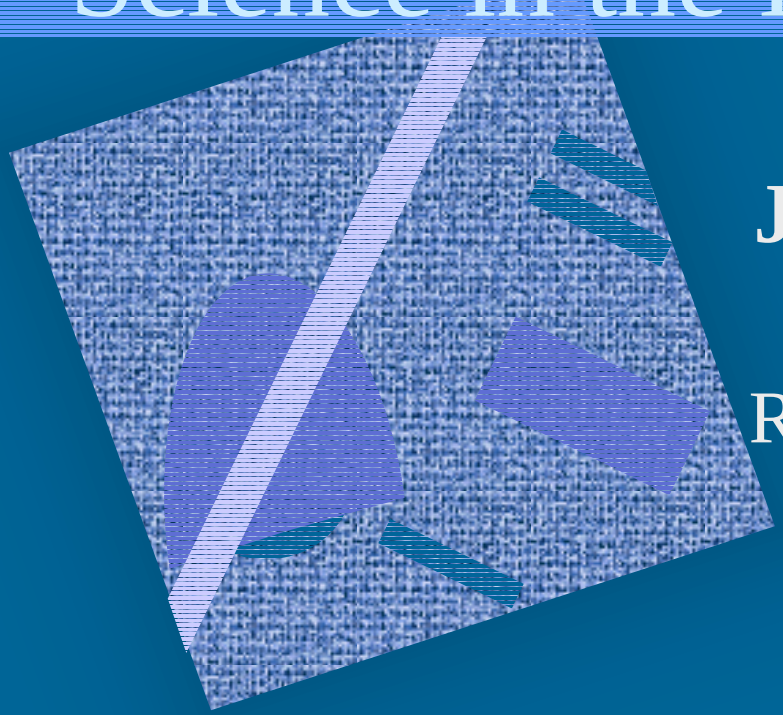
Cyberdoodling: Management Science in the Information Age



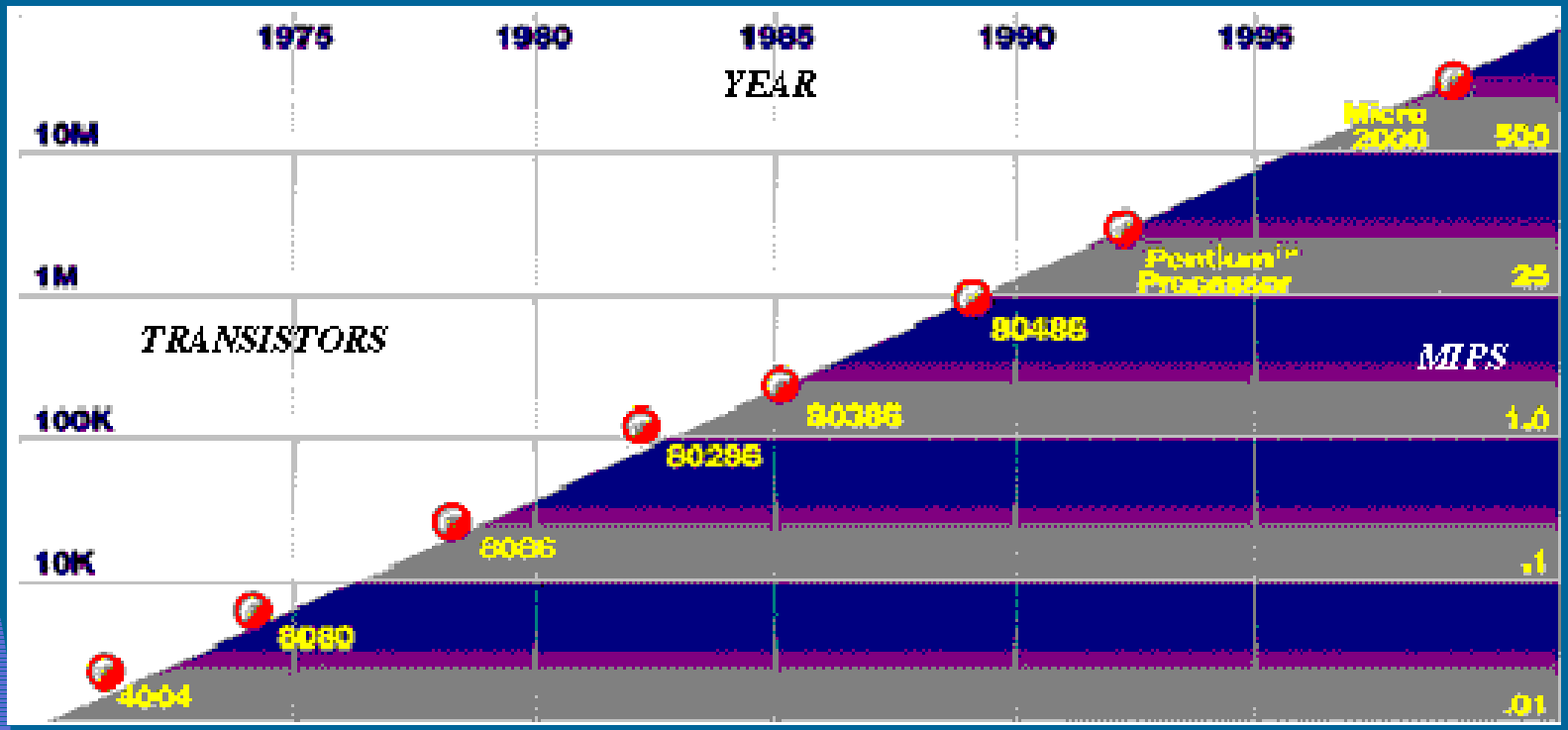
Jeffrey MacKie-Mason

Director, Program for Research on the Information Economy (PRIE)

Dept. of Economics and School of Information

University of Michigan

Silicon

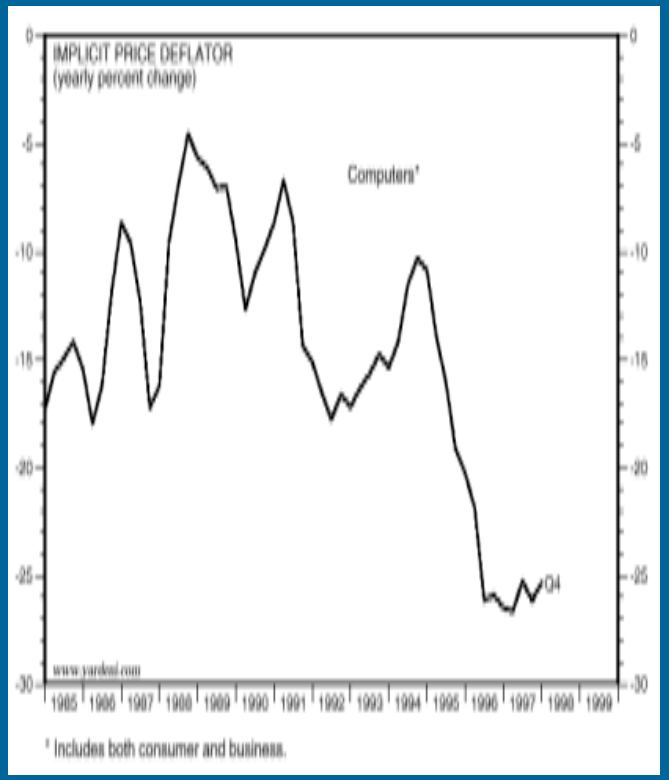


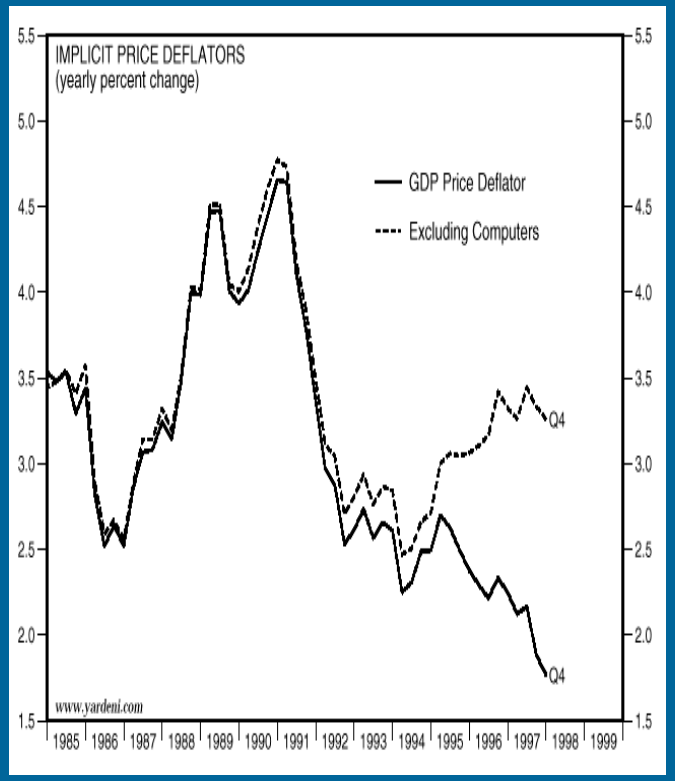
Transistor density doubling every 2 years since 1965

By Y2K, 100 million transistors, 1 billion instructions/sec

Source: Intel Corp.

Silicon Prices



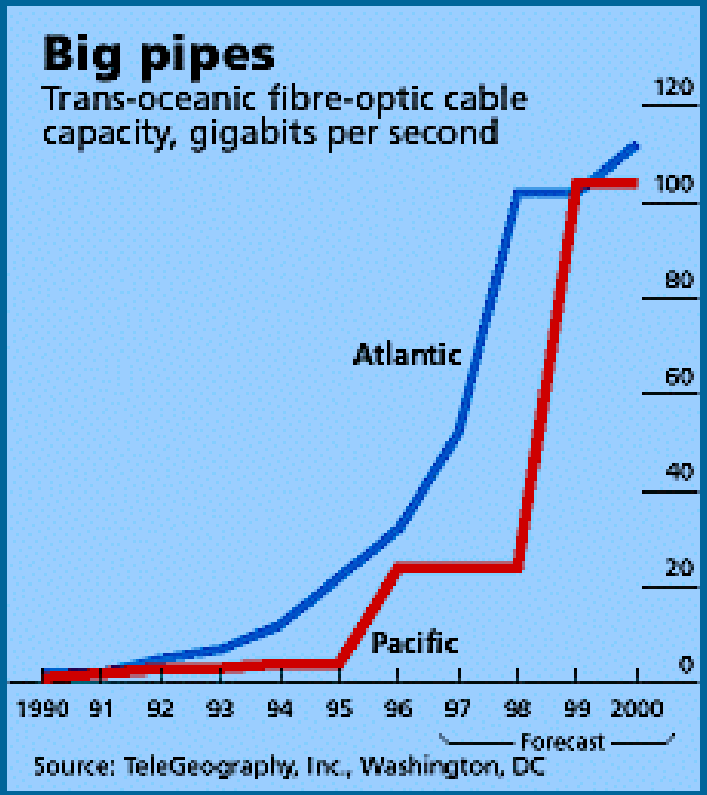


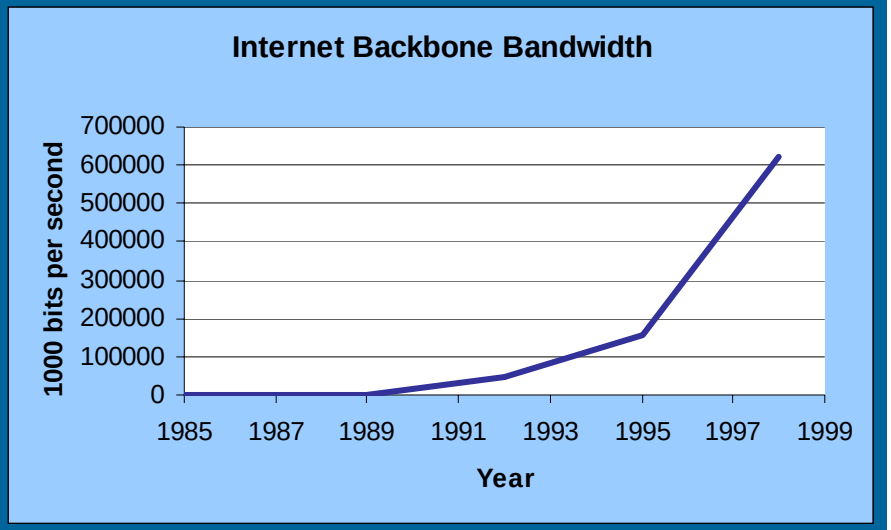
Computers: 5-20% price drop per year

GDP inflation: 3.25% without, 1.75% with computers

Source: Ed Yardeni, Deutsche Morgan Grenfell

Sand

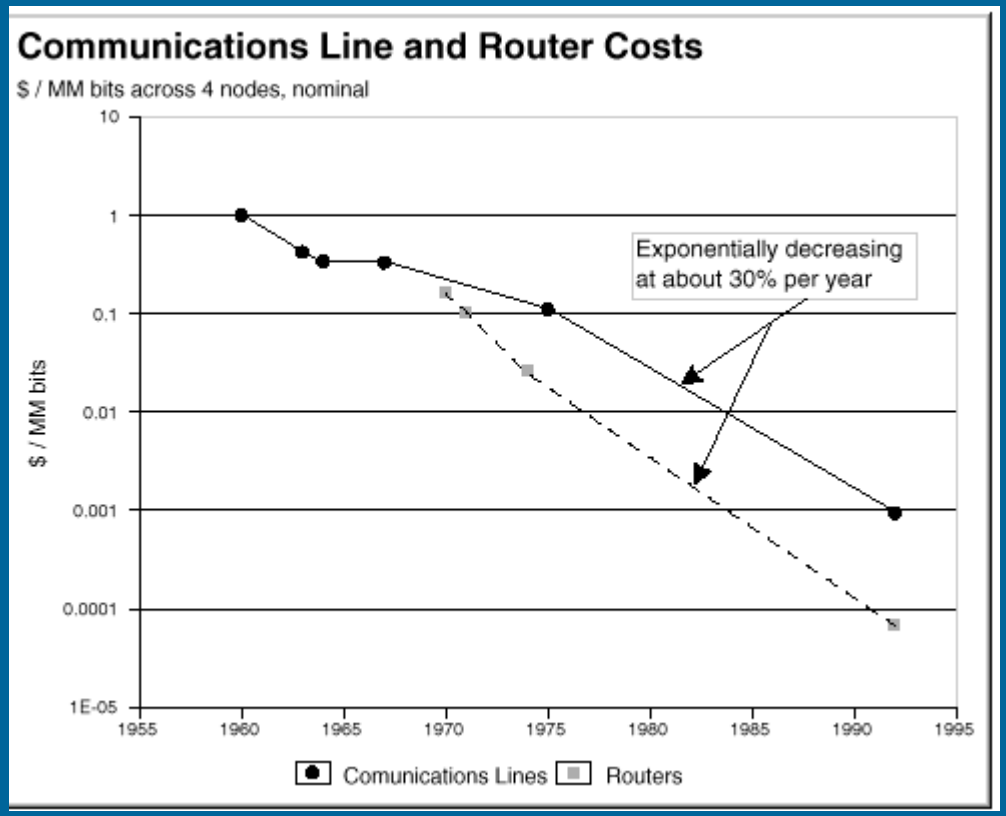




Source: MacKie-Mason and Varian 1995; MacKie-Mason

By 1999, Qwest will have a nationwide fiber backbone with more capacity than AT&T, MCI/Worldcom, Sprint combined

Sand Prices



Source: MacKie-Mason and Varian 1995

Would you use free communications?

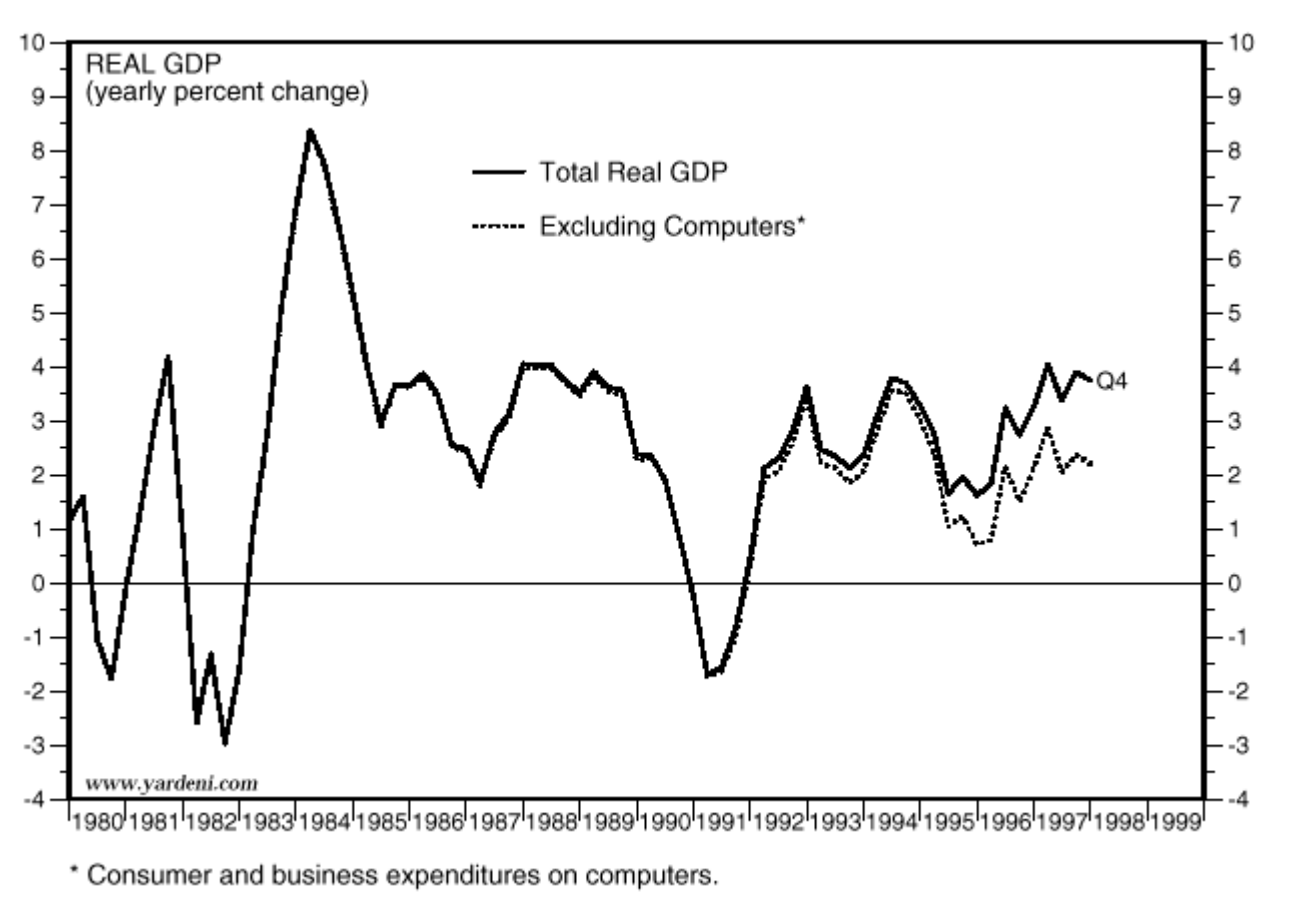
Internet traffic growth:

	Jan-88	Nov-94
packets	85 million	86 billion

6% / month since early 1990s,
continuing at least through 1997
This is an annual doubling!

Source: NSF; MCI

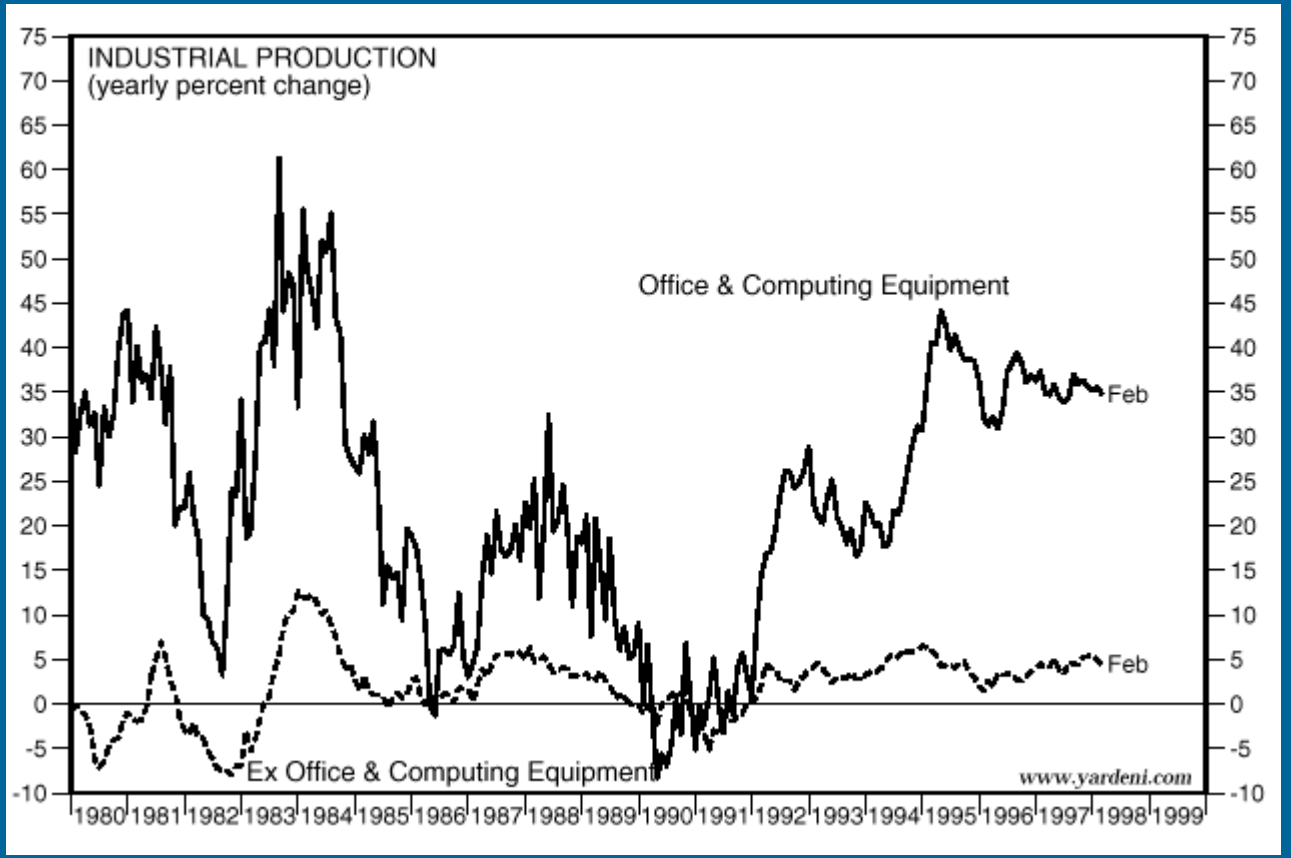
Make it up on the volume



1-1.5 points of GDP growth directly from computers

Source: Ed Yardeni, Deutsche Morgan Grenfell

Push the product



Since end of recession, automation production up 20-45% per year

Source: Ed Yardeni, Deutsche Morgan Grenfell

What do these numbers mean?

- If faculty salaries fell 30%/year, a $125,000 business prof would make $6000 in 10 years
- At 6% growth/month, Gates > GE in 31 months

Market Cap in Billion $		
Bill Gates	GM	GE
$46.33	$45.97	$277

New Economy?

- "This emerging new economy represents a tectonic upheaval in our commonwealth, a social shift that reorders our lives more than mere hardware or software ever can. It has its own distinct opportunities and its own new rules. Those who play by the new rules will prosper; those who ignore them will not." Kevin Kelley, *Wired*, Sept. 1997

Not so new...

- Increasing returns not new…
- Technological progress not new…
  - Car prices fell 53% while quality increased 105% 1906-1918 (Raff and Trajtenberg)
  - Supply curves slope down, demand curves slope up:
    - textiles, transportation, construction, watches and jewelry, telegraphs, telephones, household utilities, household appliances, broadcasting, and medical care--all before the microelectronics revolution (de Long)

What is new?

- The revolution is now taking place in silicon and sand
- The "heroic age" is here for computation and communications: what implications for management and economics?

Sobering thoughts

- “In every sector the heroic period of rapid technological progress comes to an end”
- “In every sector the bulk of economic value added comes before the heroic period has come to an end” (de Long)

Organizational implications

- Info hierarchies: flattening, reduced inhibition
- Brainstorming: open white board + anonymity
- Scarce attention:
  - connectivity ≠ access
  - cyberbalkanization

Attention economy?

- Steiner (QJE 1952): radio format competition with scarce channels yields inefficient duplication
- Competition among different delivery technologies will affect:
  - content available (mass vs. niche)
  - content created (experimentation; ability to capture innovation rents)
- Is the product the content or the eyeballs?

Future of traditional telecom

- $670 billion in 1996: going where? (Cairncross)
  - fax is 30% of $62B for int'l calls: perfect store-and-forward app
  - WorldCom and others deploying commercial Internet fax at 1/2 price per page
- Flawed assumptions
  - expensive, scarce infrastructure can be shared to offer premium priced services,
  - talk generates most of the traffic,
  - the telephone company is in control of its network (David Isenberg, "Stupid Network")

Strategic centrality of network externalities

- What is the real lesson of Microsoft?
  - When network externalities are important, need to gain market share
  - Get lucky? Might as well pick stocks.
  - Buy share: MS by leveraging power from one market to others
- Increasingly common: cf. Kodak

Pushing and pulling

- Netscape: Give away the product. Give away the source code.
- Keep what?

Intellectual property

- Is cyberlaw the “law of the horse”? (Easterbrook, Lessig)
- Difference: more interaction is intermediated by “code”
  - codewriters do not have the same accountability or traditions as do writers of laws and regulations

Product space

- What business model when fixed costs high, marginal costs low?
  - Differentiation essential
    - from competitors
    - across customers
  - Bundling
    - attach commodities to value-add
    - matching customer preferences
- Publishing has relevant history

Marketing

- Scarce resource: Cyberfrontier
  - E-Yellow Pages: GTE sues RBOCs, Netscape
  - HCI geography: Search key for rent
    - Yahoo bundles with Netscape
    - Netscape bundles with OEM
    - Yahoo bundles with OEM



WHERE IS THE GATEWAY?
Netscape/MS, Yahoo/Excite, AOL/ISP?

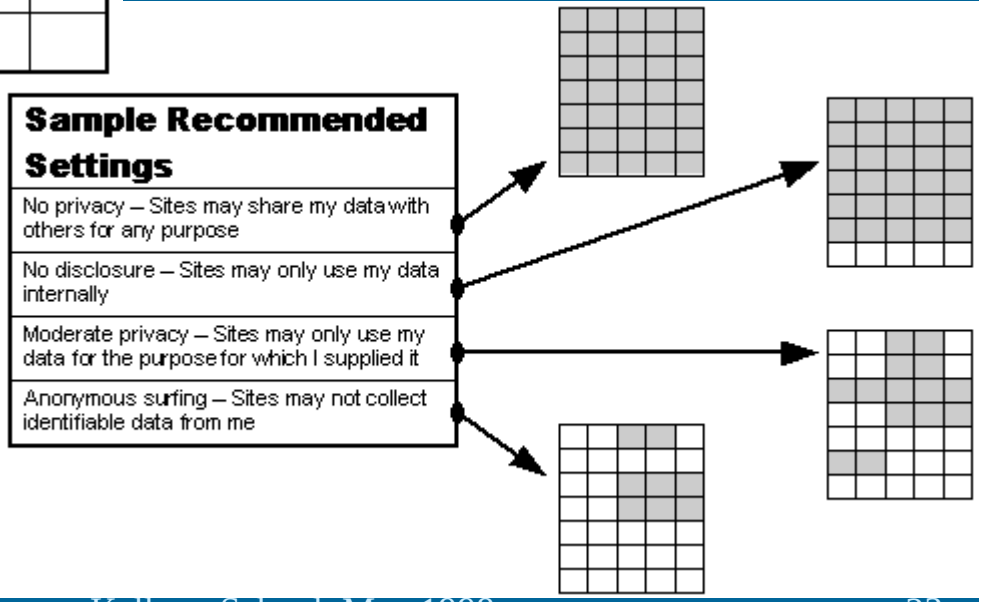
One-to-one?

- Scarce resource: personal information
  When will people give away info?
  - Zero (opportunity) cost
  - Specific reciprocity
  - Generalized reciprocity?
- Cheap sand + silicon: low-cost, fast, specific reciprocity

Platform for Privacy Prefs (P3P)

Sample Privacy Vocabulary		Data Categories				
		Contact information	Account numbers and unique IDs	Information about my computer	Navigational and click-stream data	Demographic & preference data
Data Practices	Used for system administration					
	Used for research and/or product development					
	Used for completion and support of current transaction					
	Used for customization of content and/or design of site					
	Used for marketing purposes					
	Used for linking other collected information					
	Disclosed for marketing purposes					

Reducing the opportunity cost of sharing personal information



Risks and reputations

- Scarce resource: experience
- Collaborative filtering
  - Scarcity: not experience, but access and matching
  - Business model for experience brokering?
    - Free riders
    - No bad reputations in cyberspace

Bounded rationality

- Cheap silicon and sand can relax the bounds
- Key problem of information in economics: strategic privacy
  - smart markets
- New markets = new value
  - blood
  - Space Lab slots
  - spare CPU cycles
  - Info War

Program for Research on the Information Economy (PRIE)

http://www.si.umich.edu/~prie/

- About 20 research faculty and grad students
  - economics, computer science, AI, networking, management, organization theory, law
- Genuine commitment to interdisciplinary funded research and graduate education

Research Projects

- **Content economics**
  - PEAK
  - Digital Libraries (UMDL)
  - Media Financing
  - Evaluation Brokers
- **Network economics**
  - Smart Reservations
  - Internet Congestion
  - Service Architecture
  - Web Caching
- **New media and society**
  - Anonymity, Trust, and Collective Action in Public Spaces
  - Cyberbalkanization
  - Do the Info Rich Get Richer?
- **Computational markets**
  - AuctionBot
  - MARX

What's the point?

- Money follows scarcity
- Envision free cycles and free bandwidth
- How to make money out of decreasing transaction costs?
- Old assumptions about geography and proximity need revisiting
- Build it and they may not come: Social infrastructure is harder than technical
- Learn from history