

# Disruptive Innovation

## Legend

1. Why technology tends to develop in an evolutionary manner
1. S-curve of technology improvement
2. Disruptive technologies

# Evolutionary Patterns of Technology Development

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# Evolutionary Patterns of Technology Development

## Research & Development by Firms



**Basic Research:** Targeted at increasing scientific knowledge (technology) for its own sake. It may or may not have any long-term commercial application

**Applied Research:** Targeted at increasing scientific knowledge for a specific application or need

**Development:** Activities that apply knowledge to produce useful devices, materials, or processes

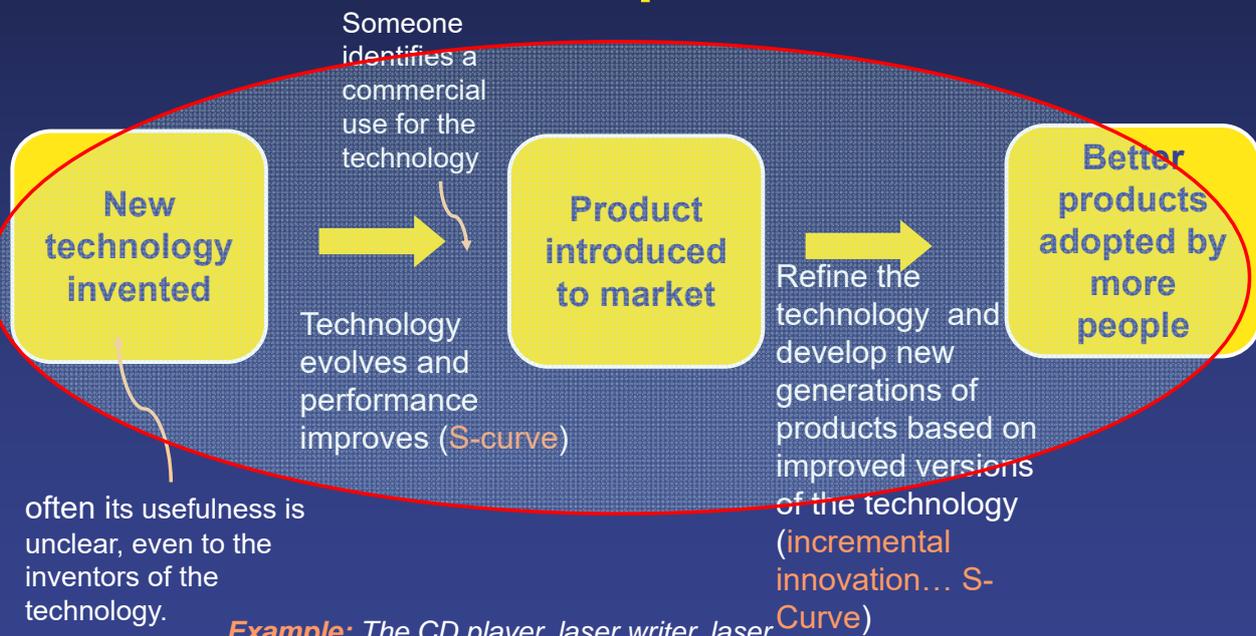
((we also call this phase: New Product Development NPD))

## Evolutionary Patterns of Technology Development

- **R&D:** A process that begins with basic scientific discoveries and ends with commercial products/services that are adopted by a wide range of customers



# Evolutionary Patterns of Technology Development



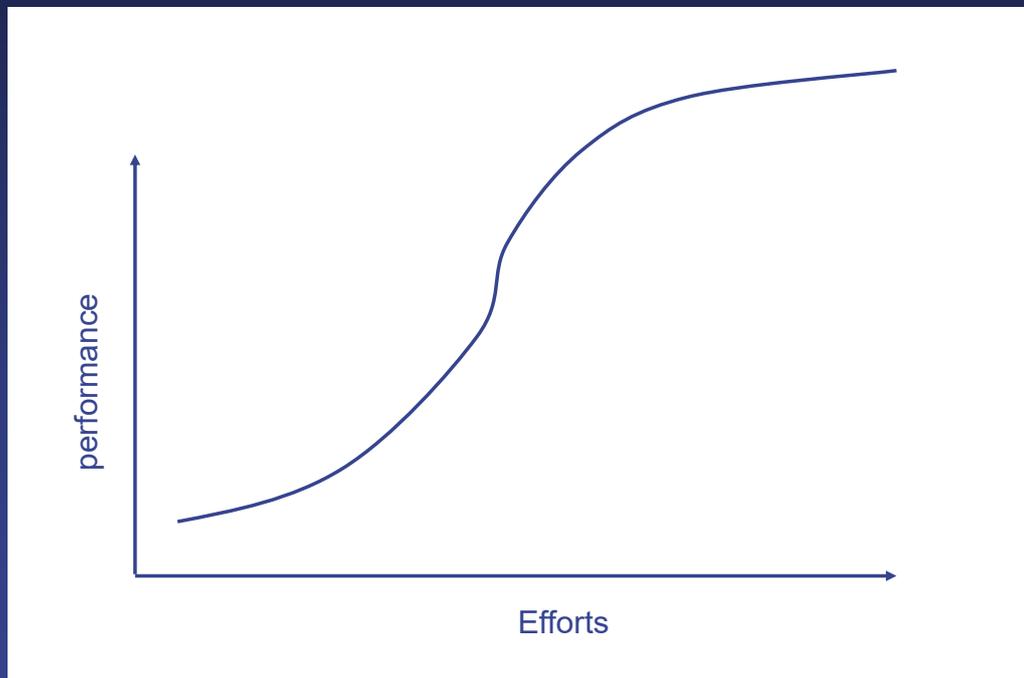
often its usefulness is unclear, even to the inventors of the technology.

**Example:** The CD player, laser writer, laser pointer and the bar code reader the cashier at the supermarket uses, are all based on laser technology.

## Technology S-Curves

- Graphical representations of the development/improvement of a new technology
- Compare some **measure of performance** (speed, cost, or capacity, etc.) with some **measure of effort** (R&D spending or intensity, person-hours, etc.)
- The relationship between **effort** and **performance** is typically **S-shaped**:
  - Initially, **performance improvements** per unit of effort are **small**
  - Once **key drivers of performance** are identified, **rapid improvement** follows
  - **Diminishing** returns as physical **limits** reached

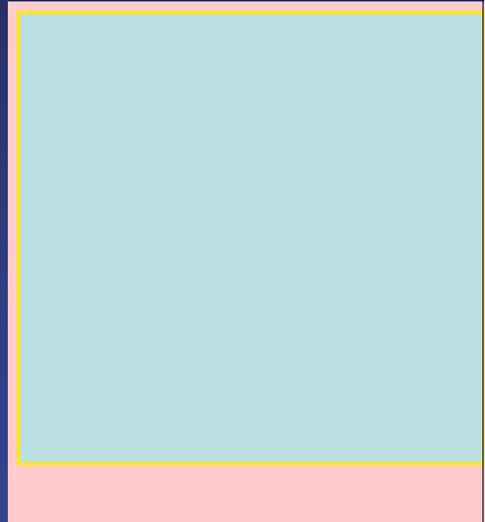
# Technology S-Curves



# Technology S-Curves



What is this ???

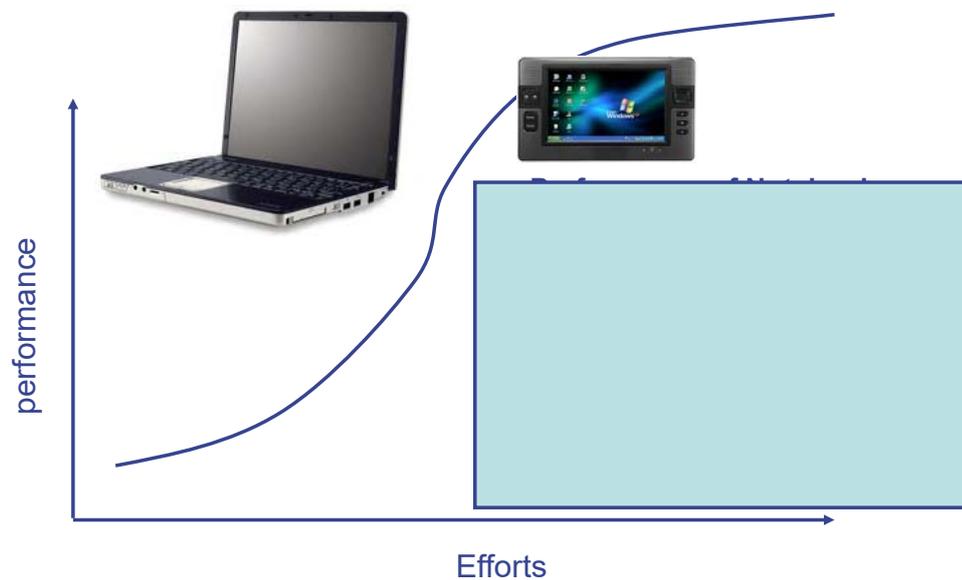


# Technology S-Curves

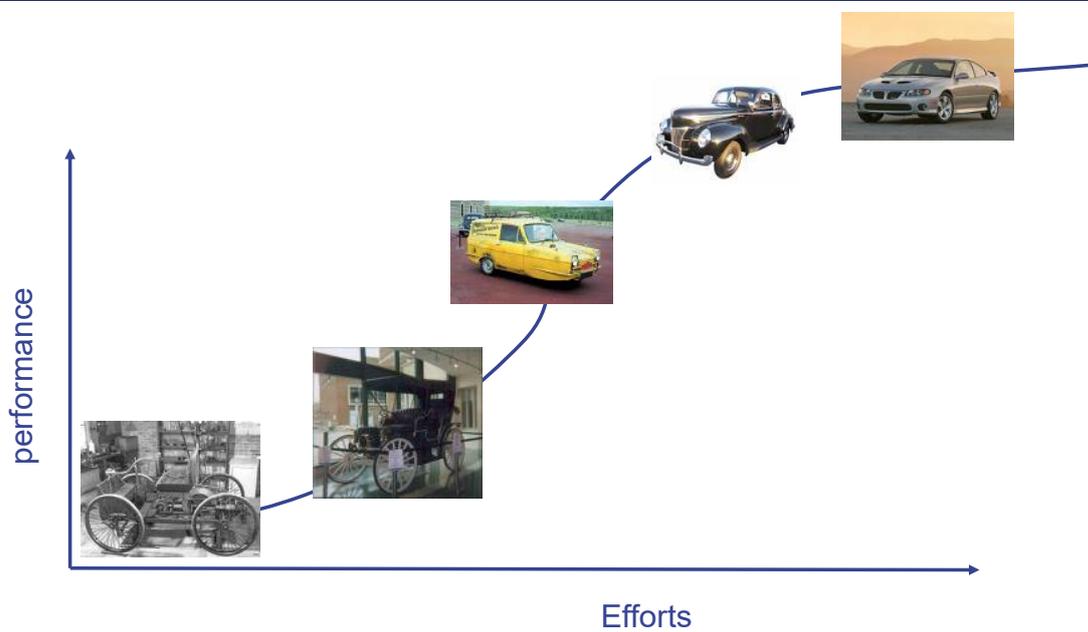


# Technology S-Curves

What is the performance criterion for Notebooks and laptops

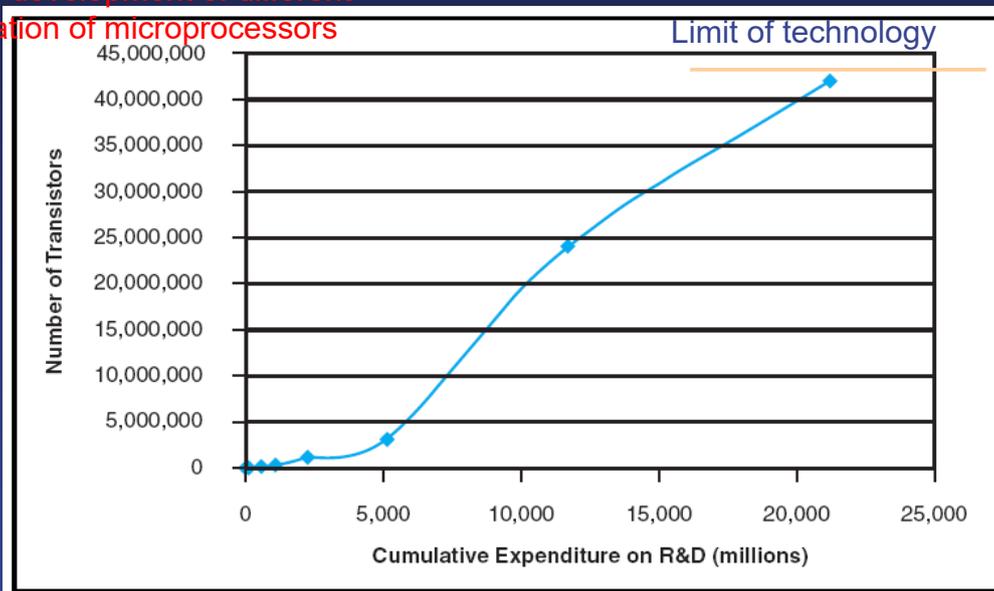


# Technology S-Curves



## The technology S-curve for Intel's semiconductors

Intel's development of different generation of microprocessors



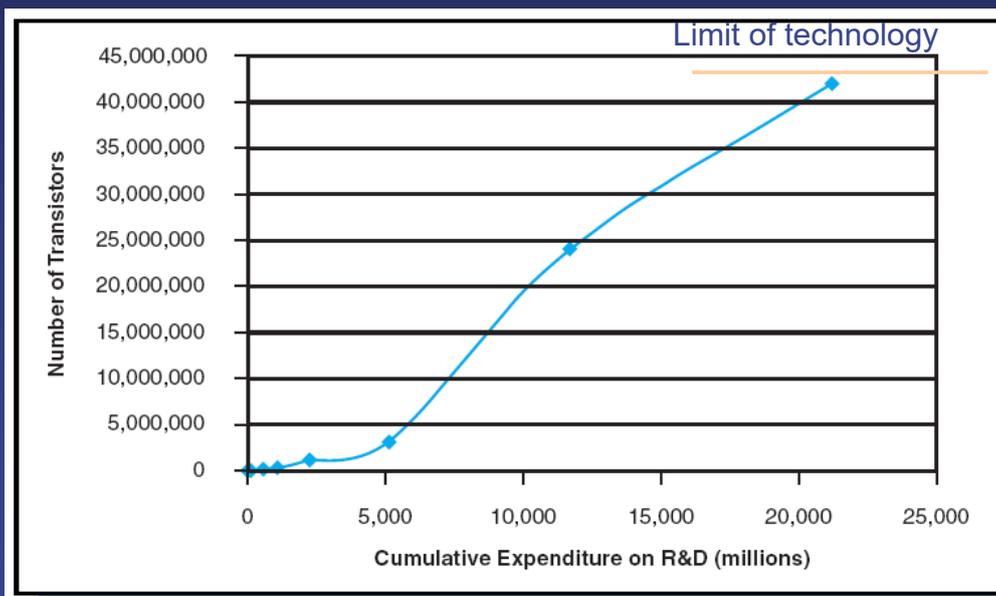
- You need to understand how technology advances along an S-curve to formulate an effective technology strategy (investment strategy).

## Technological improvements along an S-curve

- Tend to be incremental, building on prior developments, and taking place within an existing paradigm.... *Competence enhancing*
- Usually done by established firms: **Why?**
  - they have existing technical, market, and organizational capabilities
  - they have an existing customer base
  - they have access to internal cash flow to invest

## The technology S-curve

Some technologies may reach the limit, while other may get replaced by another technology product of the same category (disruptive innovation)



## Disruptive Technology

The **Innovator's Dilemma**, by Clayton M. Christensen, 1997.

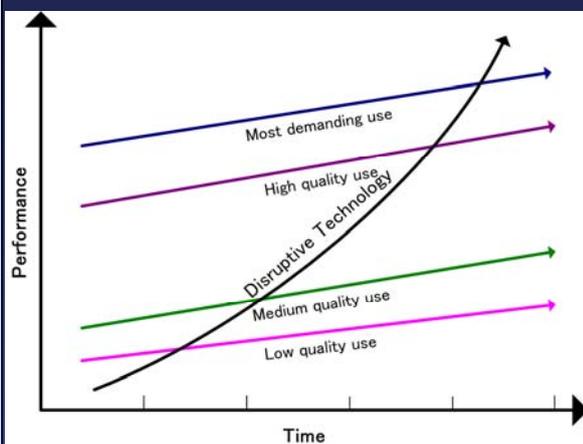
This book is about the failure of companies to stay atop their industries when they confront certain types of market and technological change. **It is not about the failure of simply any company, but of GOOD COMPANIES** – the kinds that many managers have admired and tried to emulate, the companies known for their abilities to innovate and execute.

Companies stumble for many reasons, of course, among them bureaucracy, arrogance, tired executive blood, poor planning, short-term investment horizons, inadequate skills and resources, and just plain bad luck.

But this book is **NOT** about companies with such weaknesses: **It is about well-managed companies** that have their competitive antennae up, listen astutely to their customers, invest aggressively in new technologies, **and yet still lose market dominance**.

**GOOD Companies fail when they face a “Disruptive Technology”!**

## Disruptive Technology

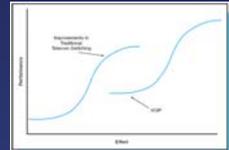


Is an innovation (technological or non-technological) that helps create a **new market** and value network, and eventually goes on to disrupt an **existing market** and value network (over a few years or decades), displacing an earlier technology.

The term is used in business and technology literature to **describe** innovations that **improve** a product or service (same or different technology but usually same product category) in ways that the market does not expect, typically first by designing for a different set of consumers in a new market and later by lowering prices in the existing market.

## Disruptive Technology: *How it works!*

- In the beginning, it is **inferior** to existing technology in some dimensions, and it has **a value in one or two dimensions** over the existed technology
- **Small** segment of the **market** will value these one/two dimensions
- In short time, the disruptive technology **performance improves** so **fast** and **overtake** the existing technology
- The **mainstream** market **move** into the new disruptive technology



## Disruptive Technology

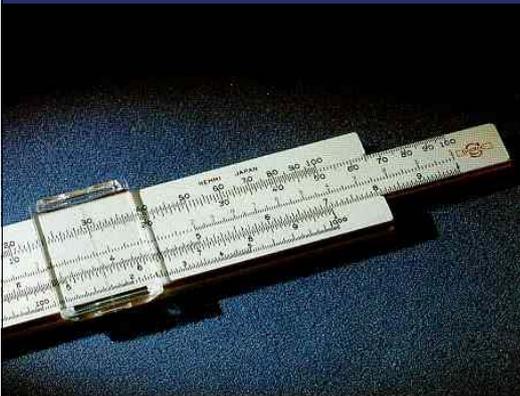
**Example:** Hard-disk-Drive 5.25 and 3.5



- ❖ 1980 – 1985, Seagate manufactured 5.25 to IBM (40MB and 60MB)
- ❖ 1985, new firm (Conner) came up with 3.5 HDD (smaller in size, but limited 10MB)
- ❖ Seagate was the second to develop a prototype of 3.5, but IBM and other big customers rejected it
- ❖ In 1987, 3.5 improved its performance (100 MB) and overtook 5.25
- ❖ Seagate lost its position as a leader to Conner



## Disruptive Technology

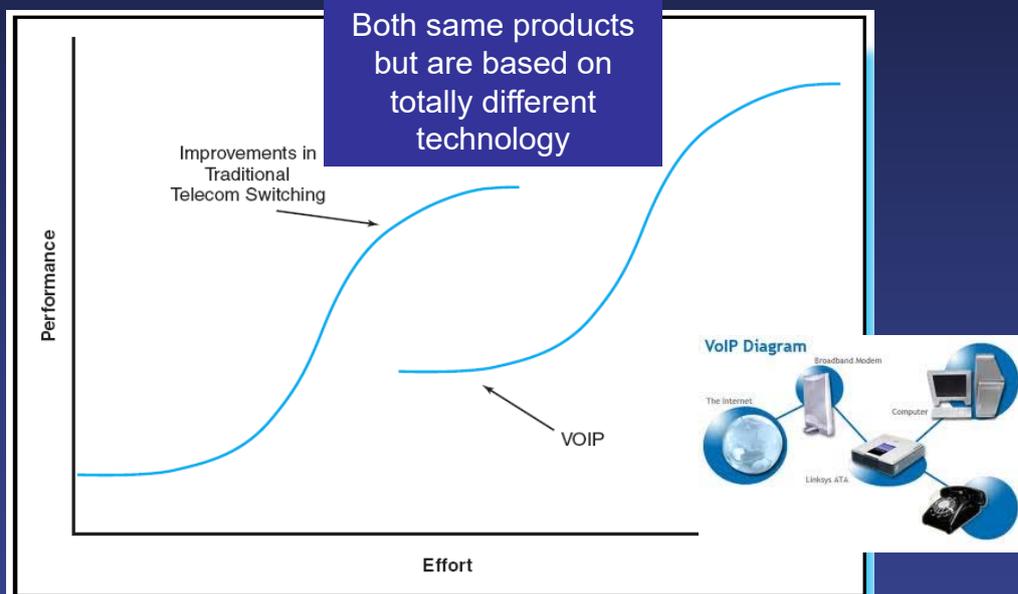


During the 1950s and 1960s  
Keuffel & Esser was the  
preeminent slide-rule maker in  
USA



In the early 1970s, a new  
innovation relegated the slide-  
rule to collectors and museum!  
(HP and Texas Instruments)

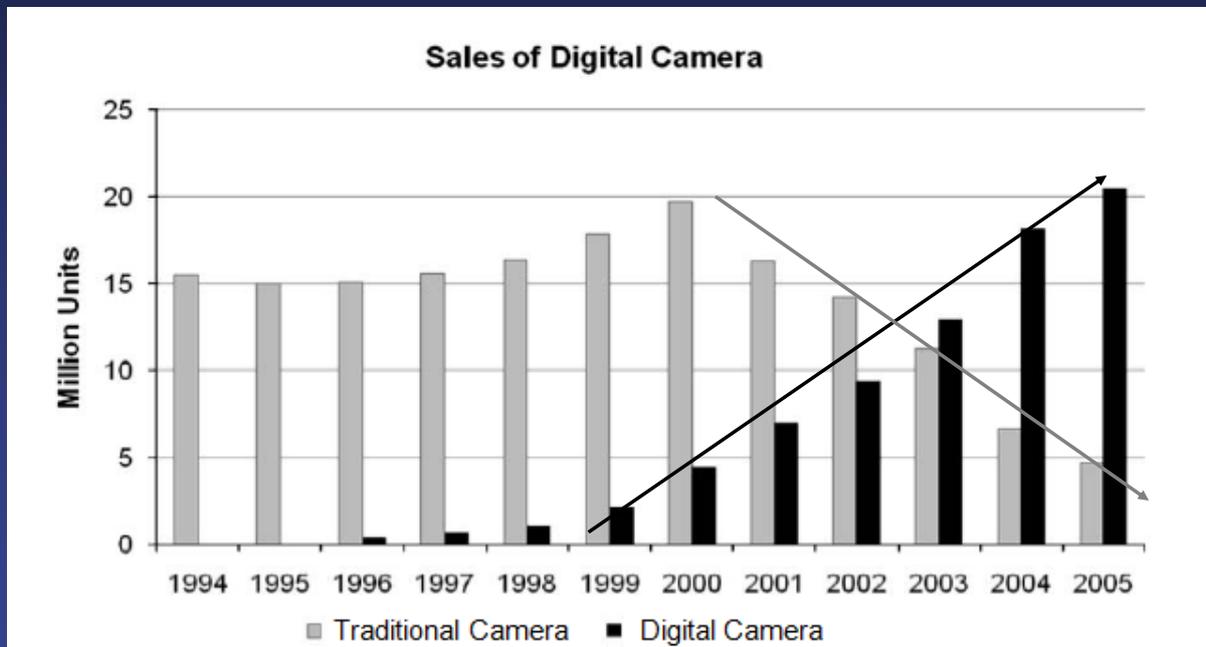
# Disruptive Technology



Is the VOIP radical or incremental technological innovation?

Usually a new /radical technological innovation which will be used as a base for an existing products (CD Vs. DVD or traditional camera vs. Digital camera , etc.)

## Disruptive Innovation: Digital Cameras



Behavior change: From the way we use traditional cameras to digital cameras

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## Disruptive Technology

- A technological innovation that improves a product or service in ways that the **market & Established firms** do not expect, typically by being **lower priced** or designed for a **different set of consumers**.
  - Filling a role in a new market that the older technology could not fill
    - **Example:** As cheaper, lower capacity but smaller-sized **flash memory** did for personal data storage in the 2000s
  - By successively moving up-market through performance improvements until finally **displacing** the market incumbents
    - **Example:** As digital photography has largely replaced film photography



## Disruptive Technology

Companies that once revolutionized and dominated new industries have seen their profits fall and their dominance vanish as rivals launched improved designs or cut manufacturing costs:

### Other Example:

Xerox in copiers replaced by Canon

Polaroid instant photography replaced by Digital Camera

Cassette tape replaced the 8-track



CD replaced cassette tape

MP3 replaced CD



Something will replace MP3



**CRT monitors**

**Commercial Banks**  
Standard Chartered  
HSBC  
citibank

**Microsoft Office**

**Disruptive Technologies**

**LCD monitors**

**What is the relationship between these technology products?**

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## Disruptive Technology

Established technology	Disruptive technology
Wire line telephone	Mobile telephone
CRT monitors	LCD monitors
Bricks and mortar retailing	Online retailing
Banks	Online banking
Silver halide photographic film	Digital photography
Type writer	Word processor

## Disruptive Technology



HDD Vs. Cloud  
technology

With every disruptive innovation, we see new comers/entrants into the business

## Disruptive Business Model Innovation: Digital Banking



The digitization (or moving online) of all the traditional banking activities and programs that historically were only available to customers when physically inside of a bank branch.

### This includes activities like:

- Money Deposits, Withdrawals, and Transfers
- Checking/Saving Account Management
- Applying for Financial Products
- Loan Management
- Bill Pay
- Account Services

## Digital Banking Business Model: New Players



FinTech companies are successfully encroaching into core banking space, and have already caused disruptions in below key areas:

- Payment processing
- Lending
- Saving/Investment
- Financial Research and Engineering

## Why Established Firms Fail When Facing Disruptive Technologies

*Companies Depend on Customers and Investors for Resources*

*Small Markets Don't Solve the Growth Needs of Large Companies*

*Market that Don't Exist Can't Be Analyzed*

*An Organization's Capabilities Define its Disabilities (processes and value)*

Why some established companies were not able to adopt the new technologies?

## How to win in the market using Disruptive Technology?

- For new firms: target a new or underserved segment of the market with a disruptive innovation
- As an incumbent firm, develop a **new company to exploit the disruptive technology**, rather than ignoring it, or trying to develop the technology within the confines of your existing organization



## Who introduce the disruptive innovation?

Technology		Quote	Person
Phonograph			
Airplane			
Computer			
Personal computer			
Movies with Sound			

**Than Q 😊**