C15.0042 Lesson 03 Edward M. Kerschner

The Information Revolution Share of Private-Sector GDP



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The Information Revolution Economic Cycles

- Agricultural
 - Cycle: Annual
 - Driver: Weather
- Industrial
 - Cycle: 5-7 years
 - Driver: Inventory
- Information
 - Cycle: ?
 - Driver: ?

- Major technological revolutions are always bigger than anyone ever expects.
 - Railroads grew by about 10,000% in fifty years;
 - Car and truck production rose 2,400% in just eight years.

- When Billy Durant, founder of General Motors, remarked that the auto industry would be producing 500,000 cars within a few years, George W. Perkins, a senior partner in J.P. Morgan and Co., exclaimed that such an idea was preposterous. Perkins advised Durant to stop mouthing such nonsense if he wanted financial aid.
- In 1908, the year that Perkins dispensed this piece of wisdom, 65,000 cars and trucks were produced.
- Eight years later the figure was 1,617,708—more than three times Durant's forecast.

- The "Information Revolution" began with the digitization of individual enterprises, which created networks of increasingly ubiquitous computers:
 - mainframes in the 1950s and 1960s,
 - mini-computers in the 1970s and 1980s,
 - and PCs in the 1980s and 1990s.

The Information Revolution Information Age versus Industrial Age

 Information Revolution makes the economy less commodity-intensive.

Commodity companies as a % of DJIA components



The Information Revolution Paper Versus Paperless

 Convenience of paper, human nature to prevent a paperless world; selective printing replaces mass storage.



The Information Revolution Entrenched versus Startup

 Tech start-ups have easy access to cheap capital; being first is not a major advantage.

Capital Raised by Web Start-ups



The Information Revolution Producer versus Distributor

 Who owns the brand? Internet increases the power of producers, threatens distributors and middlemen that do not add value.



The Information Revolution New versus Established Brands

 New brands are created as "brand arbiters" help consumers select products.

Store	Paper	Cyber space		
	Consumer Reports	AOL.COM		

The evolution of "brand arbiters"

The Information Revolution E-tailing Versus Brick and Mortar

• Real barrier to entry is fulfillment, not the Web site itself.



E-commerce sales

The Information Revolution Commoditized Information Versus Proprietary Content / Insight

Information is free in the Information Age.



The Information Revolution Gorillas Versus Monkeys

 Gorilla dominance is only likely to increase as they acquire or co-opt some competitors while others drop out.



Percent of surfers visiting the 3 "gorillas"

- Just as, in the early 20th century, electric utilities permitted firms and households to "outsource" the age-old function of power generation . . .
- ... so is the Internet making it possible in the early 21st century to outsource another age-old function: information management.
- Driven by:
 - The collapsing cost of bandwidth
 - Information management is critical
 - Economies of scale
 - Economies of skill
 - Minimizing "total cost of ownership"
 - Digital democratization

Moore's Law



Mechanical Calculating Devices

Used in the 1890 U.S. Census



Turing's Relay-Based Machine

Cracked the Nazi enigma code





Vacuum Tube Computer

Predicted the election of Eisenhower



Transistor-Based Machines

Used in the first space launches



Integrated Circuit Based PC



Ubiquitous today



What's Next?

Three-Dimensional Chips?
Nanotube Circuitry?
Optical Computing?
Crystalline Computing?
DNA Computing?
Quantum Computing?







Changing business *structures* define the age

The Information Revolution The Agrarian Economy

• Craftsman





E. Kerschner

The Information Revolution The Industrial Economy

• The Assembly Line





The Information Revolution Division of Labor

"The greatest improvement in the productive powers of labor . . . have been the effects of the division of labor."

An Inquiry into the Nature and Causes of the Wealth of Nations, *Adam Smith, 1776*

The Information Revolution The Information Economy

Virtual Businesses





In the Information Age division of labor moves from the worker to the entire organization. Productivity gains.



Per Capita GDP Growth



The Information Revolution The "Early" Information Age

- Convergence of computer, communications, consumer applications, content.
- PC is central, multipurpose consumer device of the "early" Information Age. While there will not be one single "information appliance," the PC will be the single most important tool.
- Internet is a key medium. Net is home to three business models chasing three revenue sources:
 - entertainment (advertising/subscription revenues);
 - information (subscription revenues);
 - commerce (sales revenues).
- Most valuable Web sites owned by companies with strong brands. Net also offers huge cost saving opportunities.

- What is the next growth industry?
- What is the next growth structure?
- Changing business structures define the age

- Successive economic revolutions have led to greater "customer empowerment."
- So too, the Information Revolution will see:
 - Greater customer empowerment which leads to
 - Mass customization supported by
 - Deeper tech penetration which leads to
 - Fragmentation and ultimately
 - Consolidation

1. Customer Empowerment

Push Model of the early Industrial Age



1. Customer Empowerment

Advanced Push Model — of the middle Industrial Age



1. Customer Empowerment

Pull Model — of the late Industrial Age



1. Customer Empowerment

Interactive Pull Model — of the early Information Age



2. Mass Customization

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Sneakers



Food

mycereal © com™ Seneral Mills

3. Deeper Tech Penetration

Automotive Electronics

Chip Count





4. Fragmentation



5. Consolidation



The Information Revolution Risks investing in the tech sector

- One can pay too much for even the best company.
- Even an "industry leader" may not survive for long.
- Beware of mediocre companies that come to market simply because there is a demand for them.
- High-tech booms occur when cyclical trends in the stock market and economy favor an industry, but these trends can change rapidly.

The Information Revolution Net for Naught

Most early "new technology" companies do not survive, even as the technology thrives.



Personal Computers in the early 1980's



Biotech stocks: in the early 1990's



35 leading 1991 biotech companies Prices at May 1998 vs. Q4 '91 / Q1 '92 peak

The Information Revolution Booms & Busts in the Past 30 Years

