

# 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

“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**.”

A product innovation, process innovation, business model innovation etc.

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

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)

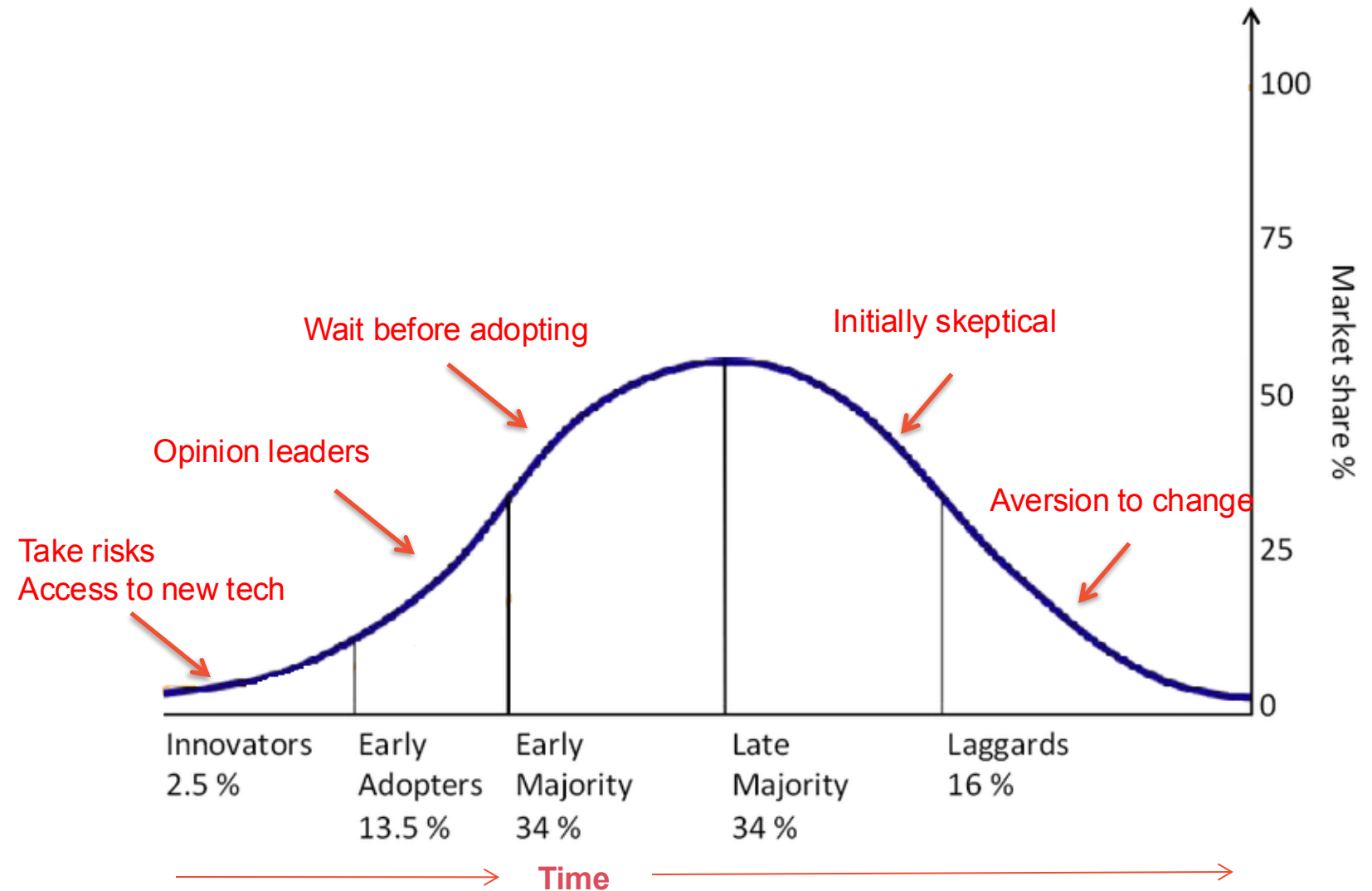
## “Tech Influencer”

—

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!**

# 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

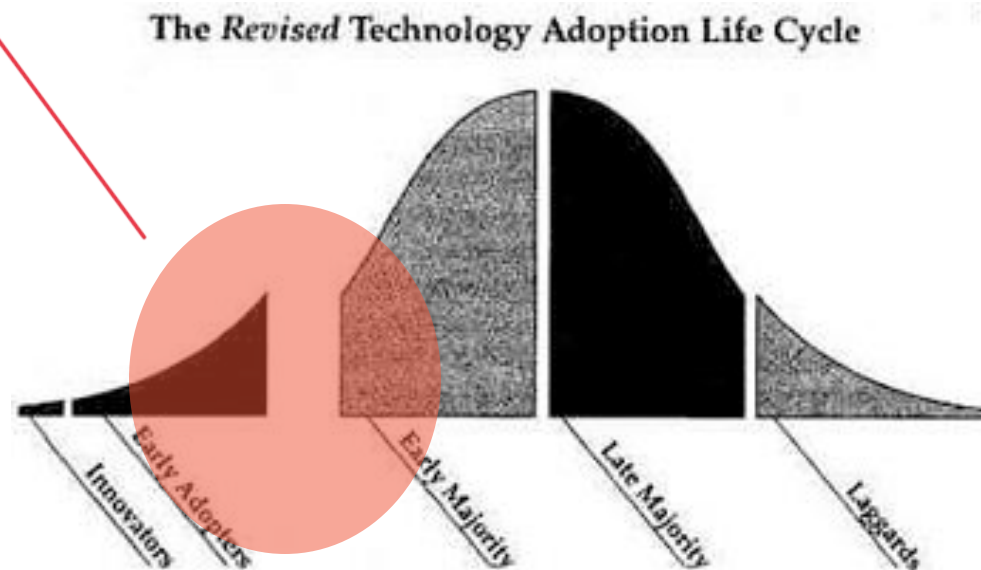


Figure from “Crossing the Chasm”

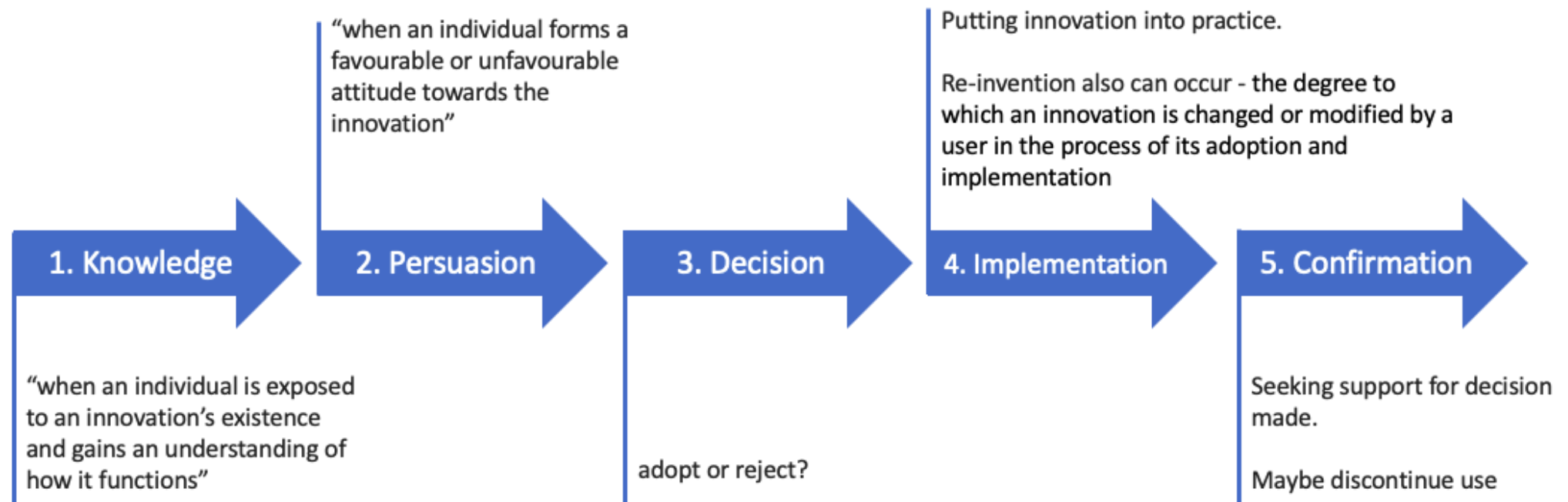
# Cumulative adoption curve

- 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”).
  - **Observeability** – 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)

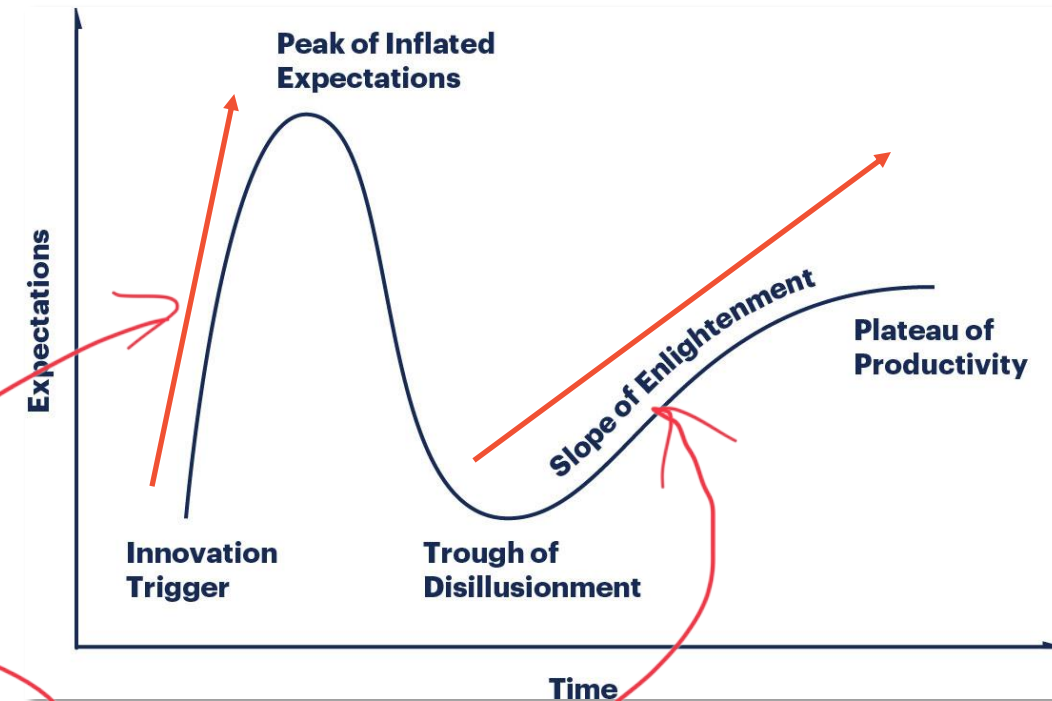


# Five phases of a technology's life cycle

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

# 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**



## 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)

## 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 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

# 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.**

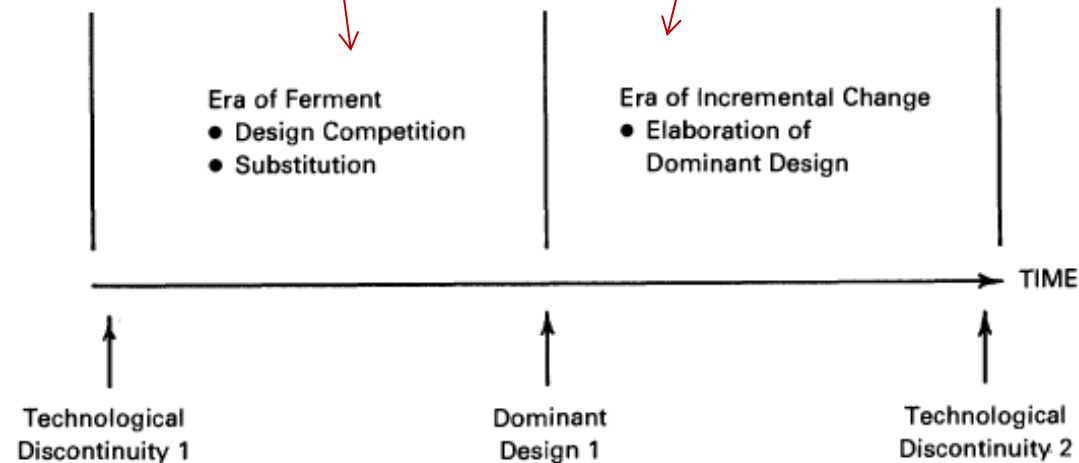
# Design Dominance and Technology Cycles

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.

# Dominant design and windows of opportunity?

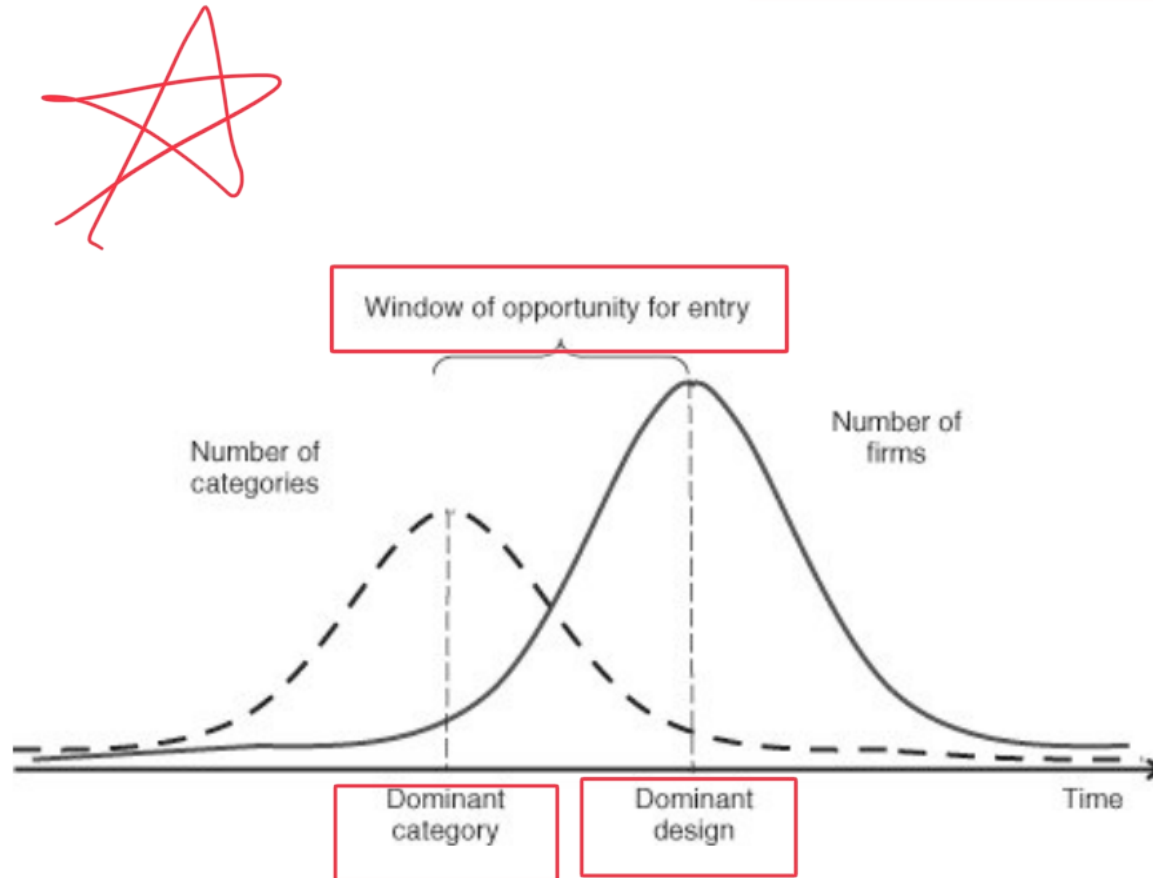
Figure

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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# 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

Standards authority	Example standards
W3C ( <u>World-wide Web Consortium</u> )	HTML, URL, CSS, XML
ISO ( <u>International Organisation for Standardisation</u> )	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
<u>Community</u> (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 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:

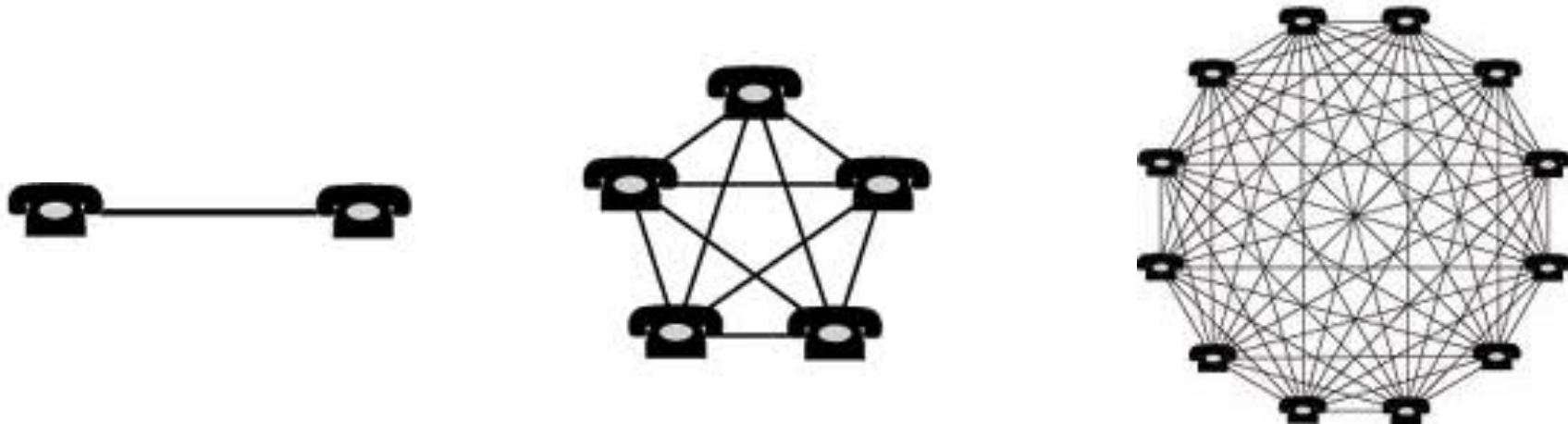
- When a design is dominant, there is greater use of the technology
- Greater use leads to greater knowledge accumulation about that technology
- Greater knowledge enables a fast rate of improvement of the technology
- Company structures and culture are based around the technology

# 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



# 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

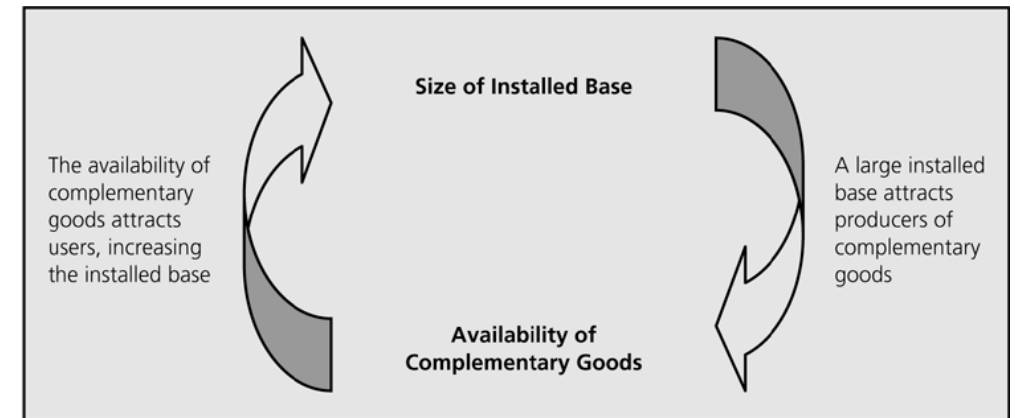


# Why Dominant Designs Are Selected:

## 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)*

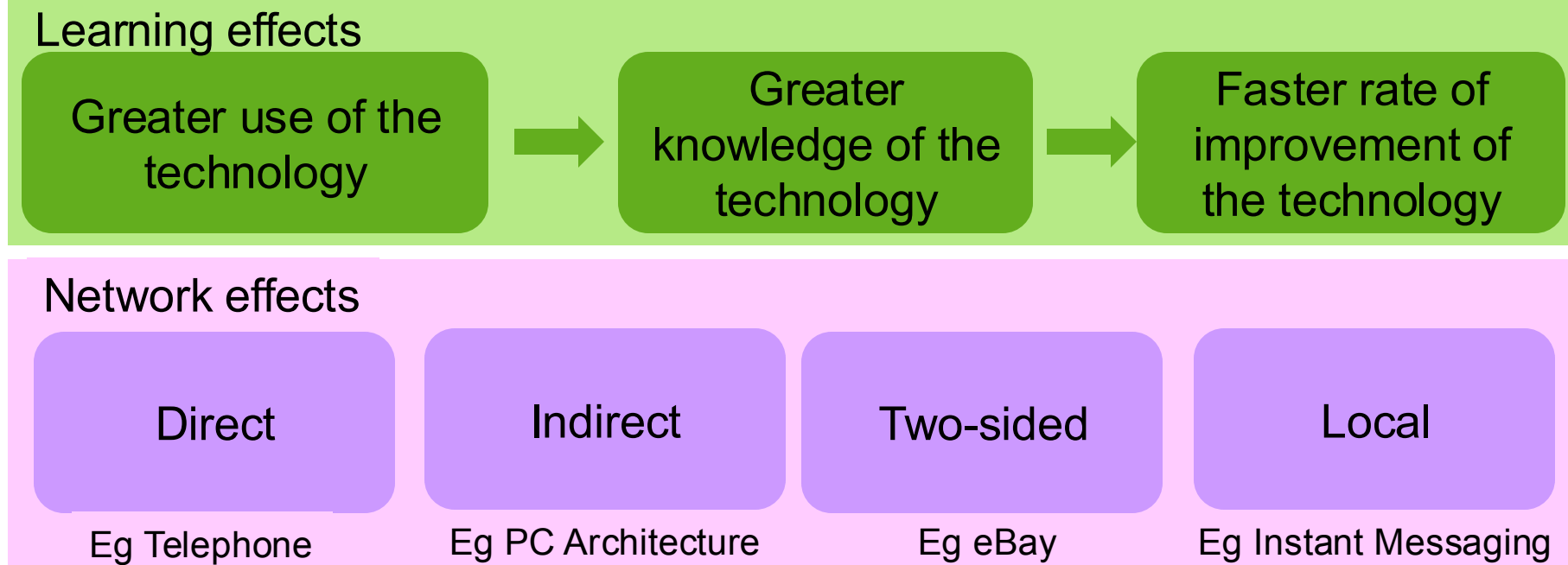
# Why Dominant Designs Are Selected:

## 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



# 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

## 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