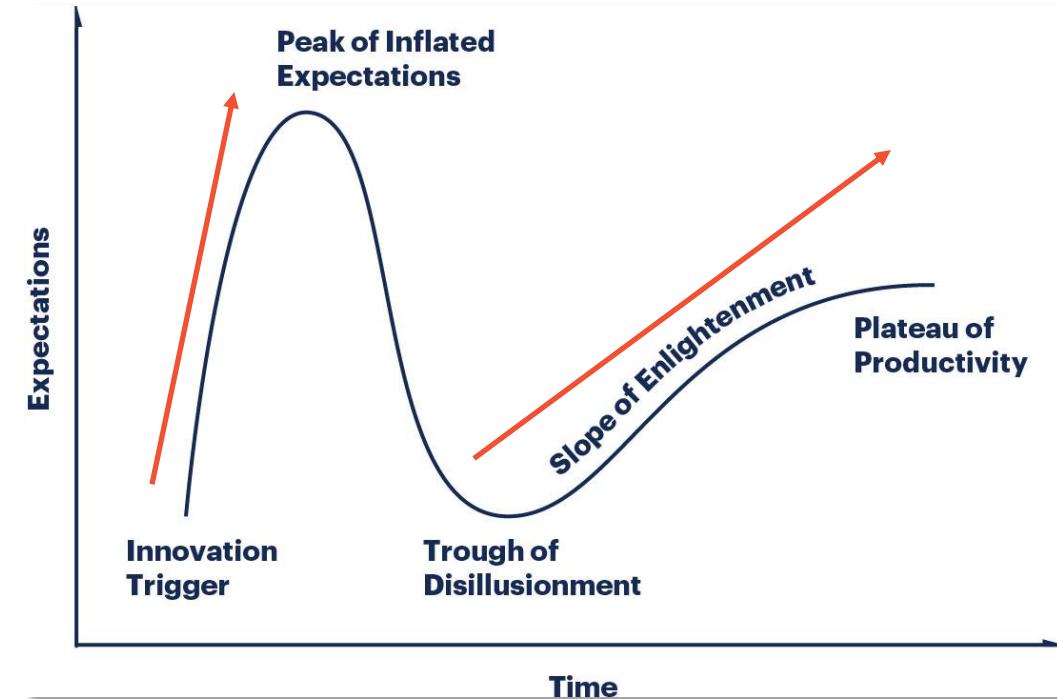
gartner.com

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Gartner

Interpreting Technology Hype

- Most innovations will progress through a pattern of **overenthusiasm and disillusionment**, followed by **eventual productivity**.
- The vertical shape shows how **expectations** surge and contract over **time** as an innovation progresses, based on the market's assessment of its future expected value.
- **Two stages of upward direction** (increasing expectations)
 - Driven by market hype; high expectations met with low maturity
 - Driven by an **increase in the maturity of the innovation**; it leads to **real value** and **fulfilled expectations**



If you look at the latest Hype Cycle, how many technologies can you recognise and what technology excites you?

Individual/Group Activity (no weightage):

- **Carry out a comprehensive analysis of ChatGPT and Blockchain.**
- **Position them on the Hype Cycle and write reasons for their placement.**

Dominant Design

Section 2

Product Category

Section 2.1

Emergence of new product categories: Example



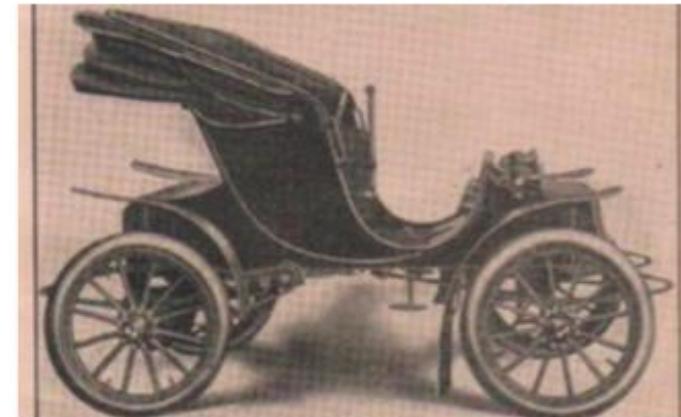
Ford's Quadricycle (1896)



King's motorcycle (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 **motorcycle** (1896)

From newspaper competition to name
the product category

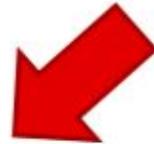
Emergence of new product categories: Example



Horse-drawn carriage (1905)



Horseless carriage (1905)



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

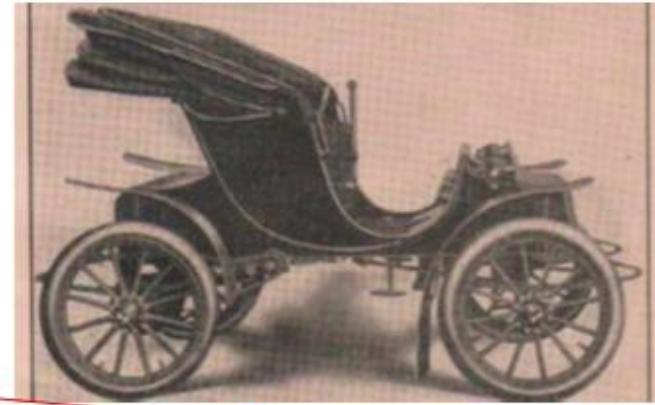
Emergence of new product categories: Example



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**”
 - (e.g. medical technology)
 - “a manner of accomplishing a task especially using technical processes, methods, or knowledge”
 - (e.g. 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>

Factors that lead to a “dominant category”:

- What is the dominant category of a product?
 - The product segment or version that captures:
 - The largest market share or
 - Significantly shapes consumer expectations
- Technological factors
- Firms attempt to claim advantageous market positions
- Stakeholders (e.g., customers, producers, critics, and regulators) making sense of emerging category
 - Suarez et al (2015)

Emergence of product categories: Recent examples



Tablets



Smartphones

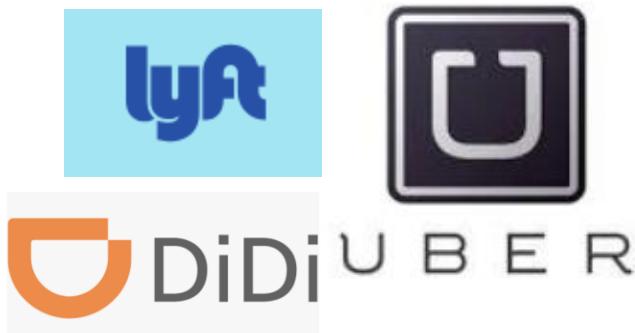
Product categories emerging now



Fitness tracker?



Smartwatch?

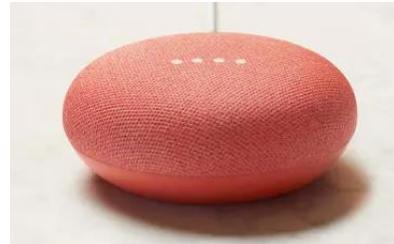


Ride-sharing apps?



Driverless cars/self-driving cars?

Product categories emerging now – Home / Smart Speakers



- Samsung Home (Bixby)
- Google Home (ok google)
- Apple HomePod (Siri)
- Amazon Echo (Alexa)
- Working on... Microsoft (Cortana)

Foldable Phones?

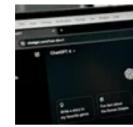


Oppo Find N2 Flip specs



The Oppo Find N2 Flip flipped closed. (Photo: Florence Ion / Gizmodo)
© Provided by Gizmodo Australia

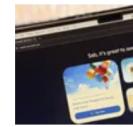
There are many technologies going through the process of Dominant Design. With chatbots (OpenAI ChatGPT, Google Bard etc.,), do we already have a dominant design?



Best AI chatbot overall

ChatGPT

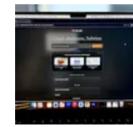
[View at ChatGPT](#)



Best ChatGPT alternative

Microsoft Copilot

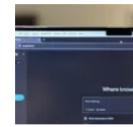
[View at Microsoft](#)



Best AI chatbot for privacy

Anthropic's Claude

[View at Claude](#)



Best AI chatbot for search

Perplexity.ai

[View at Perplexity](#)



Best AI chatbot for businesses and marketers

Jasper

[View at Jasper](#)

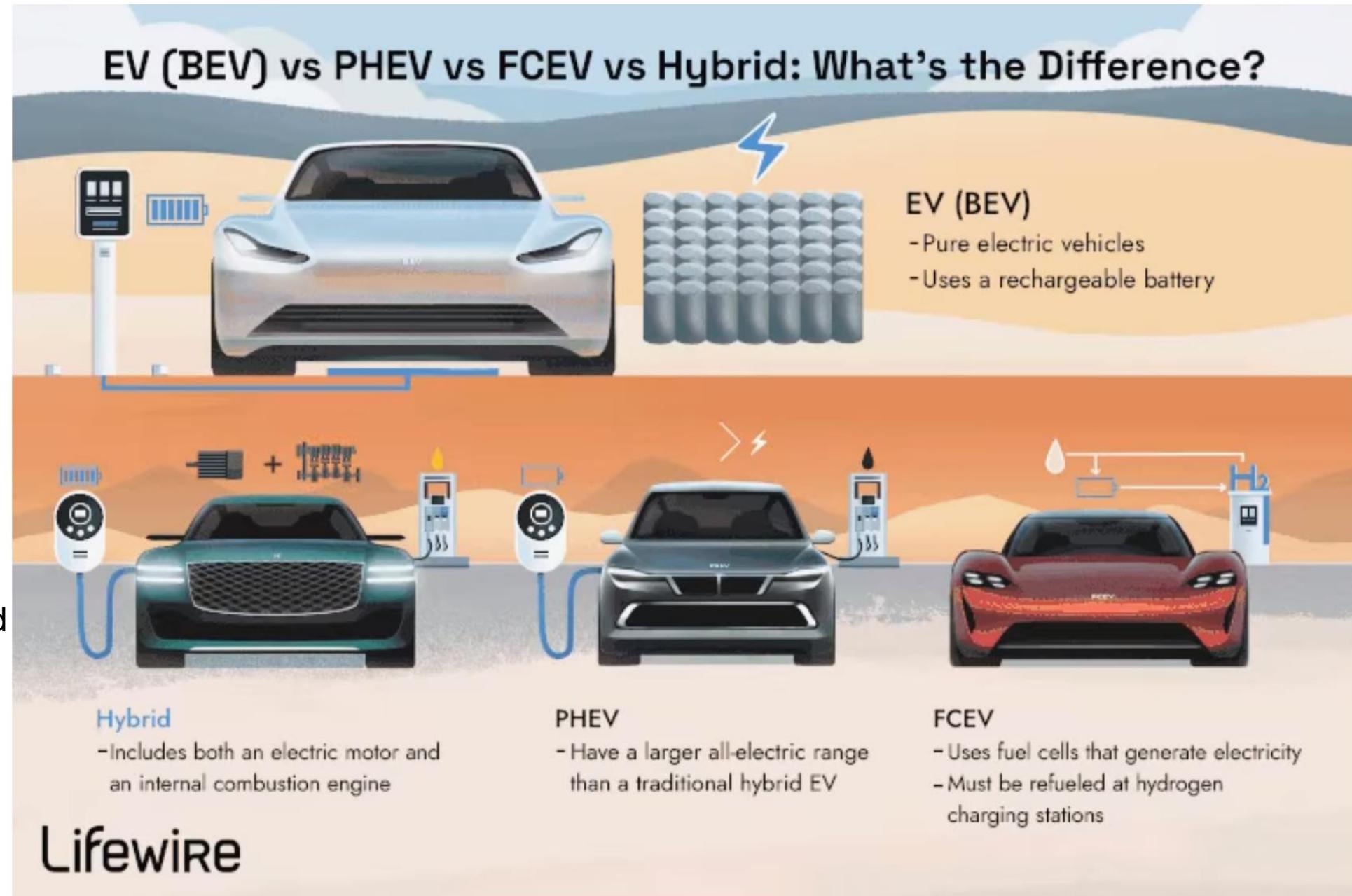
[The best AI chatbots of 2025: ChatGPT and alternatives | ZDNET](#) (Feb'25)

Tutorial 2 - Is there a Dominant Design in Electrical Vehicles?

BEV = Battery EV

PHEV = Plugin Hybrid

FCEV = Fuel Cell



Design Dominance & The Technology Cycle

Section 2.2

Example: The Personal Computer – The IBM PC

- Developed in < 1 year in a "skunkworks" project at IBM's Boca Raton, Florida facility.
- Had a rapid development cycle because of the use of "off-the-shelf" parts for disk drives, processors, memory, operating systems, etc.
 - The 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 the generation of add-ons...
 - ... but also enabled competitors to make “compatible” PCs

The IBM PC

On August 12, 1981, IBM introduced the IBM Personal Computer. This wasn't the first PC, but it did create the standards that in many ways have dominated personal computing for most of the past 42 years, including an open architecture, an Intel architecture processor, and a Microsoft operating system.



The first IBM PC (the 5150 released in 1981)

Source: <https://au.pcmag.com/news/88770/project-chess-the-story-behind-the-original-ibm-pc> (Feb'25)

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



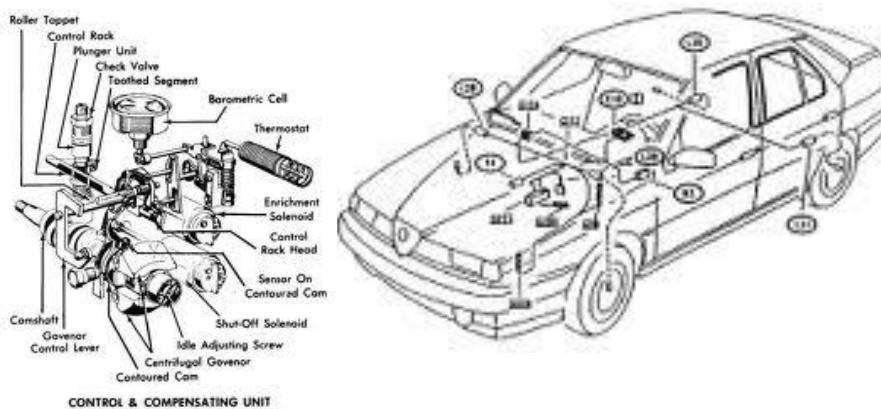
- 1985: Steve Jobs resigned from Apple
- Formed NeXT with 5 other ex-Apple staff
- Made a powerful computer with high processing, memory and graphics.
- 1988: The NeXT Computer was released.
- Far more technologically advanced than IBM Compatibles and Macs of the time.
- Poor sales.
- Could not compete 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

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 the commoditisation of components (for mass production)
5. This requires there to be a “dominant design” with components fitting within this design
6. The first company may establish the dominant design 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

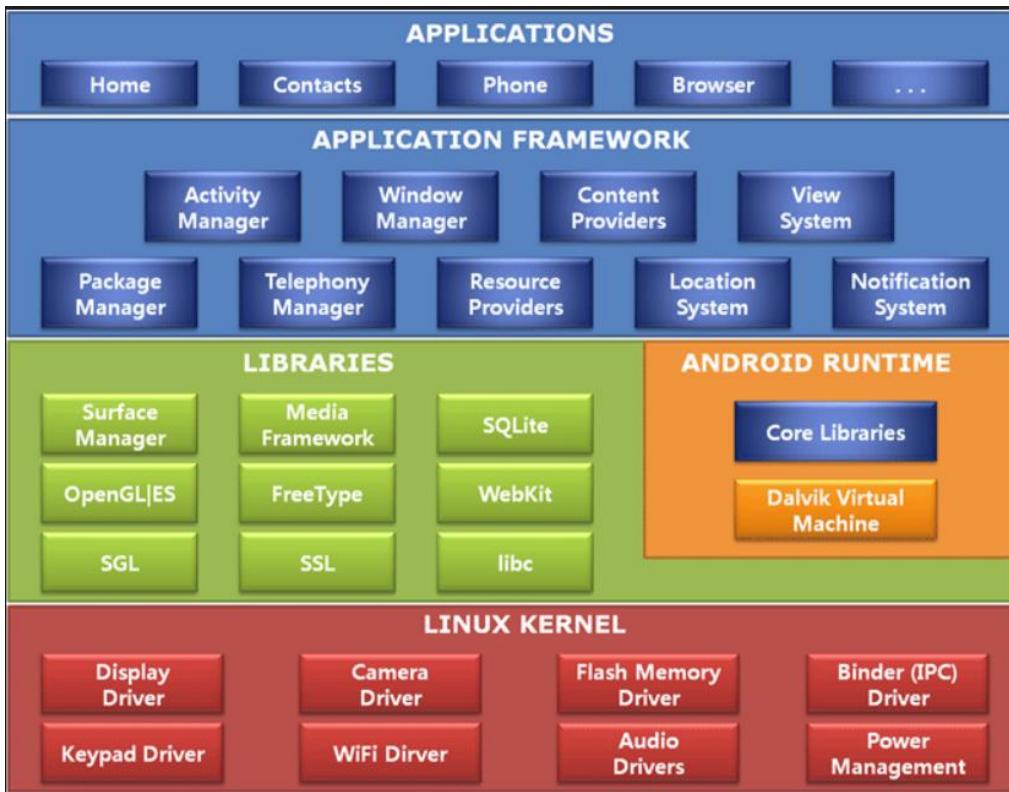
- The concept was traditionally used for industries creating physical products (e.g. cars, glass, cement)
- Principles also apply to software development:
 - The software industry and software users benefit from using common designs

Examples of dominant designs in IT

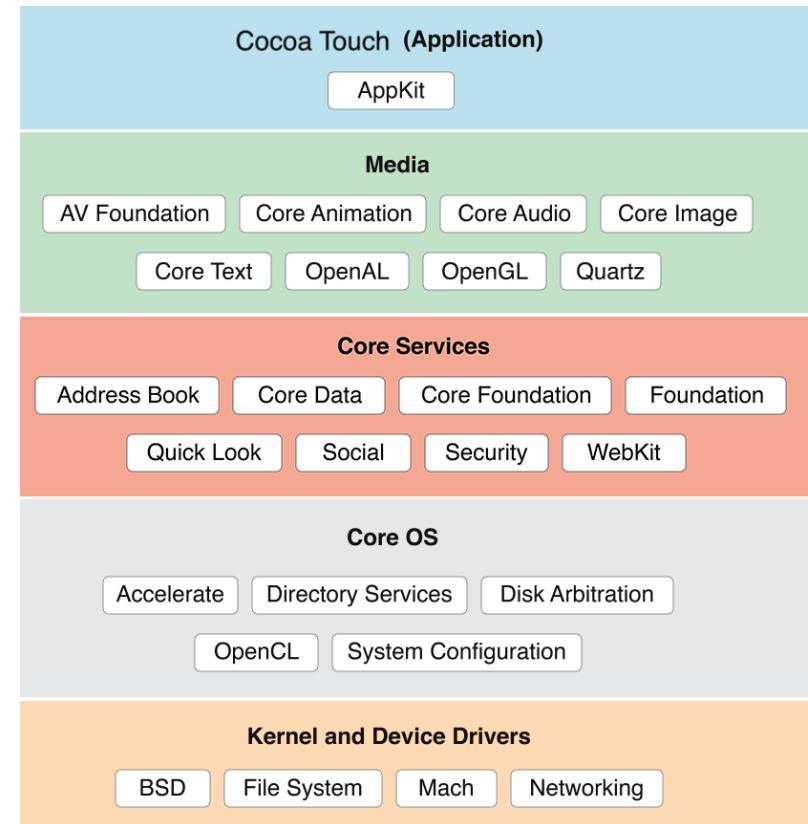
- IBM PC Architecture
- WIMP (window, icon, menu, pointing device)
- Internet protocol stack (TCP/IP, etc)
- The core web standards (HTML, HTTP, URL)
- LAMP (Linux, Apache, MySQL and Perl/PHP/Python)
- Relational Database Management Systems
- Apple iPhone application architecture
- The Android architecture
- Smart speaker API architecture
- **Note: Dominant Designs are not specific products, they are architectures.**

Dominant Design is an Architecture

- **Android Example**



- **Cocoa Touch is a UI framework for building software programs to run on iOS for the iPhone**



Design Dominance and Technology Cycles

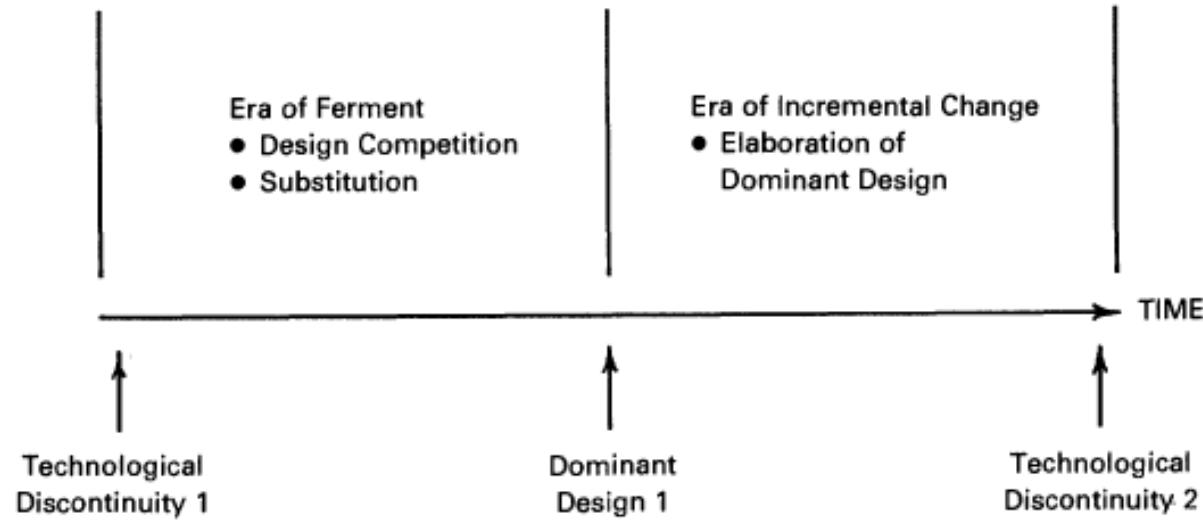


Michael L.
Tushman,
Business
Management at
Harvard
Business School

- 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

Design Dominance and Technology Cycles

Figure 1. The technology cycle.



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

[https://www.edegan.com/pdfs/Anderson%20Tushman%20\(1990\)%20-%20Technological%20Discontinuities%20and%20Dominant%20Designs.pdf](https://www.edegan.com/pdfs/Anderson%20Tushman%20(1990)%20-%20Technological%20Discontinuities%20and%20Dominant%20Designs.pdf)

Source: Anderson and Tushman (1990)

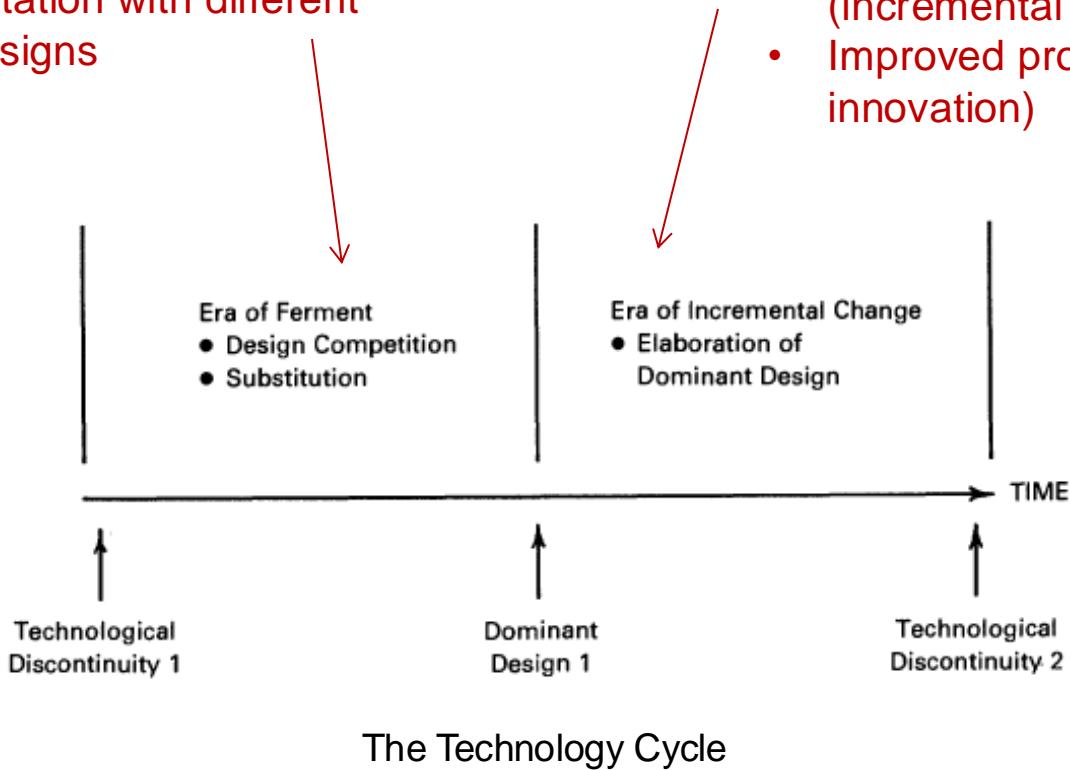
Design Dominance and Technology Cycles

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)



Source: Anderson and Tushman (1990)

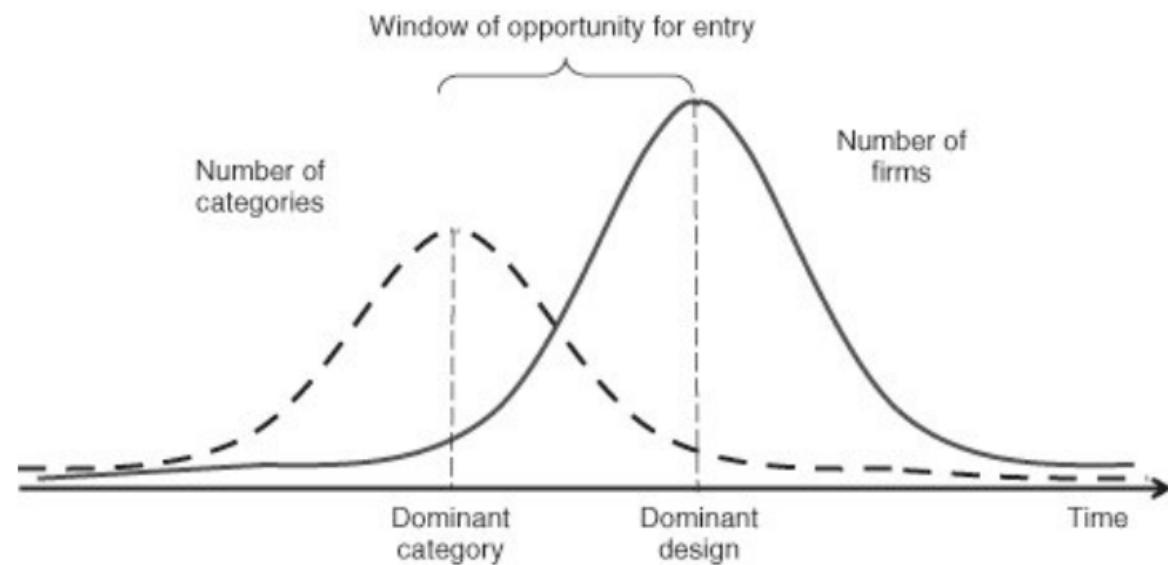
Design Dominance and Technology Cycles

- 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:
 - E.g., Microsoft's and AOL's apparent slowness in identifying and acting on the importance of the Internet

Dominant design and windows of opportunity?



Figure

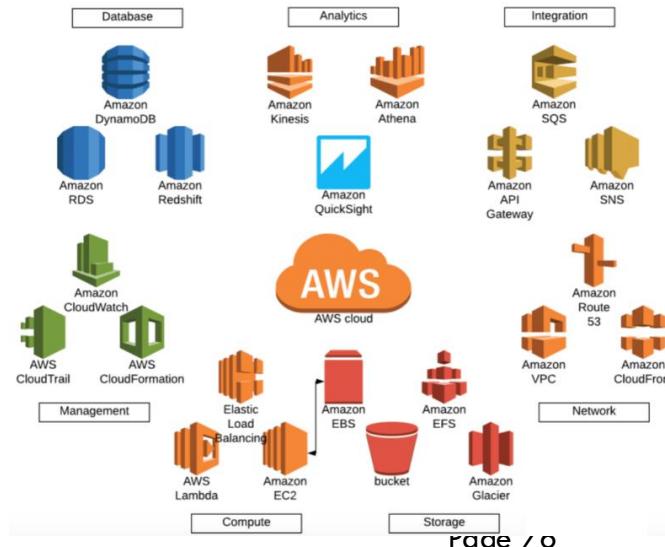
Caption

Figure 1: Theoretical framework: dominant category and dominant design during the industry life cycle. During the industry life cycle, the number of categories will increase before the number of firms increases. The emergence of the dominant category occurs as the number of categories begins to decrease. This point in time marks the opening of the window of opportunity for entry, whereas the emergence of the dominant design marks the closing of the window of opportunity

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Examples of IT Dominant Design

- **Microsoft Windows:** the dominant design in the desktop computer market for decades. This has created a network effect, where Windows is the preferred operating system because it is the most widely used
- **Apple iPhone:** The iPhone has become the dominant design in the smartphone market, with its unique user interface, app store, and ecosystem of accessories and services.
- **Amazon Web Services (AWS):** AWS is the dominant design in the cloud computing market, with a wide range of services and a large customer base.
- **Google search:** the dominant design in the search engine market, with its powerful algorithms and massive index of web pages. Competitors such as Bing and Yahoo have struggled to match the accuracy and relevance



Factors Leading To Dominant Design

Section 2.3

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 De facto standards

De jure standards		De facto standards	
Standards authority	Example standards	Company	Example Standards
W3C (World-wide Web Consortium)	HTML, URL, CSS, XML	Microsoft	Word Doc formats; PowerPoint formats
ISO (International Organisation for Standardisation)	MPEG, CD data format, Office Open XML, computer languages	Adobe	PDF (later became de jure standard), Flash
ANSI (American National Standards Institute)	C	IBM	PC architecture
IETF	TCP, IP, HTTP, JSON	Community (with guidelines set by Sun)	Java
Industry consortia	USB, BluRay	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 technology
 - **Network effects:**
 - The benefits of using technology increase with the number of users.
- **Government regulations**
 - Sometimes, the government sees the importance of technology for a nation and regulates a specific dominant design (e.g. for TV, mobiles)

Why Dominant Designs Are Selected:

1) Learning Effects

- Learning effects include:

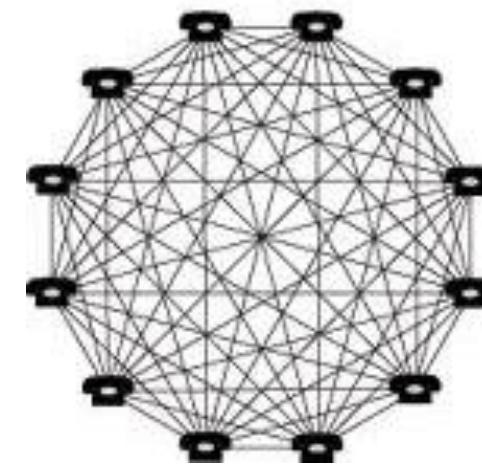
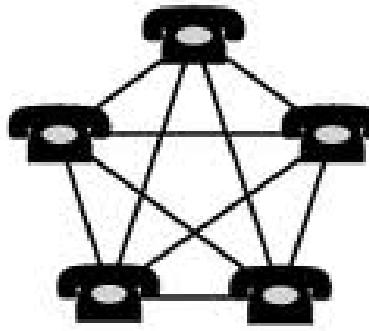
- When a design is dominant, there is greater use of the technology
- Greater use leads to greater knowledge accumulation about that technology
- Greater knowledge enables a fast rate of improvement of the technology
- Company structures and culture are based around the technology

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
 - e.g. 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”



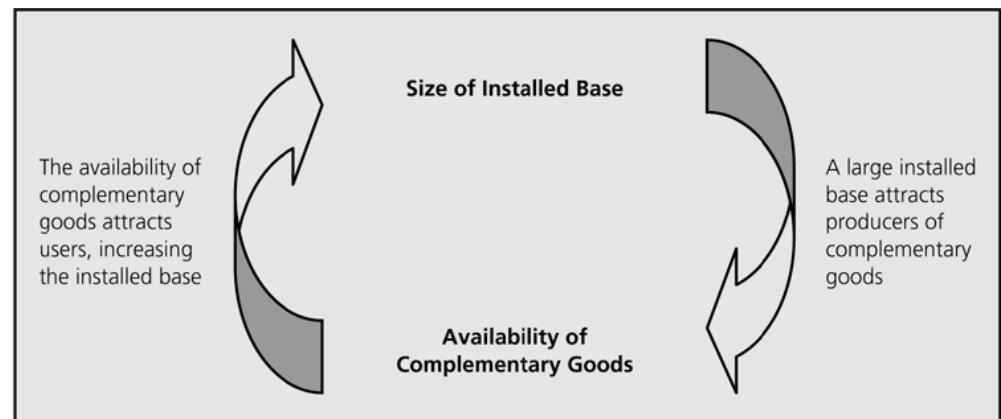
Types of network effects

- Direct network effects:
 - Increase in usage leads to direct increase in value
 - E.g. 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
 - E.g. 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
 - E.g. 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
 - E.g. Instant Messaging, Facebook

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 Complementary 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)

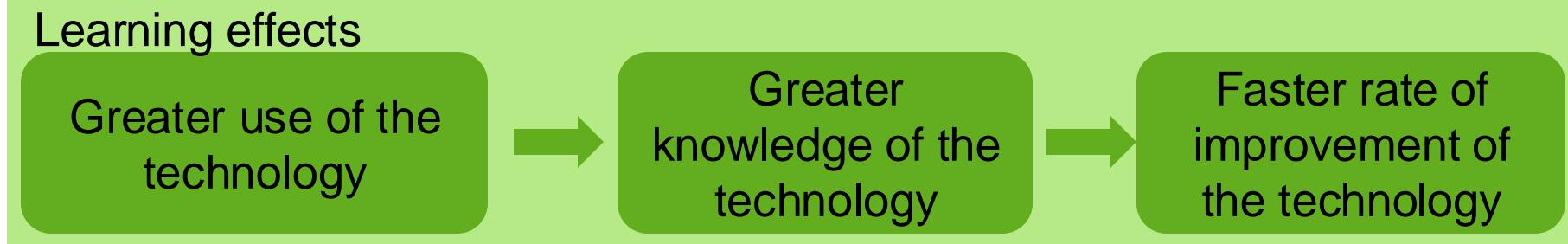
Why Dominant Designs Are Selected:

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



Network effects

Direct

Eg Telephone

Indirect

Eg PC Architecture

Two-sided

Eg eBay

Local

Eg Instant Messaging

Govt regulations

Common design seen as important for country

Govt regulates

Eg Digital TV

Harness the exponential potential of networks

Transform to the power of n

Harness the potential



**It is time to assert our leadership in networking technology
Our updated company strategy is supported by our technology
strategy, which details how networks will need to evolve to
meet the demands of the metaverse era.**



About Pekka Lundmark

Pekka was appointed Nokia's President and CEO in August 2020. He previously worked for us between 1990 and 2000, before embarking on a 20-year journey through the technology, energy, manufacturing, machinery, retail and finance sectors. This broad experience gives him insight into new technologies and techniques that will be at the heart of the Fourth Industrial Revolution.

Connect with Pekka on [LinkedIn](#) and [Twitter](#).

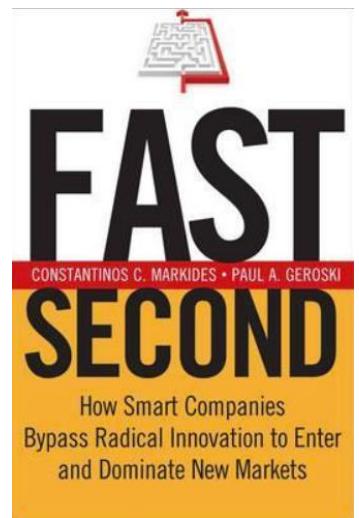
Market Entry Strategies

Section 2.4

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 then move in to be a 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

Fast Followers (Second mover)

- There's a long-standing theory that the first mover in a disruptive market is not in reality the most likely to succeed. In fact, a first mover has a 47% chance of failure compared to just 8% for that of a fast follower.
- The discrepancy can be, in part, explained by the fact that any successful disruptor has not only found a model and industry that works, but has also introduced the notion to the public. **Fast followers have a working business model to emulate.**
- Lyft, as an example, have exploited Uber's success well with a design immediately accessible to Uber users. But this can only take you so far - in July of last year, for example, Uber completed 62 million trips to Lyft's 13.9 million.

Examples of Fast Second

The book (Constantinos) identifies the following as successful fast second firms:

- **Microsoft – in some markets e.g., Internet explorer (used to be) and Xbox**
- **Amazon – e-commerce industry – the dominant leader**
- Canon—in digital camera, they were fast second to Sony... in printing, to HP...
- Heinz—food
- Procter & Gamble—consumer goods

More examples of Fast Second

- Lyft, as an example, have exploited Uber's success well with a design immediately accessible to Uber users. But this can only take you so far—in 2021, for example, Uber's revenue was \$10 billion and Lyft's revenue was \$3.2 in US and Canada.
- TikTok entered the social media market – with ‘shorts’ and smart use of ‘audio’ after established players like Facebook, Instagram, Youtube and Twitter. However, it quickly caught on with users and became one of the fastest-growing social media platforms in the world, prompting the incumbent to offer similar features e.g., Youtube Shorts



Case Study: Dominant Design in Smartphone Market

Section 2.5 (Optional)

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?

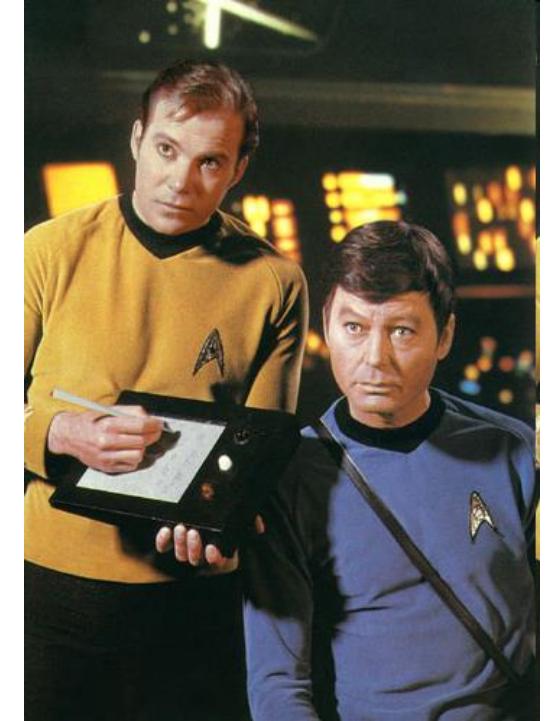


Photo copyright: Cine Text/Allstar

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)

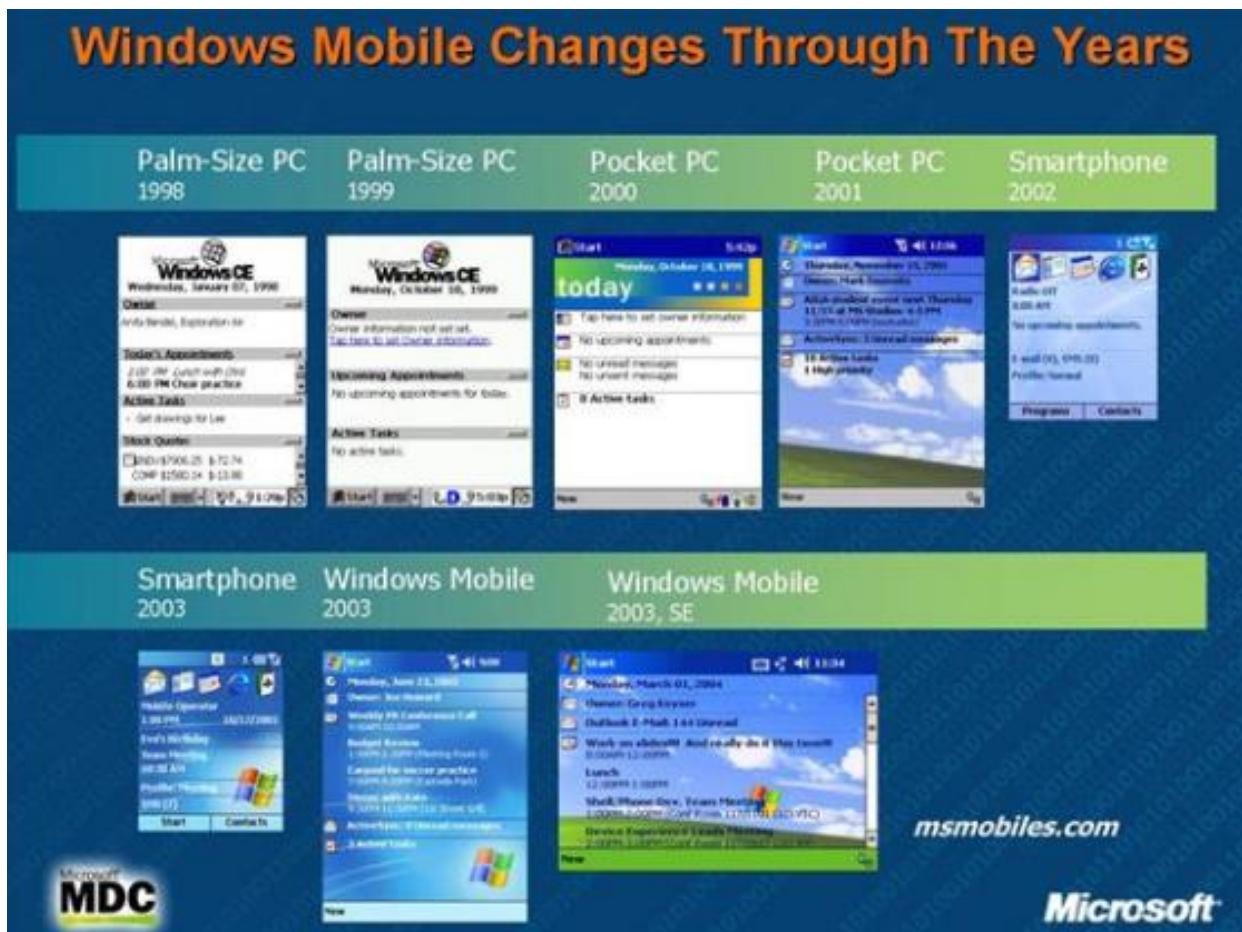
Early PDAs were not successful

- 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



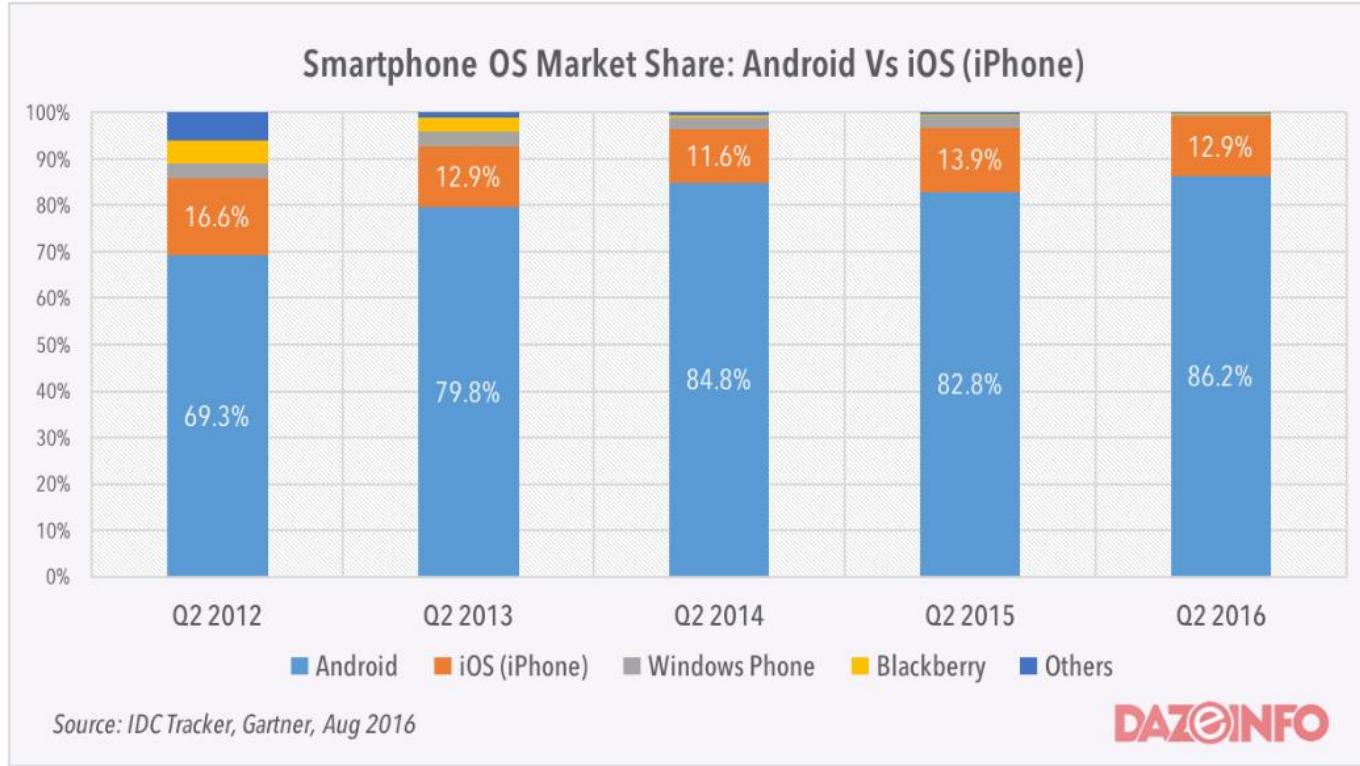
<http://www.slideshare.net/nikitakova/windows-phone-introduction>

Example – Windows Mobile



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

Death of MS Phone?

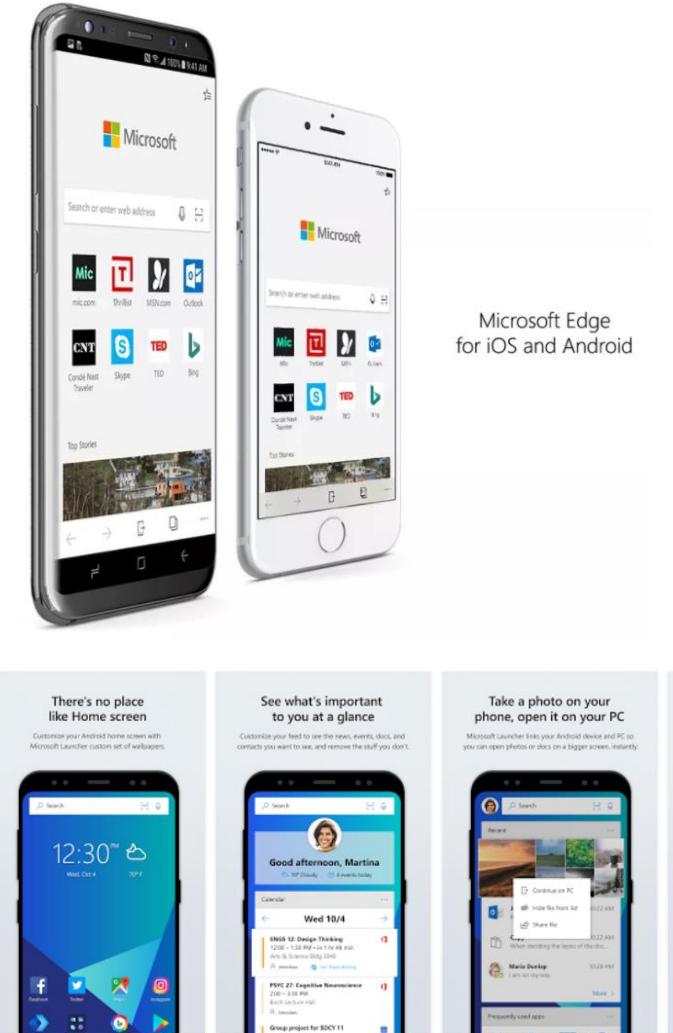


<https://dazeinfo.com/2016/08/30/android-smartphone-os-apple-ios-market-share/>

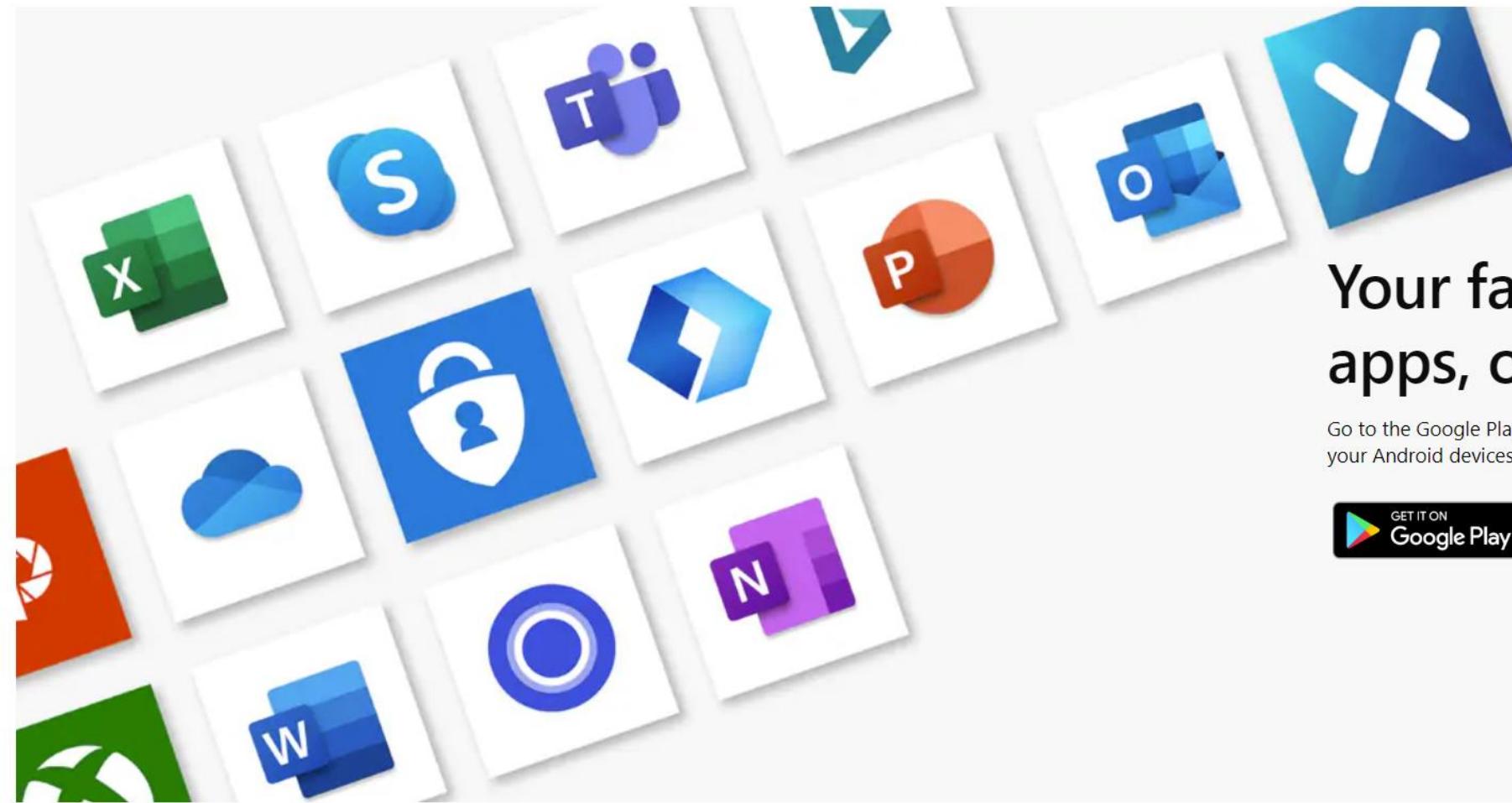
- Windows 10's Smartphone Failure Is Microsoft's Greatest Opportunity
- “The OS is no longer the key to bringing customers on board, the key is getting them into your cloud and having them continue to use it no matter where you are”

Microsoft for Android

- All sorts of Microsoft Apps, including Office, Launcher and a Edge Browser
- Android's open nature – it's the best platform for Microsoft to embrace and extend
- Of course the apps full functionality is only unlocked when a user is signed in with their Microsoft account
- Part of Microsoft's mobile strategy is to get as many people engaged with their own cloud-based services alongside the forced smartphone choice of a Google Account (on Android) or an iCloud account (on iOS).



<https://www.forbes.com/sites/ewanspence/2017/10/15/microsoft-android-launcher-edge-browser-new-app/#37829ea6e33f>
<https://www.forbes.com/sites/ewanspence/2017/02/19/microsoft-windows-10-smartphone-failure/#6aa4f58520ab>



Your favorite Microsoft apps, on your Android

Go to the Google Play Store to download the services you know and love for your Android devices.



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