Free Software as a model for Commons-Based Peer Production and its Policy Implications

CS155b: E-Commerce
Lecture 22: April 15, 2003

**Slides by Yochai Benkler, Dec. 2001**

Overview

- **The challenge of free software**
- **Peer production all around**
- **The incentives problem**
- **Coase's Penguin**
  - **an information opportunity costs theory of peer production**
  - **increasing returns to scale for agents, resources, and projects**
- **The trouble with commons**
- **Ecological competition and its institutional manifestation**
- **The stakes of law**

Free Software

- ## Getting harder to ignore success

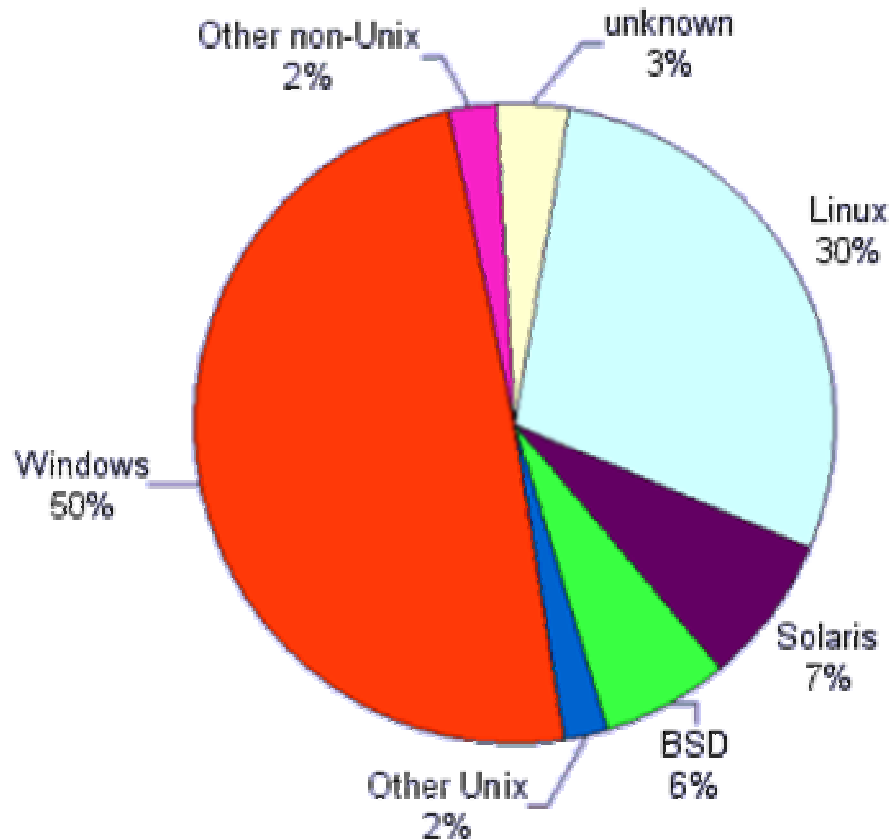**Market Share for Top [Web] Servers Across Domains**
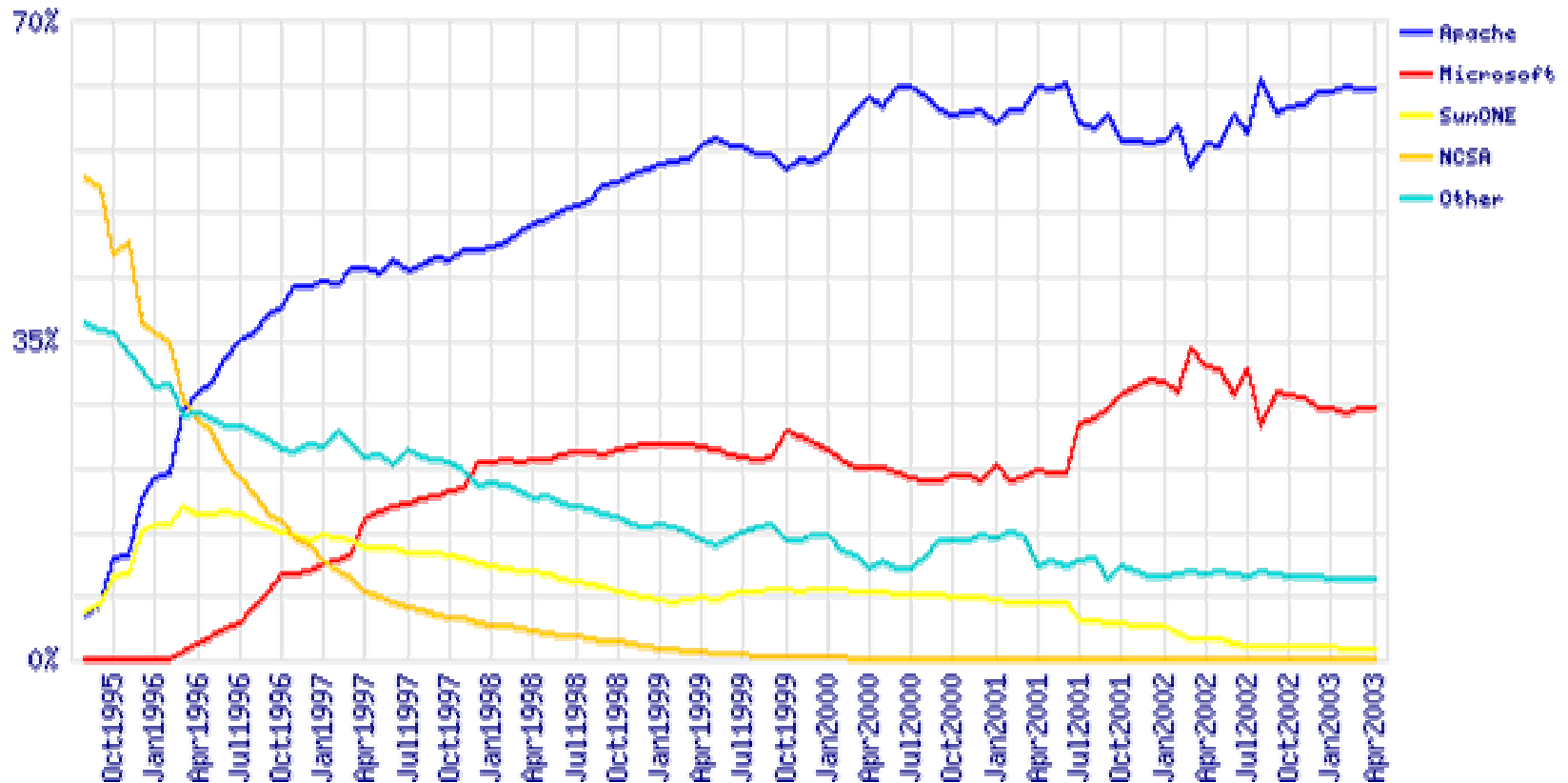
Source: Netcraft Survey April 2003; Slide updated by V. Ramachandran on 4/14/03

Free Software

- **Getting harder to ignore success**

Computer Counts, Public Web Servers Worldwide

June 2001

Source:
Netcraft Survey
Sept. 2001

Free Software

- Getting harder to ignore success

- **Current explanations of open source software**

  - **Detailed description of the phenomenon**

  - **Explanations of what is special about** *software*

  - **Explanations about hacker culture**

Free Software

- **Proprietary software depends on exclusion**

  - **Use permitted in exchange for payment**

  - **"Learning" often prevented altogether to prevent copying and competition**

  - **Customization usually only within controlled parameters**

  - **No redistribution permitted, so as to enable collection by owner**

Free Software

- **Proprietary software depends on exclusion**

- **Free software limits control**
  - **Use for any purpose**
  - **Study source code**
  - **Adapt for own use**
  - **Redistribute copies**
  - **Make and distribute modifications**
    - **Notification of changes**
    - **Copyleft**

Free Software

- Proprietary software depends on exclusion

- Free software limits control

- **Identifying characteristic is cluster of uses permitted, not absence of a price ("free speech" not "free beer")**

Anatomy of Free Software

- **Raymond, Moody**
- **One or more programmers write a program & release it on the Net**
- **Others use, modify, extend, or test it**
- **Mechanism for communicating, identifying and incorporating additions/patches into a common version (led by initiator/leader/group)**
- **Volunteers with different levels of commitment and influence focus on testing, fixing, and extending**

Peer Production All Around

- **Peer production**
  - various sized collections of individuals
  - **effectively** produce information goods
  - **without price signals or managerial commands**

Peer Production All Around

- **Peer production**

- **All Around**
  - **Old: academic research**
  - **The Web**
  - **Content (Mars <u>clickworkers</u>, MMOGs)**
  - **Relevance/accreditation**
    - **commercial utilization--Amazon, Google**
    - **volunteer--open directory project, <u>slashdot</u>**
  - **Distribution**
    - **physical--Gnutella, Freenet**
    - **value added--Project Gutenberg, <u>Distributed Proofreading</u>**

The Incentives Problem

- **Why would anyone work without seeking to appropriate the benefits?**

- **Open source software literature**

  - **Moglen:** *Homo ludens*, meet *Homo faber*

  - **Raymond & others: reputation, human capital, indirect appropriation**

The Incentives Problem

- **Why would anyone work?**

- **Open source software literature**

- **Two propositions**
  - **Given a sufficiently large number of contributions, incentives necessary to bring about contributions are trivial**
    - *e.g.*, a few thousand "players", a few hundred young people "on their way", and a few or tens paid to participate for indirect appropriation will become effective

The Incentives Problem

- **Why would anyone work?**
- **Open source software literature**
- **Two propositions**
  - **incentives are trivial**
  - **Peer production limited not by the total cost or complexity of a project, but by**
    - **modularity** (how many can participate, how varied is scope of investment)
    - **granularity** (minimal investment to participate)
    - **cost of integration**

Emerging mode of Information Production?

- **Organizations as mechanisms for reducing uncertainty of agents as to alternative courses of action**

- **Markets price to produce information**

- **Firms use managerial algorithm to separate signal from noise**

- **Each departs differently from perfect information: *information opportunity cost* relative to perfect information**

Emerging mode of Information Production?

- **Human capital highly variable**

  - **time, task, mood, context, raw information materials, project**

- **Difficult to specify completely for either market or hierarchy control**

Emerging mode of Information Production?

- Human capital highly variable
- Difficult to specify for market or firm
- **Peer production may have lower information opportunity costs than markets and firms in terms of identifying human capital and assigning it to resources**

Emerging mode of Information Production?

- **Human capital highly variable**
- **Difficult to specify for market or firm**

- **Peer production may have lower information opportunity costs**
  - **Agents self-identify for, and self-define tasks**
    - **Have best information about capability at the moment**
    - **Mechanism for correcting misperceptions necessary: *e.g.* "peer review" or averaging out**

Emerging mode of Information Production?

- Human capital highly variable
- Difficult to specify for market or firm
- Peer production may have lower information opportunity costs
- **Larger sets of agents, resources, and projects; increasing returns to scale of each set because of variable talent**
  - **Increasing the sets is core information processing strategy, and has improved assignment characteristics**

Emerging mode of Information Production?

- Human capital highly variable
- Difficult to specify for market or firm
- Peer production may have lower information opportunity costs
- **Larger sets of agents, resources, and projects; increasing returns to scale of each set because of variable talent**
  - **Higher probability that best agents will collaborate with best resources on project best suited for that combination**

Emerging mode of Information Production?

- Human capital highly variable
- Difficult to specify for market or firm
- Peer production may have lower information opportunity costs
- Larger sets of agents, resources, and projects
- **Declining capital cost of information production & communications may make relative advantage in human capital assignment salient**

The Commons Problem

- **Different kinds of commons have different solutions**
- **Information only a provisioning problem, not an allocation problem**
- **Primary concerns**
  - **Defection through unilateral appropriation undermine intrinsic and extrinsic motivations**
  - **Poor judgment of participants**
  - **Providing the integration function**

The Commons Problem

- **Primary approaches to solution**
  - **Formal rules, technological constraints, social norms to prevent defections (GPL, Slash, LambdaMOO)**
  - **Peer review--iterative peer production of integration**
  - **redundancy & averaging out--technical plus human**
  - **reintroduction of market and hierarchy with low cost, and no residual appropriation**

Ecological Competition

- **Free Republic**
- **IP differentially effects different information production strategies**
  - **increases appropriability in some forms**
  - **increases all input cost**
    - **"shoulders of giants" effect**
  - **particularly valuable to large inventory owners that integrate new production with inventory management**

$$B_d + B_{\underline{d}} > C_h + C_m + C_{\underline{m}} (I_{pd} + I_{intrafirm}) + C_b + C_{comm}$$

Ecological Competition

- **Example: Photocopying prohibited**
- **Journal:**
  - **subscription $100**
  - **articles   10**
  - **photocopying royalty $1**
  - **budget $10,000**
  - **researchers   100**
- **Pre change: library has 1000 articles; each researcher can choose 10 repeat-access articles, no added cost**

Ecological Competition

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  - **articles   10**
  - **photocopying royalty $1**
  - **budget $10,000**
  - **researchers   100**
- **Post change, no inventory:**
  - **10 articles x $1 x 100 researchers=$1000 increased cost**
    - *non-profit: net $1000 increase in cost: buy 90 journals, reserve $1000 for copying, reduce inputs to 900 articles, or keep variety of articles, but with no repeat access copies*

Ecological Competition

- **Example: Photocopying prohibited**
- **Journal:**
  - **subscription**   **$100**
  - **articles**   **10**
  - **photocopying royalty**   **$1**
  - **budget**   **$10,000**
  - **researchers**   **100**
- **Post change, no inventory:**
  - **10 articles x $1 x 100 researchers=$1000 increased cost**
    - *for-profit: $1000 increase in cost; Increase revenues from photocopying: indifferent to new rule if on average each article in each issue copied by 100 unaffiliated researchers*

Ecological Competition

- **Example: Photocopying prohibited**
- **Journal:**
  - **subscription**   **$100**
  - **articles**   **10**
  - **photocopying royalty**   **$1**
  - **budget**   **$10,000**
  - **researchers**   **100**
- **Post change, with large inventory:**
  - **Assume 4 of 10 articles needed for new research owned by publisher**
  - **6 articles x $1 x 100 researchers=$600**
    - *indifferent to new rule if on average each article in each issue copied by 60 unaffiliated researchers*

Ecological Competition

Cost minimization / Benefit maximization	Public domain	Intra-firm	Barter/sharing
Direct	**Romantic maximizers**	**Mickey**	**RCA** (patent-based sales w/ cross-licensing and patent pools)
Indirect **Market**	**Scholarly Lawyers** (lawyers /doctors who write in journals to attract clients)	**Know-how** (law firm corporate forms; industrial know-how)	**Learning networks** (informal sharing; defensive patent portfolios)
Nonmarket	**Joe Einstein** (amateurs; academics; census bureau)	**Manhattan Project**	**Being There** (circulating drafts, workshops)

Ideal-type information production strategies

Consequences of Strong IP

- **Commercialization**
    - **only direct appropriation strategies gain**

Consequences of Strong IP

- **Commercialization**

- **Concentration**
  - **scope economies of inventory increase returns to inventory scale**
  - **ownership and integration permit wider talent pool to apply to wider set of resources at marginal cost**
    - **Mickeys buy up romantic maximizers to increase inventory and talent to apply to it**

Consequences of Strong IP

- **Commercialization**

- **Concentration**

- **Homogenization**
  - **Disney employees work with Mickey & Goofy, AOL Time Warner employees with Bugs & Daffy**
  - **product x |$_{intrafirm}$ at cost 0 + human**
  - **product y at C_m + human**
  - **firm misapplies talent to inputs so long as $P_x + C_m > P_y > P_x$**

Competition Over the Shape of the Institutional Ecosystem

- **Anti-circumvention and anti-device provisions**
  - *Reimerdes*
- **UCITA**
  - *cphack*
- **Term-extension**
  - *Eldred*
- **Software patents in standard interfaces**
- **Database protection**
  - Where "database" extends to collections of public domain materials

The Stakes of Law

- ## Economic
  - ### Growth through innovation
  - ### Allocation of human capital
- ## Autonomy
  - ### One domain of productive life not built around following orders
  - ### Destabilization of the consumer/ producer model of interaction with world
- ## Democracy
  - ### Semiotic democracy
  - ### Political democracy

Conclusion

- Peer production emerging throughout information environment
- May be better mode of production of certain information goods
- Advantages in clearing human capital
- Solutions to commons problem
- Battle over the institutional ecosystem
- Stakes: economic and political