

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

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# Overview

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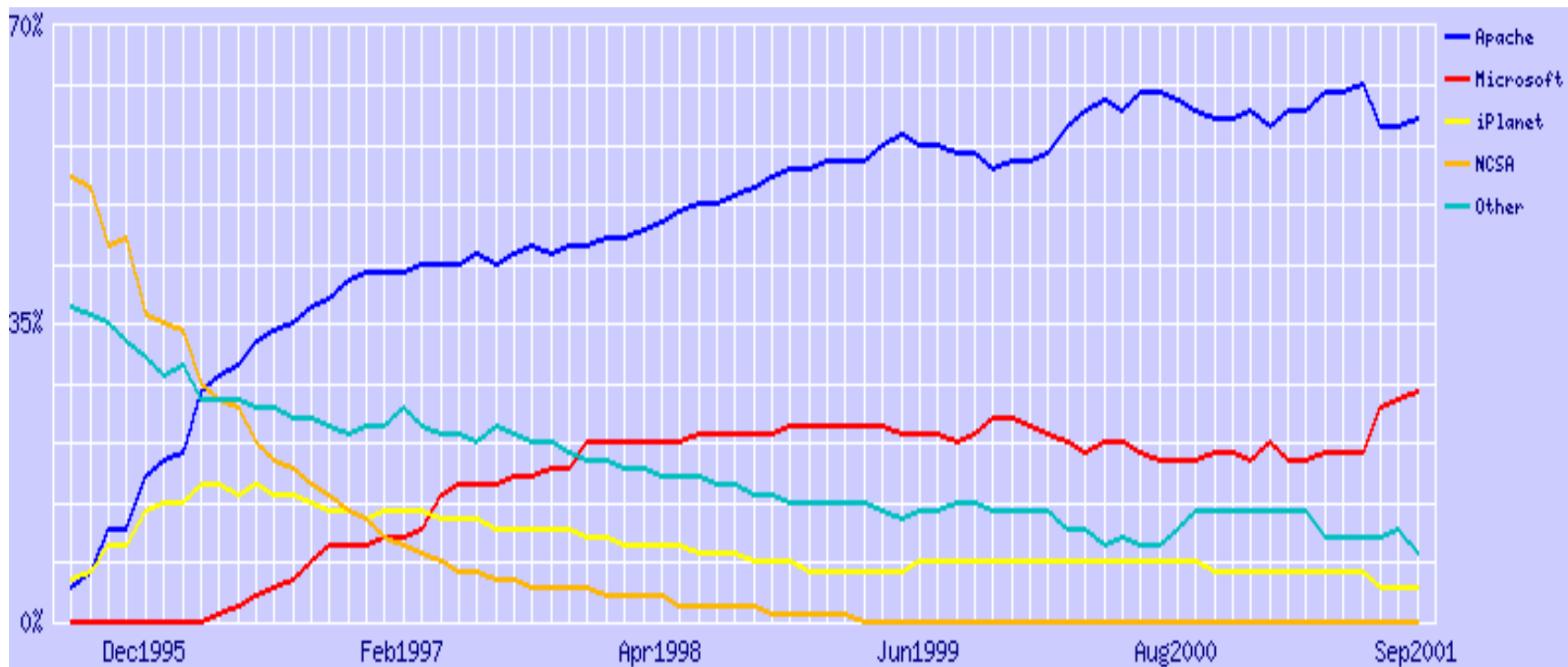
- **The challenge of free software**
- **Peer production all around**
- **The incentives problem**
- **Coase's Penguin**
  - **an information opportunity costs theory of peer production**
  - **increasing returns to scale for agents, resources, and projects**
- **The trouble with commons**
- **Ecological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

# Free Software

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- **Getting harder to ignore success**



**Apache market share 1995-09/2001 Source: Netcraft Survey Sept. 2001**

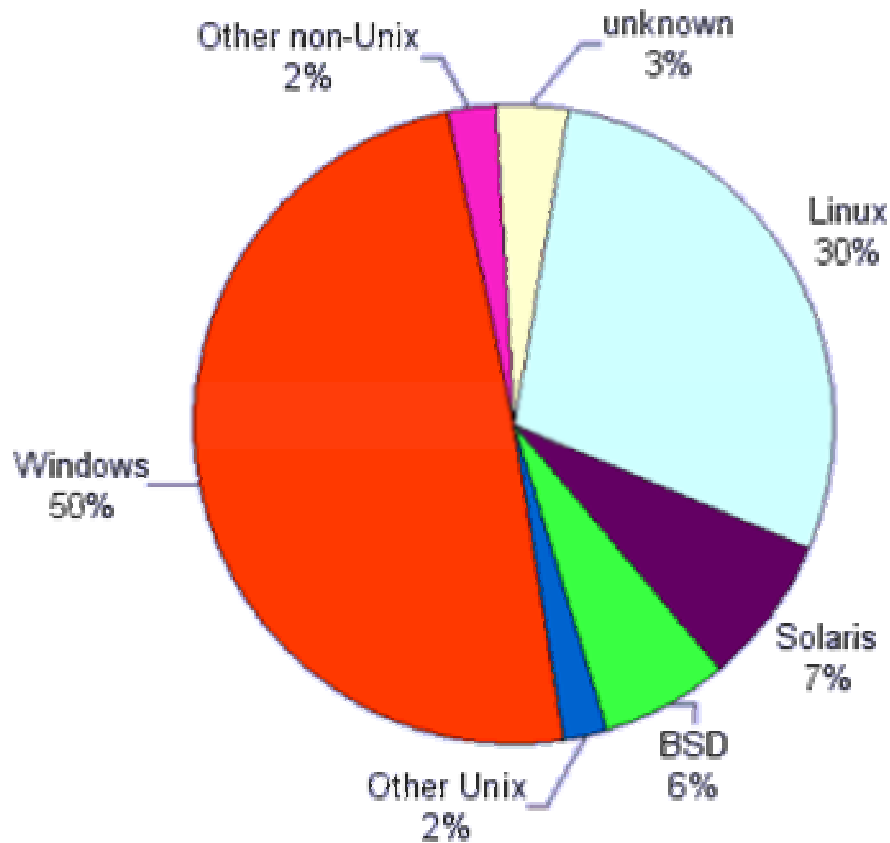
# Free Software

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- **Getting harder to ignore success**

Computer Counts, Public Web Servers Worldwide

June 2001



**Source:**  
**Netcraft Survey**  
**Sept. 2001**

# Free Software

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- 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

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- **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

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- 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

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- 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

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- **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

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

# Peer Production All Around

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

# The Incentives Problem

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- **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

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- 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

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- 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?

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- 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?**

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- **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?

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- 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?

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- 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?

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- 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?

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- 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?

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- 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

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- **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

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- **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

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- **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

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- **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**

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  - **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

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- **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

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- **Example: Photocopying prohibited**
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  - **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

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

**Ideal-type information production strategies**

# Consequences of Strong IP

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

# Consequences of Strong IP

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- **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

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- 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

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- **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

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- **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

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- **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**