Getting the good stuff in, keeping the bad stuff out: Incentives and the Web

Jeff MacKie-Mason

School of Information and
Department of Economics University of Michigan

Southern Economic Association Meetings, Nov 2006

The Read/Write Web

The Read/Write Web

Web 2.0

"Network effects from user contributions are the key to market dominance in the Web 2.0 era"

Tim O'Reilly, "What is Web 2.0"

The Read/Write Web

Web 2.0

"Network effects from user contributions are the key to market dominance in the Web 2.0 era"

Tim O'Reilly, "What is Web 2.0"

The wisdom of crowds

"The power of the web to harness collective intelligence"

Id.

Economic drivers

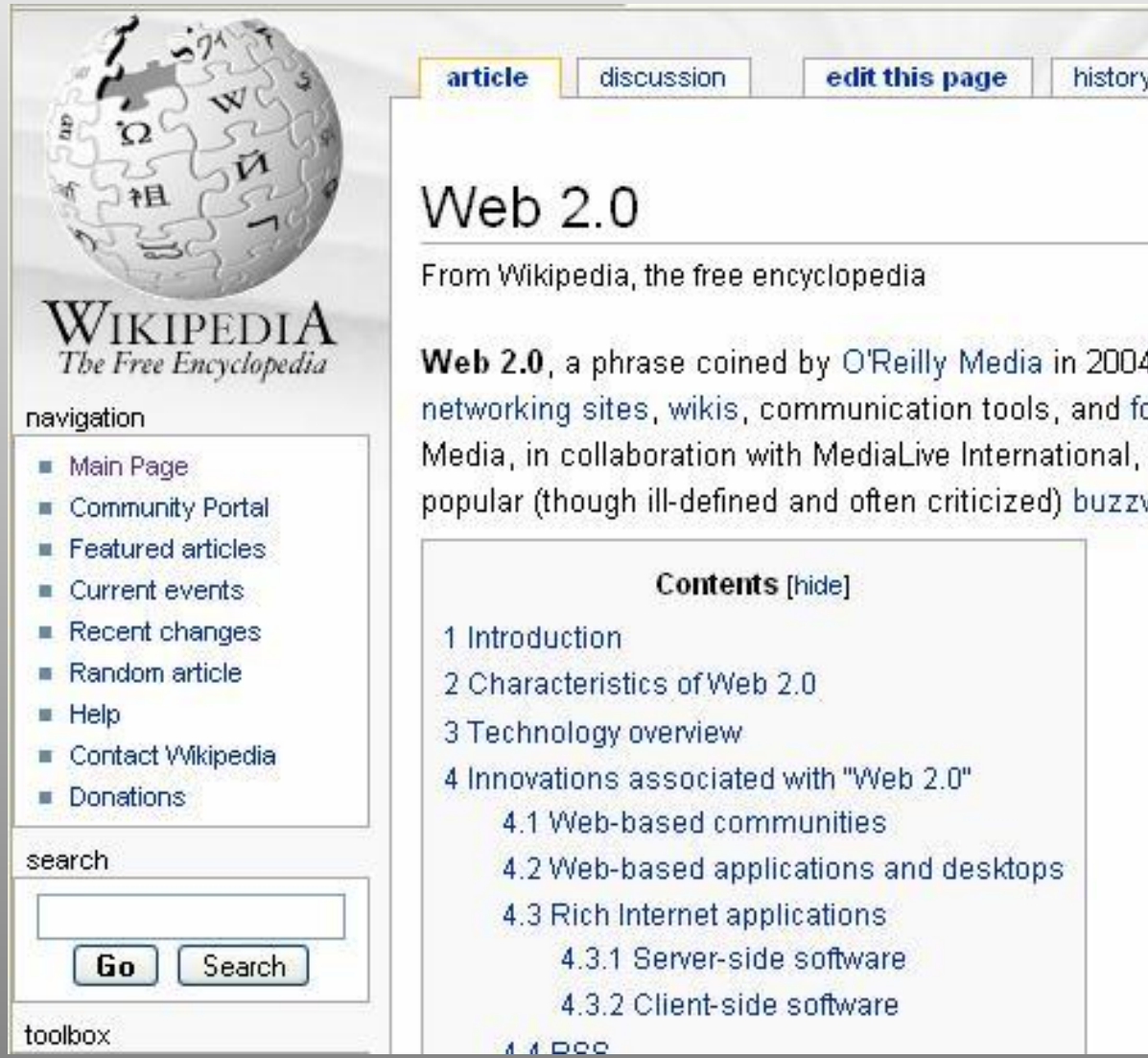
cheap bandwidth
cheap computing
densely-connected network

$\Longrightarrow$

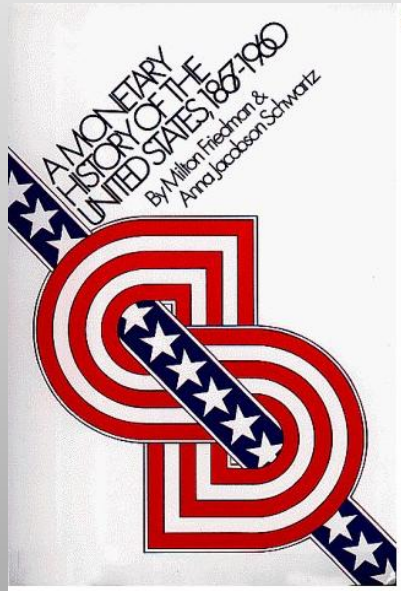
synergistic information sharing and collaboration

Wikipedia

- Since 15 Jan 2001 $>$ than 1.4 million English articles
- 17 language versions have $\geq$ 50,000 articles
- In top 15 most-visited sites
- *Nature* rated as comparably accurate to Encyclopedia Britannica Online



Amazon reviews



Customer Reviews

Average Customer Review: ★★★★☆
Number of Reviews: 8
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38 of 40 people found the following review helpful:

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Reviewer: **Dan Rogers** (Virginia) - See all my reviews
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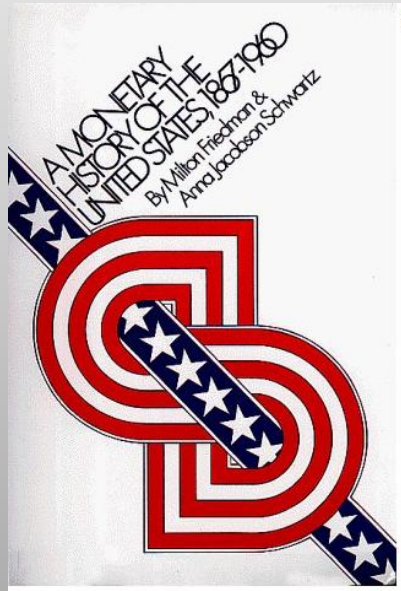
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- Written for free by users

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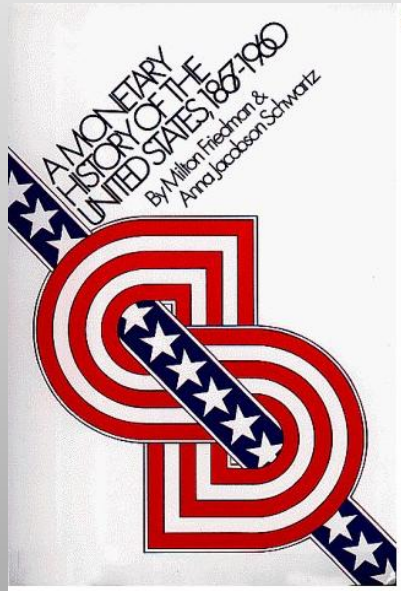
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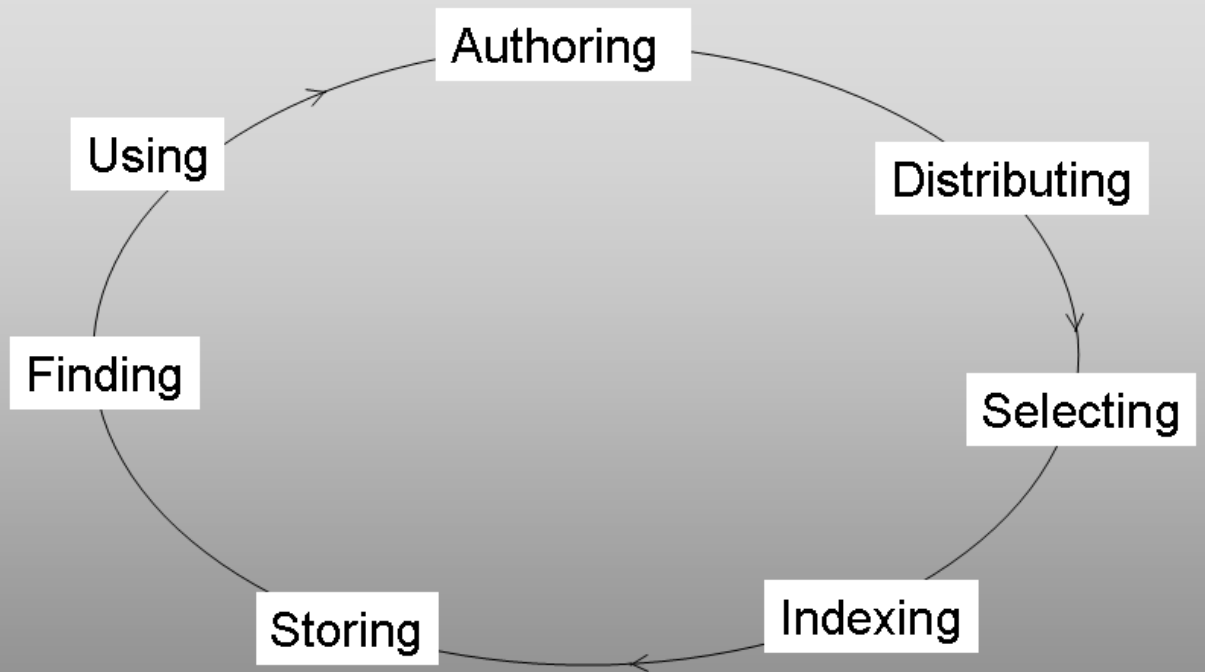
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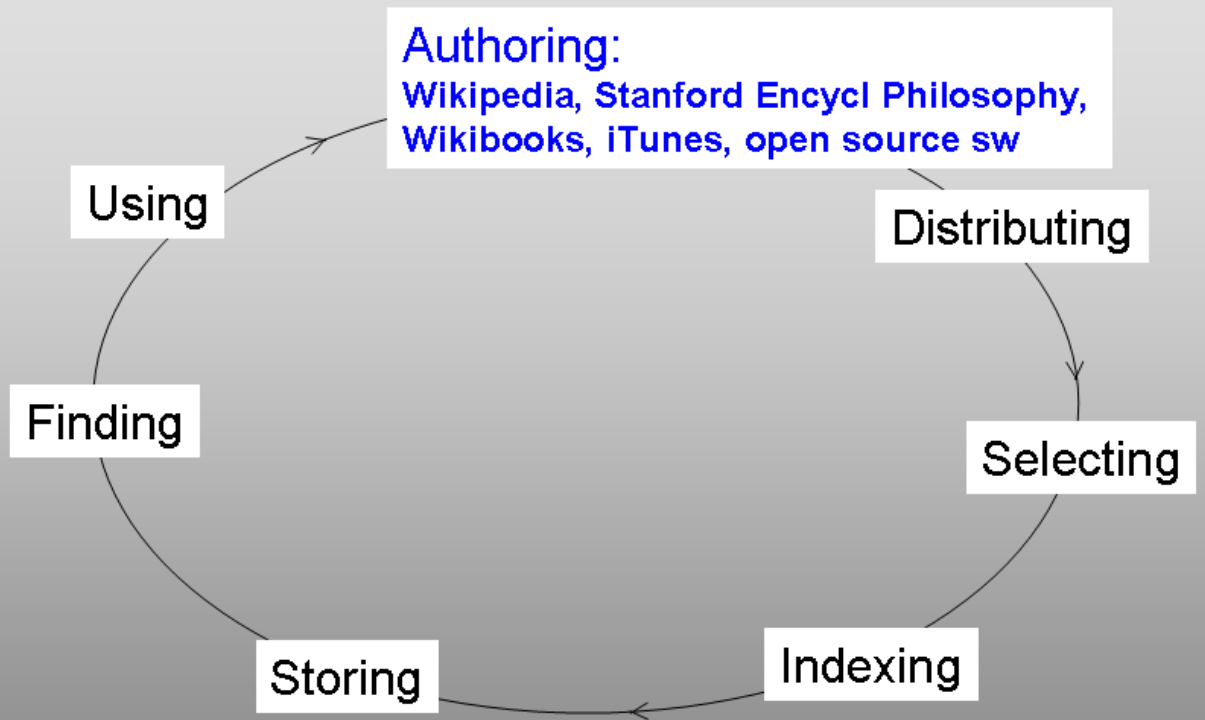
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Life cycle of information



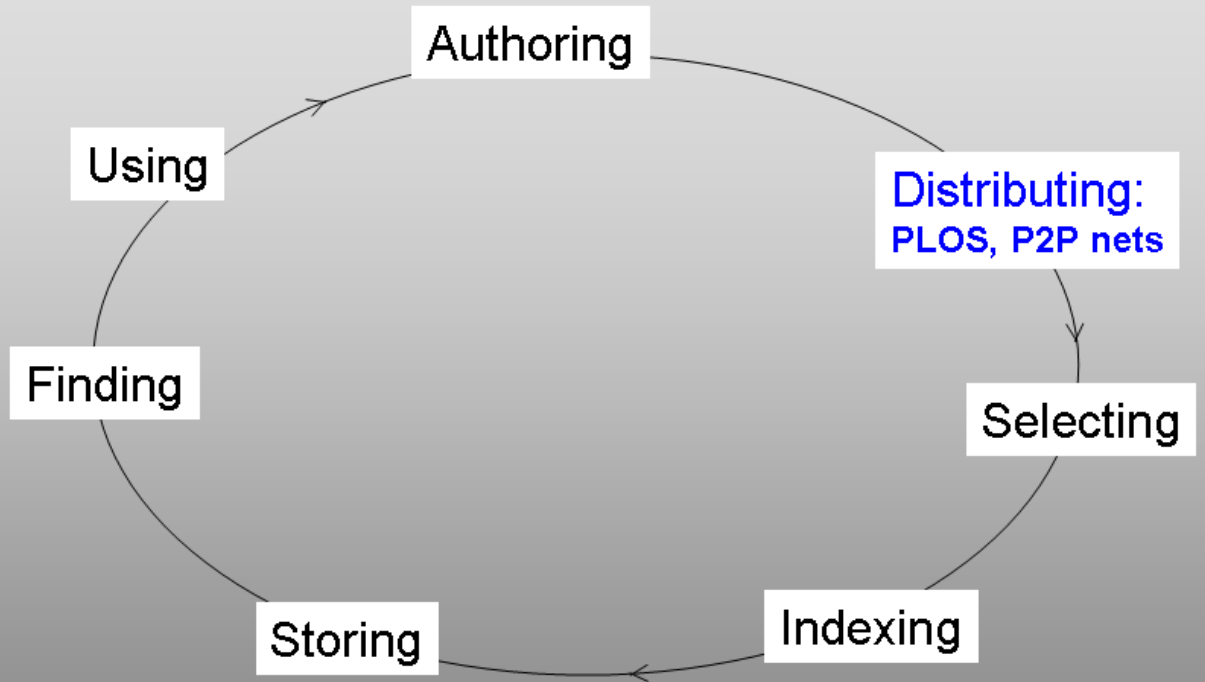
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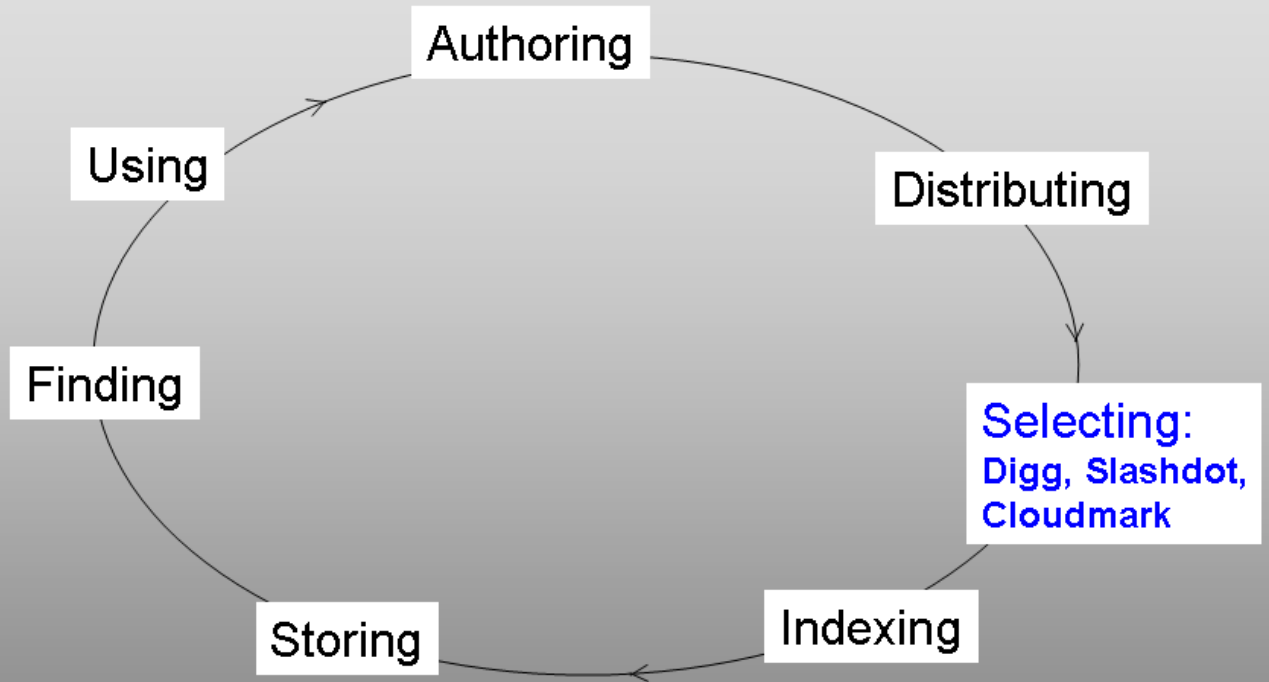
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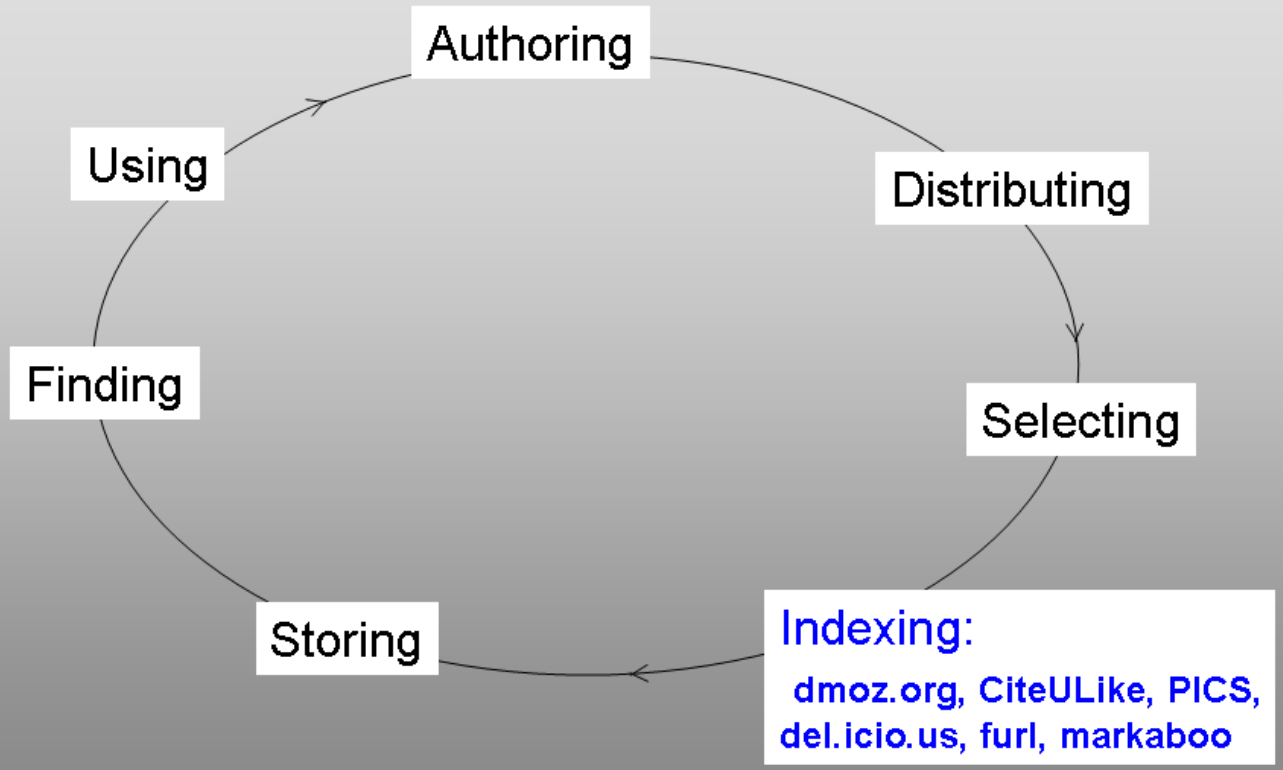
Life cycle of information



Life cycle of information



Life cycle of information



Indexing

User-contributed, shared metadata folksonomies:



Indexing

User-contributed, shared metadata folksonomies: open directories



Indexing

User-contributed, shared metadata folksonomies: open directories, tagged site content



Indexing

User-contributed, shared metadata folksonomies: open directories, tagged site content, tagged bookmarks



Indexing

User-contributed, shared metadata folksonomies: open directories, tagged site content, tagged bookmarks, bibliographies



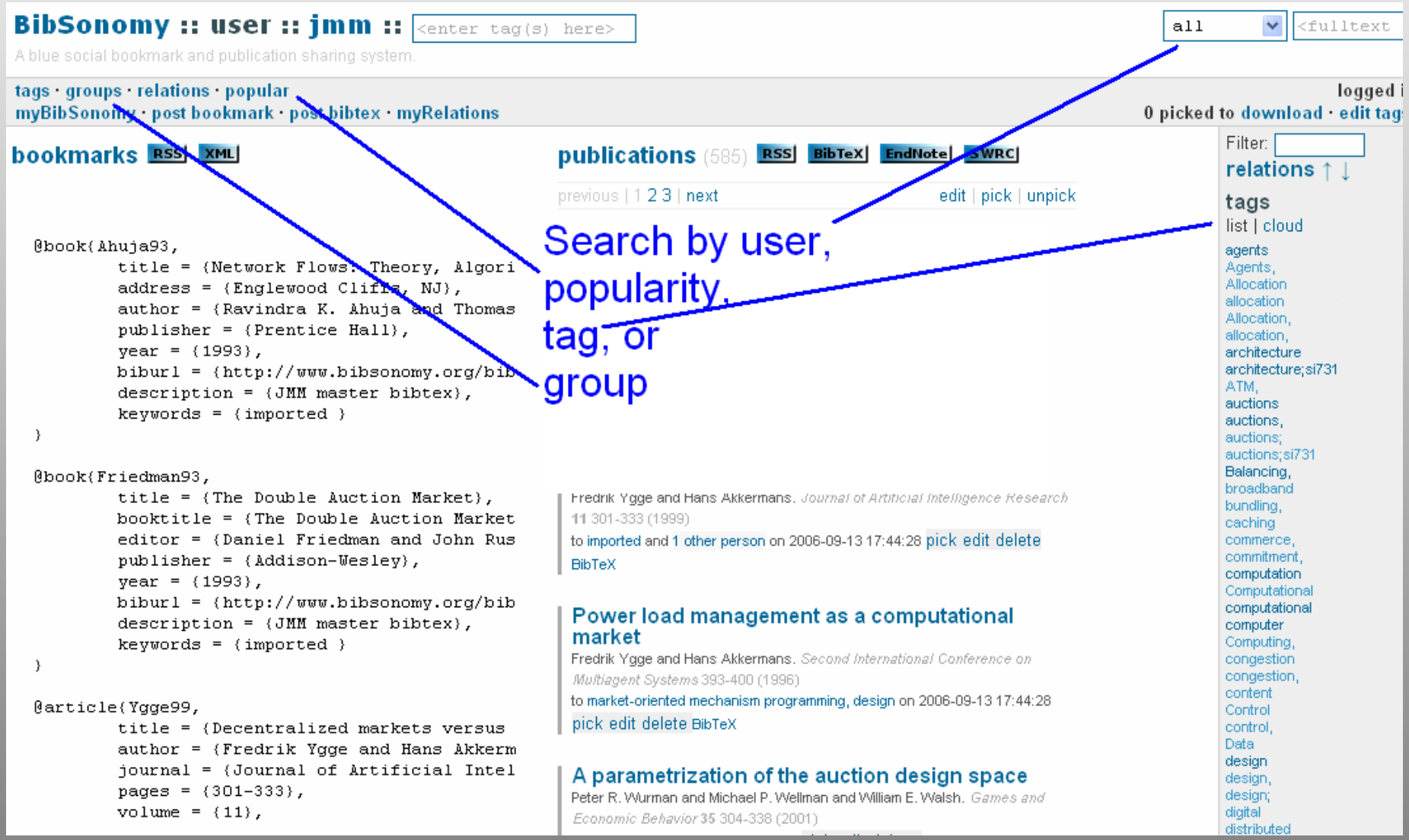
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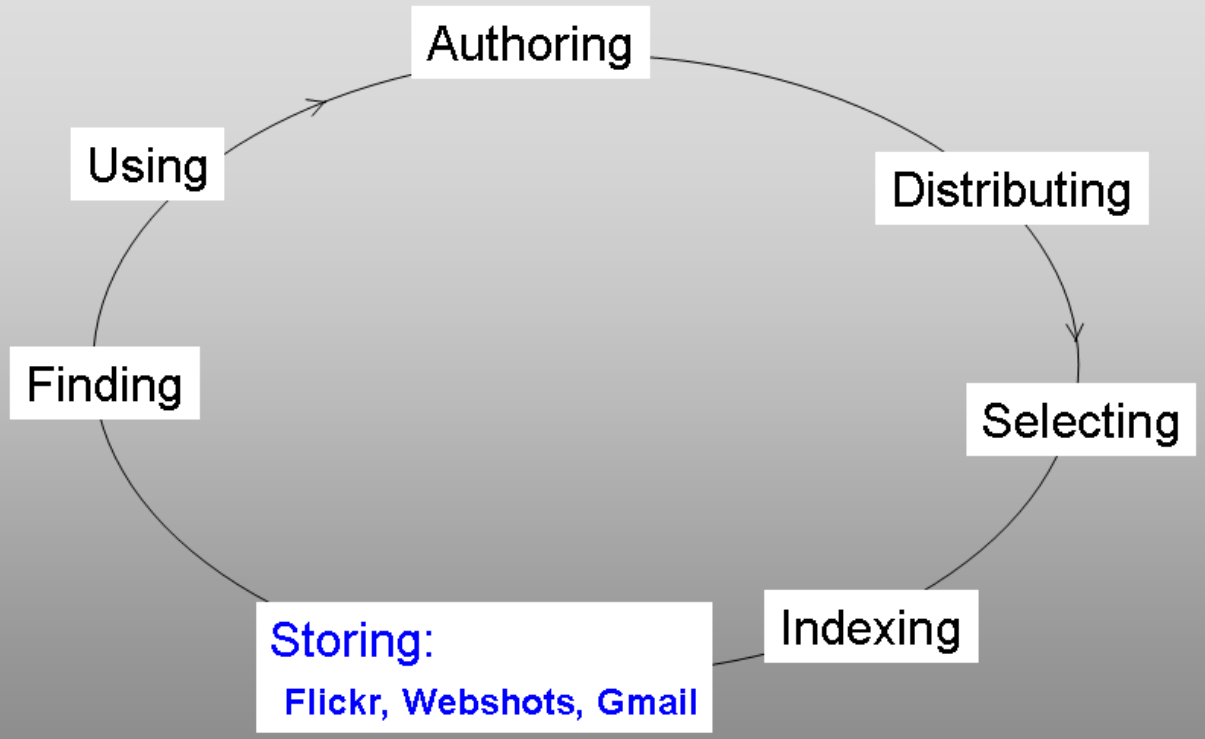
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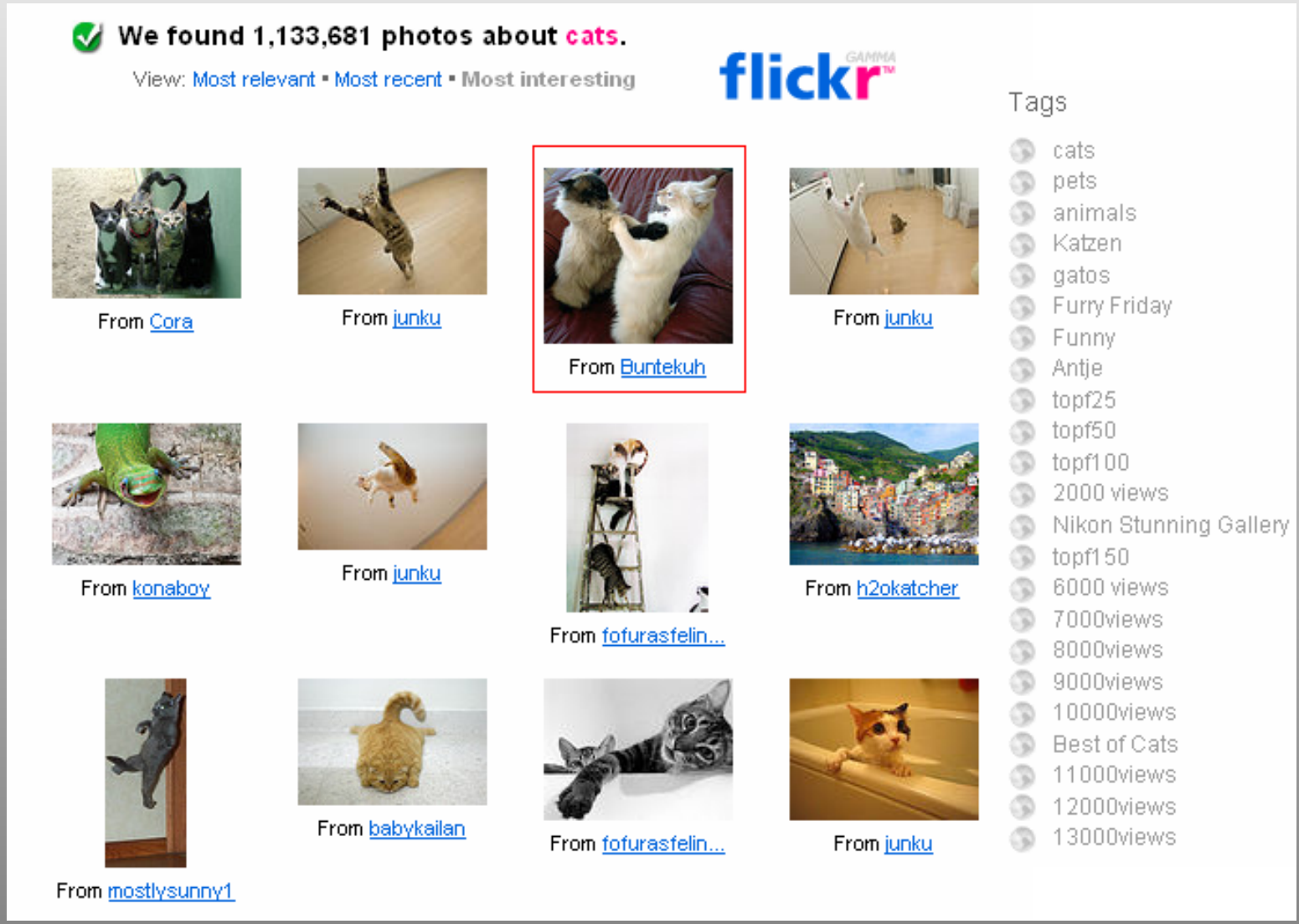
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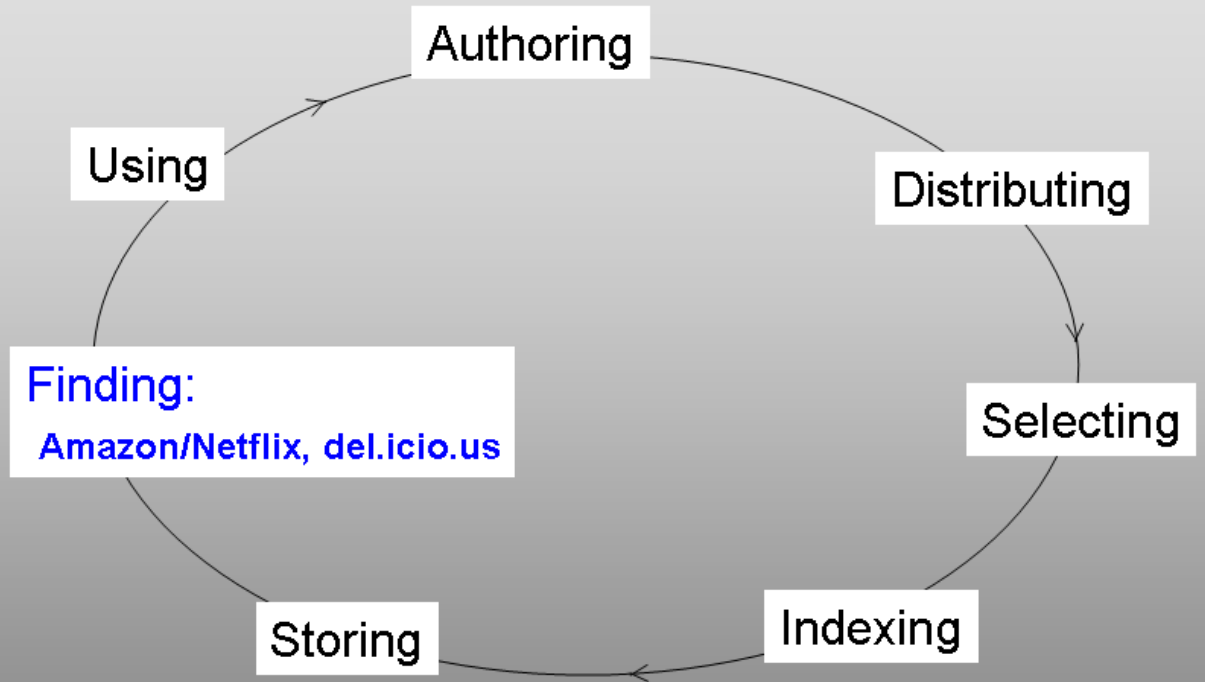
Life cycle of information



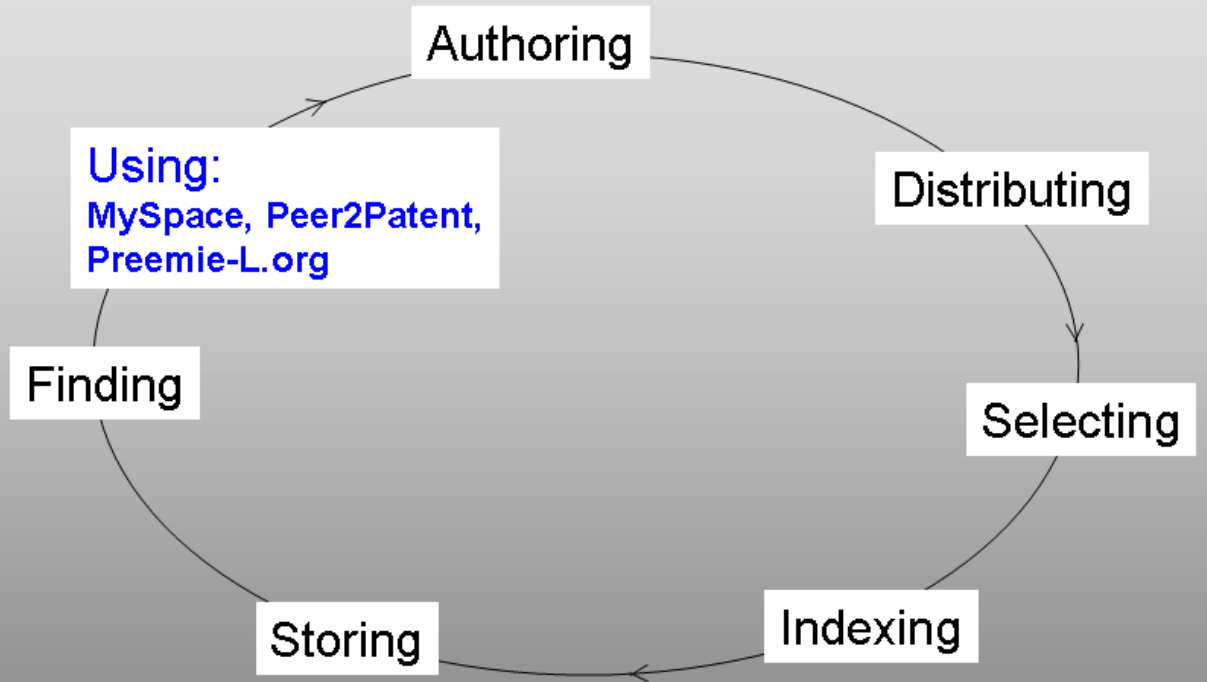
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topf150
6000 views
7000views
8000views
9000views
10000views
Best of Cats
11000views
12000views
13000views

Life cycle of information



Life cycle of information



Peer2Patent



What are the defining economic problems?

Vast surge of community-based information production, most without direct compensation to content creators.

What are the defining economic problems?

Each joint production opportunity creates strategic interactions between contributors (and site owners, often for-profit)

What are the defining economic problems?

First 10 years of commercial Internet (1994-2004): explosion in auction and network pricing economics

What are the defining economic problems?

Next 10 years: explosion in economics of user-contributed content

What are the defining economic problems?

What are the defining economic problems invoked?

What are the defining economic problems?

1. Getting the good stuff in

What are the defining economic problems?

1. Getting the good stuff in
   Why make effort to contribute if not compensated?
   (private provision of public goods)

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2. Keeping the bad stuff out
   Why not make privately-beneficial contributions that are publicly detrimental?
   (pollution)

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3. Evaluating the stuff

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1. **Getting the good stuff in**
   Why make effort to contribute if not compensated?
   (private provision of public goods)

2. **Keeping the bad stuff out**
   Why not make privately-beneficial contributions that are publicly detrimental?
   (pollution)

3. **Evaluating the stuff**
   Asymmetric information: content-providing user is better informed about quality of the information
   (signaling, screening, reputation, trust)

Getting the good stuff in

Information often non-rivalrous: once created any can use beneficially without detracting from use of others

- What does it cost users to contribute?
- What do users get out of contributing?

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Getting the good stuff in

Usual model has agents concerned with private net benefits of contributing, and total supply of public good.

Nash equilibrium generally exists with

- positive total contributions
- underprovision

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Getting the good stuff in

Additional incentives require value transfer, but monetary transfers are often infeasible or undesirable for decentralized user-contributed content

There is promising work by both economists and social psychologists on implicit and non-pecuniary incentive designs

Getting the good stuff in

Additional incentives require value transfer, but monetary transfers are often infeasible or undesirable for decentralized user-contributed content

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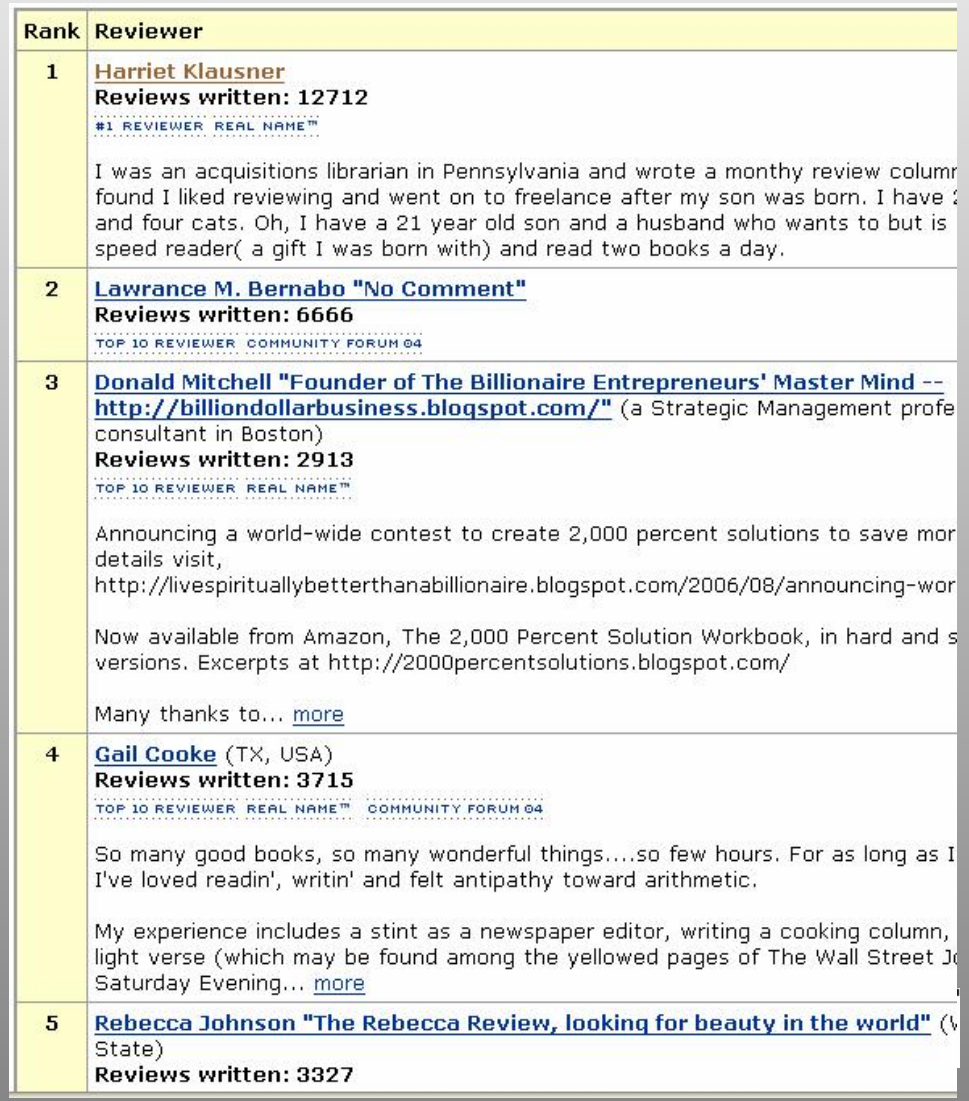
Example

- Garnering reputation or personal experience (e.g., writing code for open source projects) can motivate some contribution[a]
- Top-rated Amazon reviewers have posted thousands of reviews each

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Rank	Reviewer
1	Harriet Klausner **Reviews written: 12712** #1 REVIEWER REAL NAME™ I was an acquisitions librarian in Pennsylvania and wrote a monthy review columr found I liked reviewing and went on to freelance after my son was born. I have and four cats. Oh, I have a 21 year old son and a husband who wants to but is speed reader(a gift I was born with) and read two books a day.
2	Lawrance M. Bernabo "No Comment" **Reviews written: 6666** TOP 10 REVIEWER COMMUNITY FORUM 04
3	Donald Mitchell "Founder of The Billionaire Entrepreneurs' Master Mind -- http://billiondollarbusiness.blogspot.com/" (a Strategic Management profe consultant in Boston) **Reviews written: 2913** TOP 10 REVIEWER REAL NAME™ Announcing a world-wide contest to create 2,000 percent solutions to save mor details visit, http://livespirituallybetterthanabillionaire.blogspot.com/2006/08/announcing-wor Now available from Amazon, The 2,000 Percent Solution Workbook, in hard and s versions. Excerpts at http://2000percentsolutions.blogspot.com/ Many thanks to... more
4	Gail Cooke (TX, USA) **Reviews written: 3715** TOP 10 REVIEWER REAL NAME™ COMMUNITY FORUM 04 So many good books, so many wonderful things....so few hours. For as long as I I've loved readin', writin' and felt antipathy toward arithmetic. My experience includes a stint as a newspaper editor, writing a cooking column, light verse (which may be found among the yellowed pages of The Wall Street J Saturday Evening... more
5	Rebecca Johnson "The Rebecca Review, looking for beauty in the world" (V State) **Reviews written: 3327**

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Polluting the infosphere

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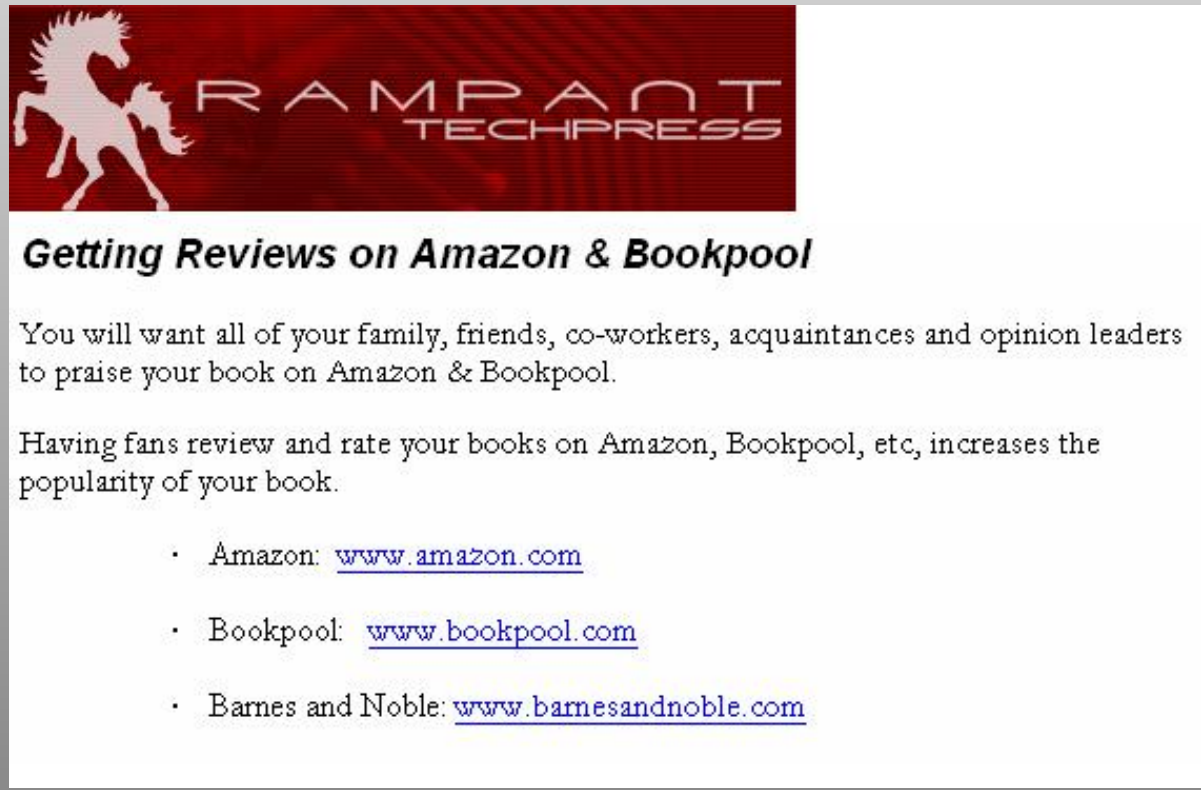
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Publishers have paid users to start "buzz" about new music through MySpace and other influential forums

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Pollution

Flips the public goods provision problem: how to discourage low or negative quality content?

Negative externality: individual's actions impose direct costs on others

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Coase on the Web

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Property rights defined

Content may be user-contributed, but the site is owned by a legal entity

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Transaction costs a problem

Many (sometimes millions of) participants: authenticating, contracting and authorizing each could eliminate most benefits of user-contributed content

Wrinkle: Pollution as Hidden information

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Thus we also apply hidden information techniques: signaling, screening, reputation

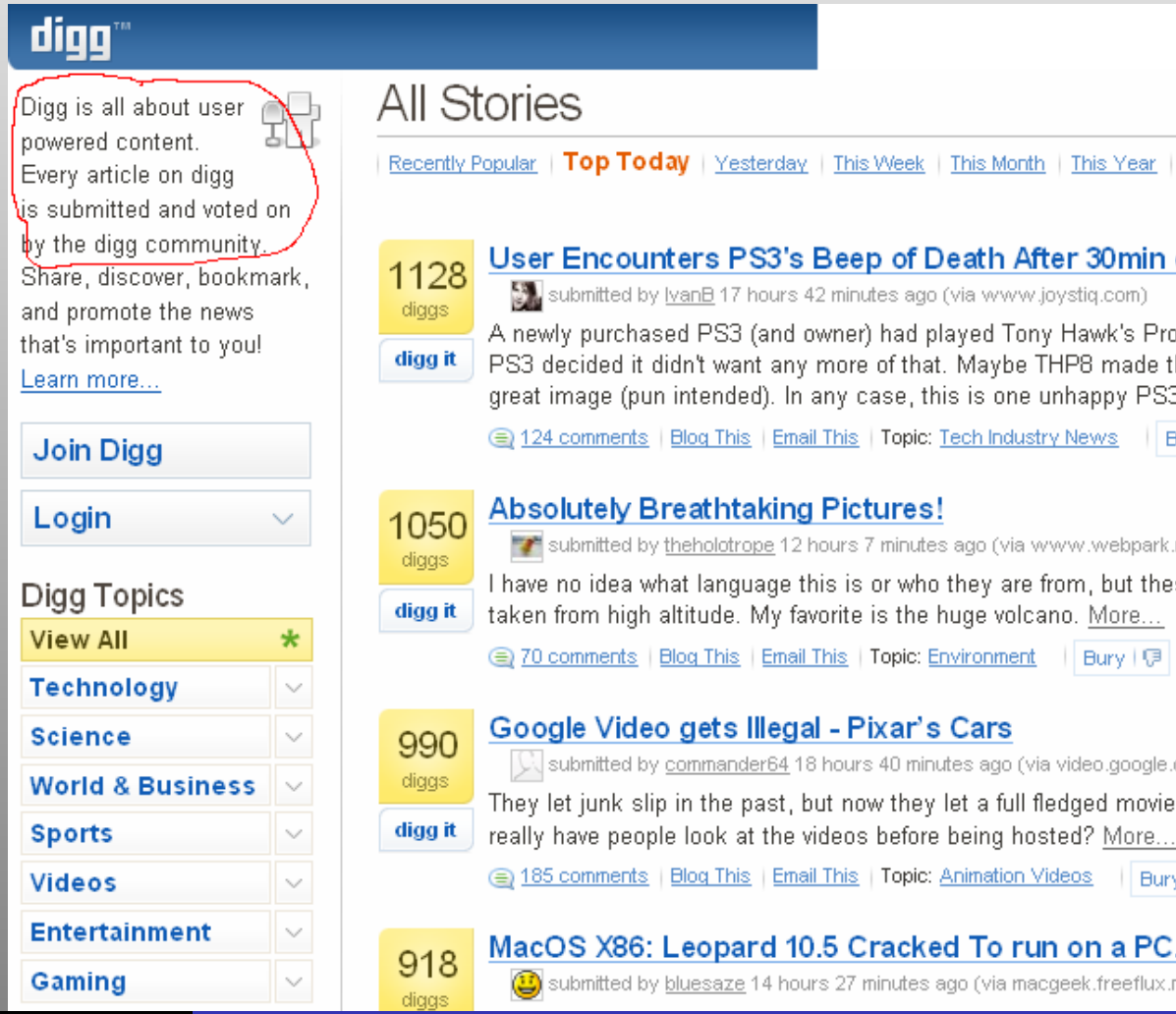
Incentives in action: Digg.com

A simple economic mechanism for an information pollution problem . . .

Incentives in action: Digg.com

`Digg.com` is a news selector/aggregator:

- users submit news stories
- readers vote up or down (“digg it!")
- stories with top votes are promoted to the front page, which prompts millions to go read them (the “Digg effect”)



Manipulating Digg



- Last spring, a flurry of rumors swirled that Google was about to purchase Sun Computing
- News got traditional media attention when a story about imminent acquisition was promoted to Digg front page
- Soon became evident the story was (probably) false. Mistake, or someone trying to manipulate stock price (successfully)?

Digg's problem

Users post stories:

- Two types, Truthtellers and Liars ($\tau \in \{T, L\}$)
- Fraction p are $\tau = T$
- Contributers experience posting benefits $\{v_T, v_L\}$

Digg benefits $\pi_T > \pi_L$ from each contribution ($\pi_L < 0$ permissible)

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Simple proposal

Collect "deposit" for every story posted, ϕ

Invite readers to vote on story's truthfulness; calculate score $\rho(\#\text{ votes}, \#\text{ false})$, e.g.,

$$\rho = \begin{cases} 1 & \text{if } N < 20 \\ \frac{T}{T+L} & \text{if } N \geq 20 \end{cases}$$

After some time, Digg returns deposit if $\rho > \bar{\rho}$ with $\bar{\rho}$ set in advance by Digg.

Digg chooses $\{\phi, \bar{\rho}\}$ to maximize its value

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Signal distribution

Assume $\rho_\tau \sim f(\mu_\tau, \bar{\sigma}^2)$, with

- $\mu_T > \mu_L$
- cdf is $F_\tau(\rho)$

Then $\Pr(\rho \leq \bar{\rho}|\tau) = F_\tau(\bar{\rho})$, which is the probability of losing deposit

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Optimization problem

Users get $EU_\tau = v_\tau - \phi F_\tau(\bar{\rho})$

Digg solves

$$\max_{\bar{\rho},\phi} p(\pi_T + \phi F_T(\bar{\rho})) + (1-p)(\pi_L + \phi F_L(\bar{\rho}))$$

$$\begin{array}{lrcll} \text{s.t.} & v_T - \phi F_T(\bar{\rho}) & \geq & 0 & \text{(Participation constraints)} \\ & v_L - \phi F_L(\bar{\rho}) & \geq & 0 & \end{array}$$

if both types $\tau \in \{T, L\}$ are participating

Results

1. $v_L = \phi F_L(\bar{\rho}) \implies$ PC binding for Liars (zero rent)
2. If $\pi_L + v_L < 0$ (remember, $\pi_L < 0$ permissible: *pollution*), then set $\phi\bar{\rho}$ marginally higher to exclude participation by Liars
3. $v_T > \phi F_T(\bar{\rho}) \implies$ Truthtellers keep some rent

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- We call this advertising!

Bonding as signaling

This is a simple signaling model in which agents "post bond". Cf.

- Friedman-Resnick (2001) on bonding for seller trust on eBay[1]
- Loder-van Alstyne-Wash (2006) on bonding for email inbox attention (to discourage spammers)[2]

[1] "The Social cost of cheap pseudonyms." *Journal of Economics and Management Strategy*, 10(2):173-199.

[2] "An economic solution to unsolicited communication." *Advances in Economic Analysis and Policy*, 6(1).

Getting the good stuff in (truthful voting)

Why should readers incur effort to vote rather than free-ride?

- For exchange transactions (e.g., eBay), Gazzale (2004) shows that "gossips" benefit by getting better treatment (think of a recognizable restaurant reviewer)[3]
- Digg might consider a "proper scoring" mechanism to rate the prediction quality of the voters, and reward them by posting a tally sheet (cf. Amazon's "Top Reviewers")[4]

[3] "Giving Gossips Their Due: Information Provision in Games with Private Monitoring." Ph.D. dissertation, ch. 4, University of Michigan.

[4] Miller, Resnick, and Zeckhauser. "Eliciting informative feedback: The peer-prediction method." *Management Science*, 51(9):1359-1373, Sept 2005.

Moral of the story

The promise of user-contributed content on the Web is tremendous

Moral of the story

The promise of user-contributed content on the Web is tremendous

- fueled by low entry barriers
- network externalities from sharing and collaborating

Moral of the story

User-contributed content is in a profound state of immaturity

Moral of the story

Key problems are incentives to get the good stuff in

Moral of the story

Key problems are incentives to get the good stuff in, and to keep the bad stuff out

Moral of the story

Incentive-centered design

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- Users are autonomous smart devices in the system

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Incentive-centered design

- Users are autonomous smart devices in the system
- Non-programmable but responsive to bribes and punishments