

# Technology Strategy (MGMT 731)

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Definition of technology

Roles relative to technology

What is a technology strategy?

Incremental vs. radical innovations / H1, H2, H3 innovation

S-curves

Technology push and market pull

Drivers of diffusion rates

Rogers' categories of adoption / "crossing the chasm"

Industry patterns of entry/exit and the "dominant design"

**Session 9:**

Disruption + Tesla Case

Competence-enhancing vs. competence-destroying technologies

Disruption of incumbents - disruption from below and the "innovator's dilemma."

Drivers of value capture - appropriability and complementary assets

Patents as mechanism for appropriation

Standards as mechanism for appropriation

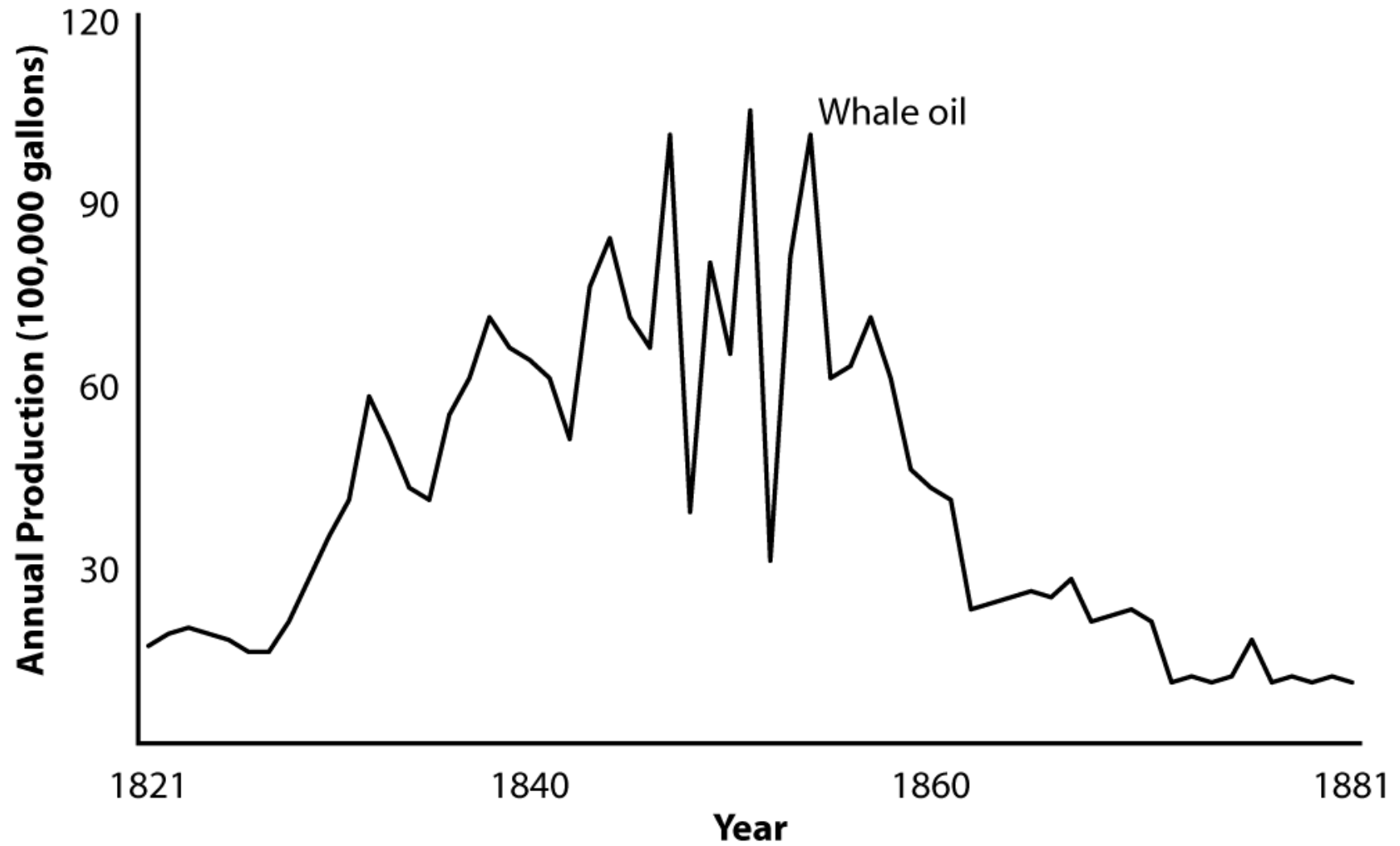
Timing of entry, first mover "advantage"

Open innovation, open tournaments

Make-buy decisions in innovation, establishing an innovation frontier

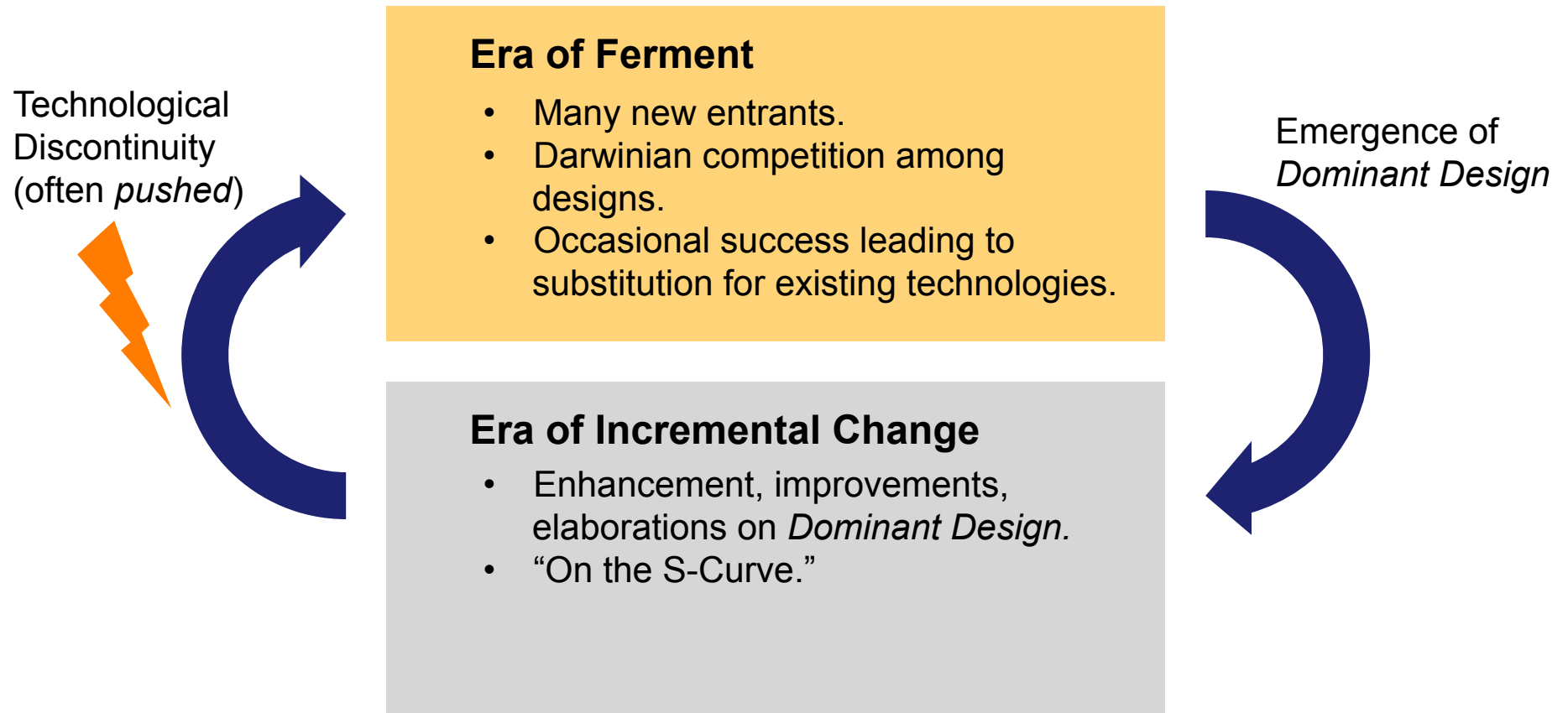
Technology ecosystems





**Source:** Terwiesch and Ulrich. 2009. *Innovation Tournaments*.

# The Technology Cycle (for Radical Innovation)

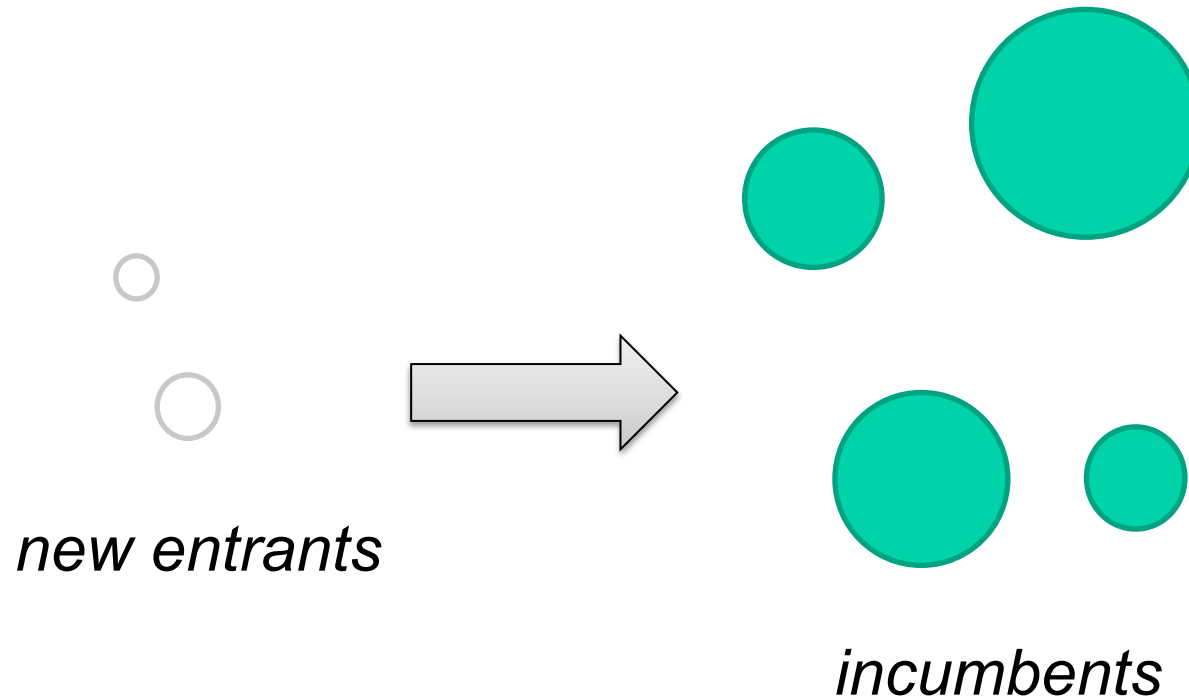


**Source:** adapted from Schilling, Chapter 3.

# ***Disrupt***

1. *interrupt (an event, activity, or process) by causing a disturbance or problem.*





## Conditions for Disruption

- ① Substantial fraction of market must prefer the new product or service.  
(The new technology must prevail.)
- ② Incumbent must be unable to respond and replicate.



## LED Lighting – Market Leaders

Cree  
Epistar  
Everlight Electronics  
GE Lighting Solutions  
GYLED  
Lighting Science Group  
Lite-On Technology / Ledtek  
Mitsubishi / Verbatim  
Osram / Sylvania  
Philips  
Samsung  
Solid State Lighting Systems  
Toshiba



# Will an Innovation Disrupt Incumbents?



LCD displays did not disrupt **SONY**.



The eBook/internet killed **Borders**.

## ***How hard is it for an organization to change?***

Does the technological innovation *enhance* or *destroy* the *competencies* and *complementary assets* of the incumbent?

Is this a *component innovation* or an *architectural innovation*?



# Does the innovation **enhance** or **destroy** competencies?

## *SONY Competencies and Complementary Assets*

- Brand
- Consumer insights and product design
- Distribution and channel partnerships
- Miniaturization and engineering excellence
- Production and supply chain
  - CRT production



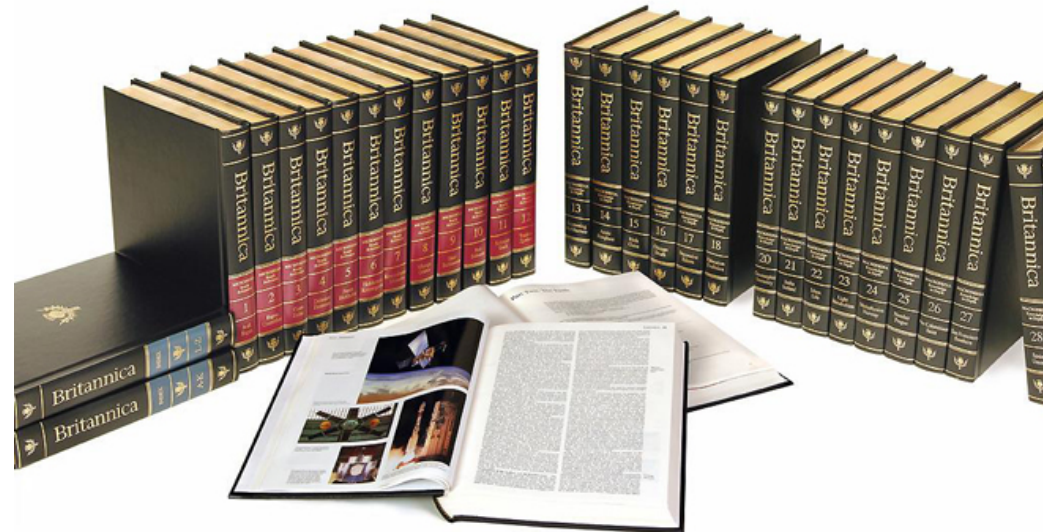
# Does the innovation **enhance** or **destroy** competencies?

## *Borders Competencies and Complementary Assets*

- Brand
- Café and library experience
- Retail store location
- Managing a part-time workforce
- Managing distribution and store inventory
- Relationships with publishers and distributors
- Product assortment planning



# Is the technology a **component** innovation or an **architectural** innovation?



**Component Innovation**



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The *Britannica* is the oldest English-language encyclopaedia still being produced. It was first published between 1768 and 1771 in [Edinburgh](#), Scotland as three volumes. The encyclopaedia grew in size: the second edition was 10 volumes, and by its fourth edition (1801–1810) it had expanded to 20 volumes.

The *Britannica* is a [scholarly work](#) that has been a [major reference work](#) and the

### Encyclopædia Britannica



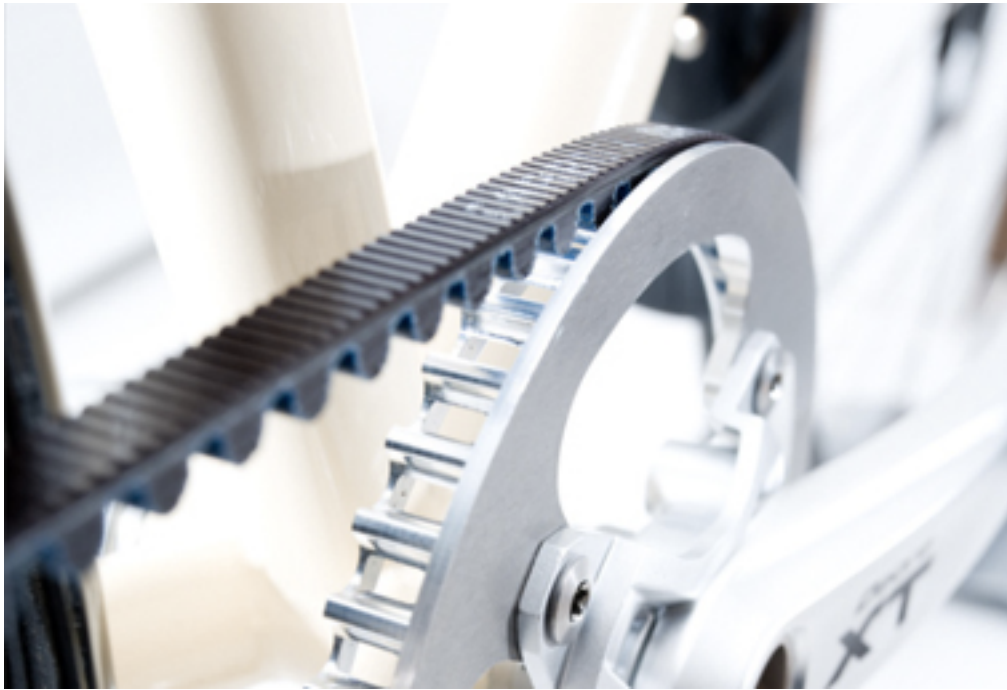
Britannica's thistle logo

**Author** As of 2008, 4,411 named contributors  
**Illustrator** Several, initial engravings by [Andrew Bell](#)

**Architectural Innovation**



## Component vs. System Perspective



Gates Carbon Drive





Few incumbents succeed in adapting to architectural innovation.  
What about these?

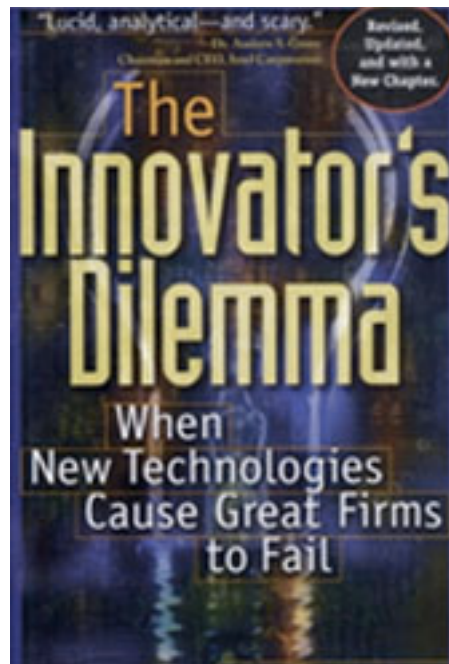


## Innovator's Dilemma

- Clayton Christensen's highly influential book (from his PhD thesis).
- Popularized term “disruptive innovation.”
- Term used in a very specific way to describe a very specific type of disruption.
- Controversial because:
  - Has not proven predictive.
  - Definition somewhat tautological.
  - Empirical evidence weak.
- Still...is an pattern exhibited frequently enough that worth understanding.

e.g.

[Tellis and Sood, Demystifying Disruption: A New Model for Understanding and Predicting Disruptive Technologies](#)



## Generations of disk drives and repeated failure of incumbent firms

- 14-inch drives (1970s)
- 8-inch drives (1978-80)
  - Entrants: Shugart, Micropolis, Priam, Quantum
  - 2/3 of 14-inch drive makers did not introduce an 8-inch model
- 5.25-inch drives (1980)
  - Entrants: Seagate, Miniscribe, Computer Memories, International Memories
  - By 1985, only half of the firms producing 8-inch drives had introduced 5.25-inch drives (only Micropolis (barely) survived)
- 3.5-inch drives (1984)
  - Entrants: Rodime, Conner Peripherals, Western Digital, Maxtor
  - Seagate tested 3.5-inch drives but cancelled the program after talking to customers

The disk drive industry is the central example from Christensen's book *The Innovator's Dilemma*.



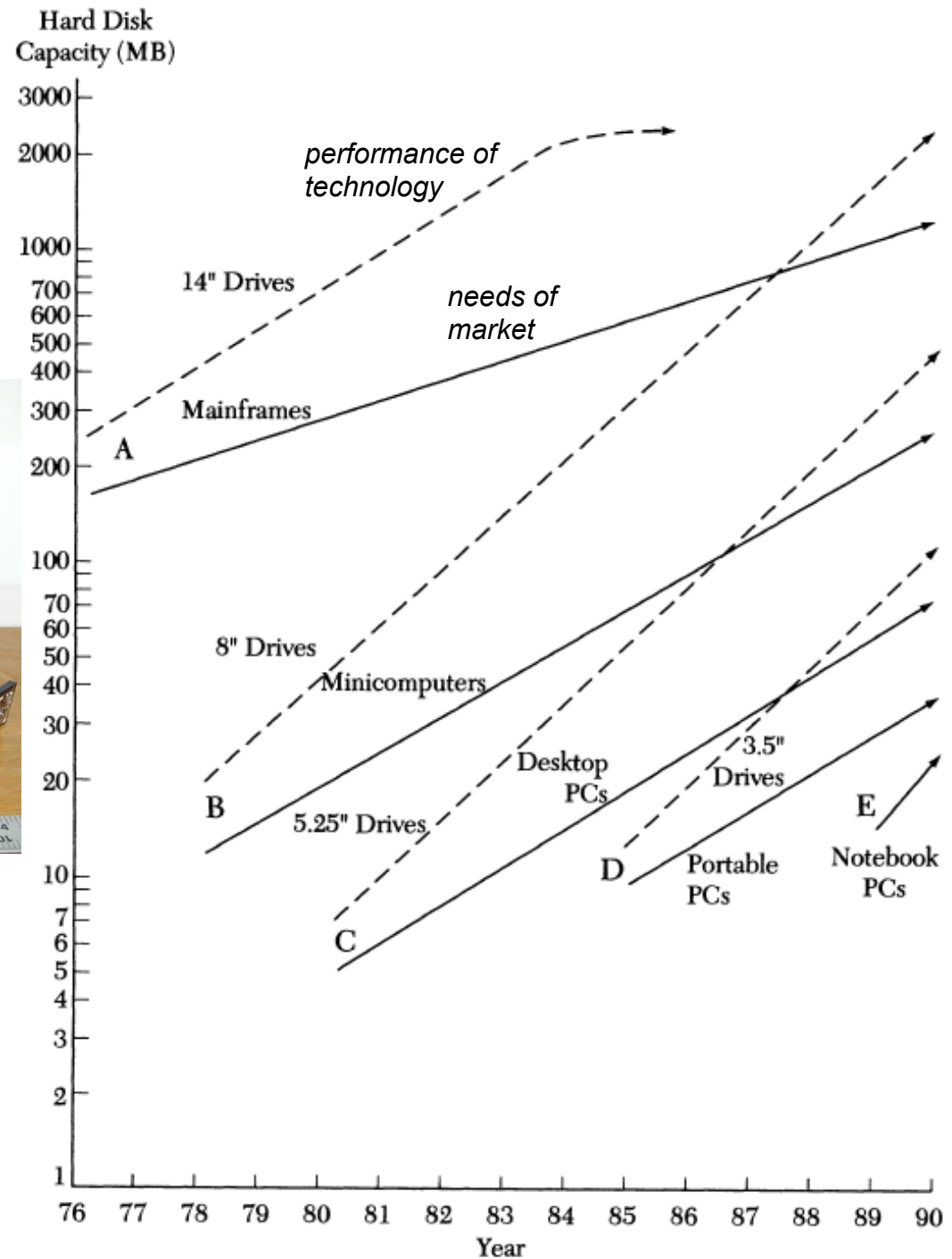


## Introduction of 5.25-Inch Hard Drive in 1981

	<b>8-Inch Drive</b> (Minicomputer Market)	<b>5.25-Inch Drive</b> (Desktop Computer Market)
Capacity (MB)	60	10
Physical Volume (cu-in)	566	150
Weight (lbs)	21	6
Access Time (ms)	30	160
Cost/MB (USD)	\$50	\$200
Total Unit Cost (USD)	\$3000	\$2000

**Source:** Disk Trends via Christensen *Innovator's Dilemma*.

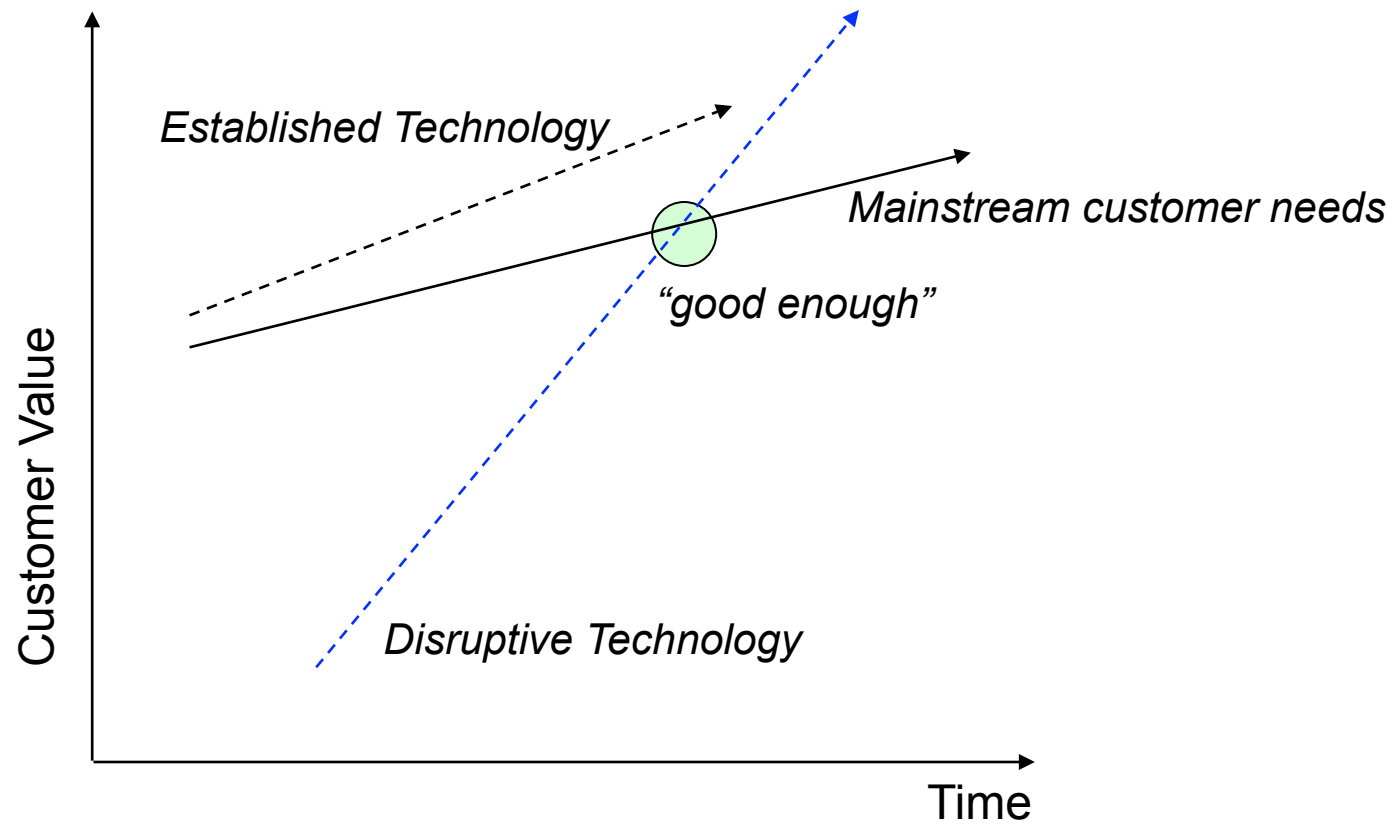
# Successive Generations of Hard Disk Drive Technologies



## Source:

Clayton Christensen, *Business History Review*, Vol. 67, No. 4, 1993.

## The Innovator's Dilemma (Christensen)



1. Incumbents focus on their existing customers.
2. New entrant serves a niche with a lower performing, lower cost product. Incumbent dismisses the new technology as "not good enough."
3. The new technology gets better, and eventually is good enough for the needs of the high-end customer.
4. The incumbent is disrupted.

# Competition on Multiple Dimensions



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