Cooperation, Human Systems Design, and Peer Production

Yochai Benkler

cooperation
loosely-coupled systems
human agency/freedom
change and unpredictability

GM Fremont plant ==> NUMMI (Toyota Production System)





organizational (Taylorism) => technical (Fordism) => legal (NLRA) organizational (TPS) => legal (union negotiation) => techno/organizational (teams)

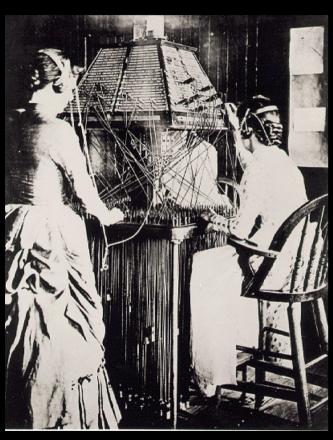
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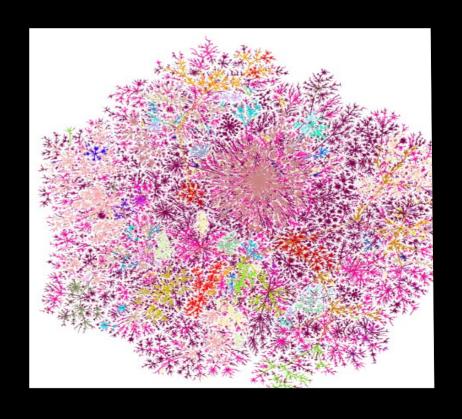




Ma Bell ==>

end-to-end Internet architecture

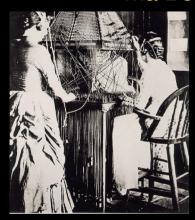


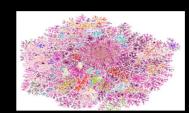


GM Fremont plant ==> NUMMI (Toyota Production System

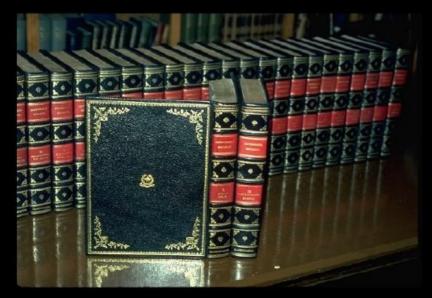


Ma Bell ==> end-to-end Internet architecture





Britannica ==> Wikipedia





human systems

routinized interactions among objects and processes, institutions and organizations, technical platforms, and conceptual frameworks; which provide people with affordances and constraints.

Affordances: regularities of interaction that lead human beings who understand a given action as operating within a given system that possesses these regularities to believe, reasonably, that that action is feasible and will likely lead to their desired outcome

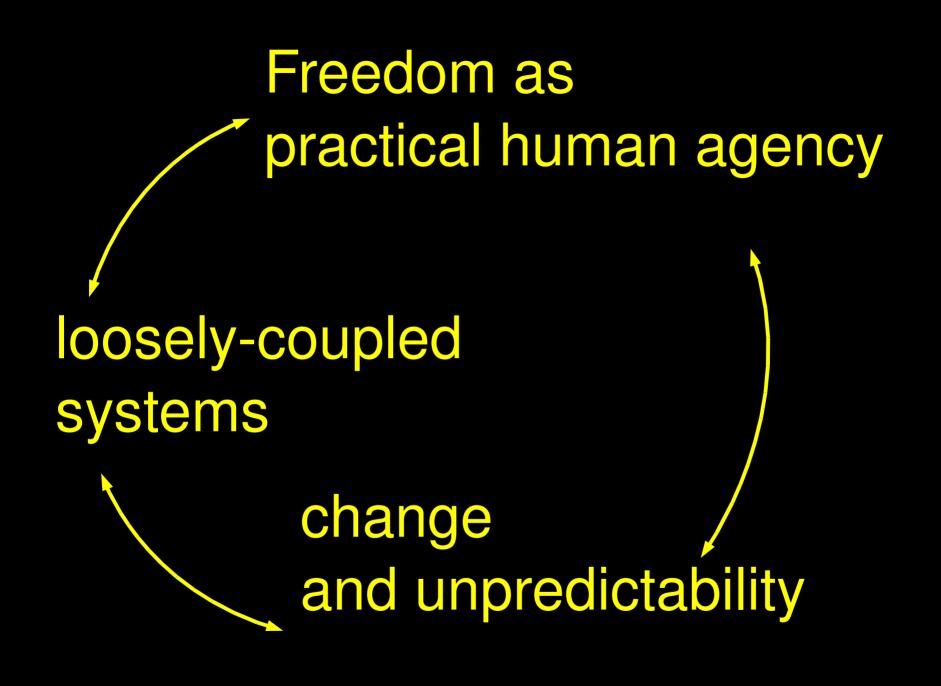
Constraints are the inverse

NB: both are necessary for effective planning and action

systems

coupling

the degree of completeness and determinism with which a system characterizes its inputs, processes, and outputs, to connect action to outcome



19th - 20th centuries:

rationalization through tightly bound systems

19th - 20th centuries: rationalization

Firms & Governments bureaucratize

Weber; Taylorism/Fordism; planned economies

- => tightly-bound systems abound
 - => inputs, behaviors, processes, outputs fully characterized, monitored, and delivered over the lifetime of the interaction



19th - 20th centuries: rationalization

Actual limitations of planning in face of rapid change and complexity plus association of communism with planning reorient rationalization toward *homo economicus*:

"The expected utility (EU) of unsafe sex for m and for f is equal to the benefits (B) of unsafe sex minus its expected costs, and is given by $EU_{m} = B - C(1-P_{m})(P_{f}) \text{ and } EU_{f} = B - C(1-P_{f})(P_{m}).$ "

simplification allows removal of the planner without losing the illusion of certainty in the mechanism =>can still specify inputs and predict

outputs because the agents and universal



Das Kapital.

Kritik der politischen Oekonomie.

Yen

Karl Marx.

Erater Band. Buch I: Der Produktionsprocess des Kapitale.

Ben Bentl der Urbeneuns wird verbebelten.

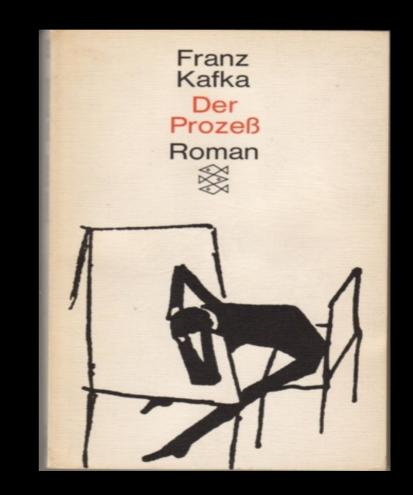
Hamburg

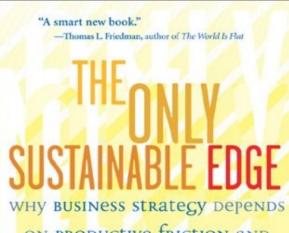
Vertag von Otto Meissnor.

1867.

New-York: L. W. Schmidt, 24 Berelay-Street.

critique of markets and bureaucratic administration is hardly new

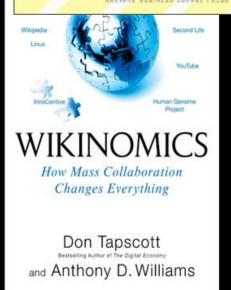


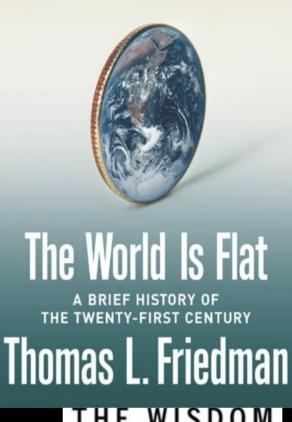


on productive friction and bynamic specialization

John Hagel III John Seely Brown

HARVARD BUSINESS SCHOOL PRESS





new sense of "mainstream," inevitability of reorientation of the relative role and advantages of markets, hierarchies, and social processes

THE WISDOM
OF CROWDS
JAMES
SUROWIECKI
WITH A NEW AFTERWORD BY THE AUTHOR

Faster learning and innovation

increasingly seen as an imperative forced by global-scale competition and faster innovation cycles

Faster learning and innovation

increasingly seen as an imperative forced by global-scale competition and faster innovation cycles

resistant to full specification for pricing and managerial control

Networked Information Economy Radical decentralization of inputs and processes

Material

processing, storage, computation

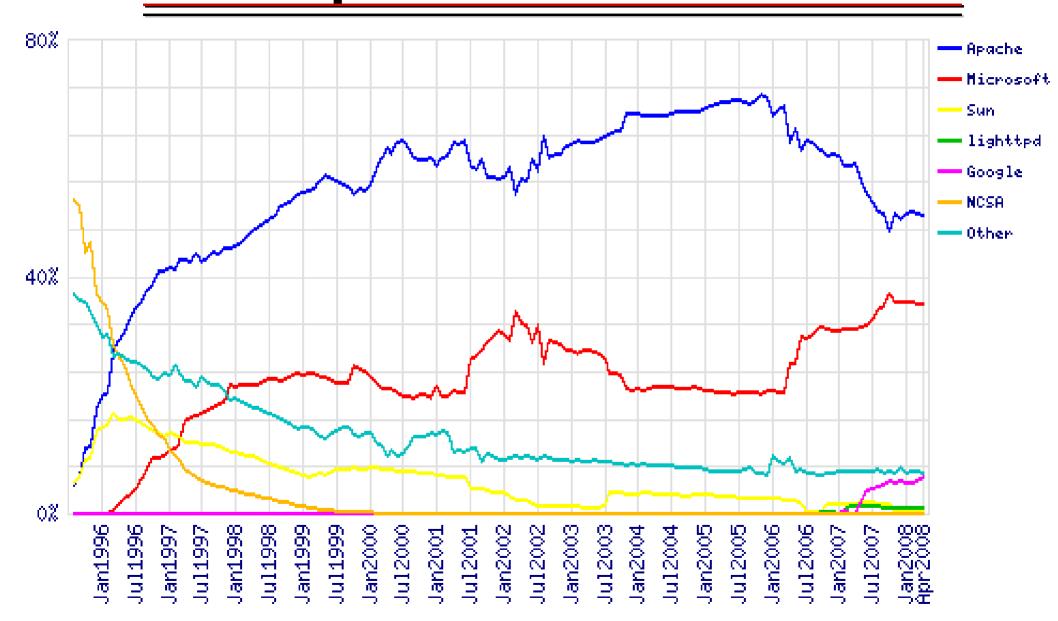
Human

creativity, wisdom; intuition, experience sociability

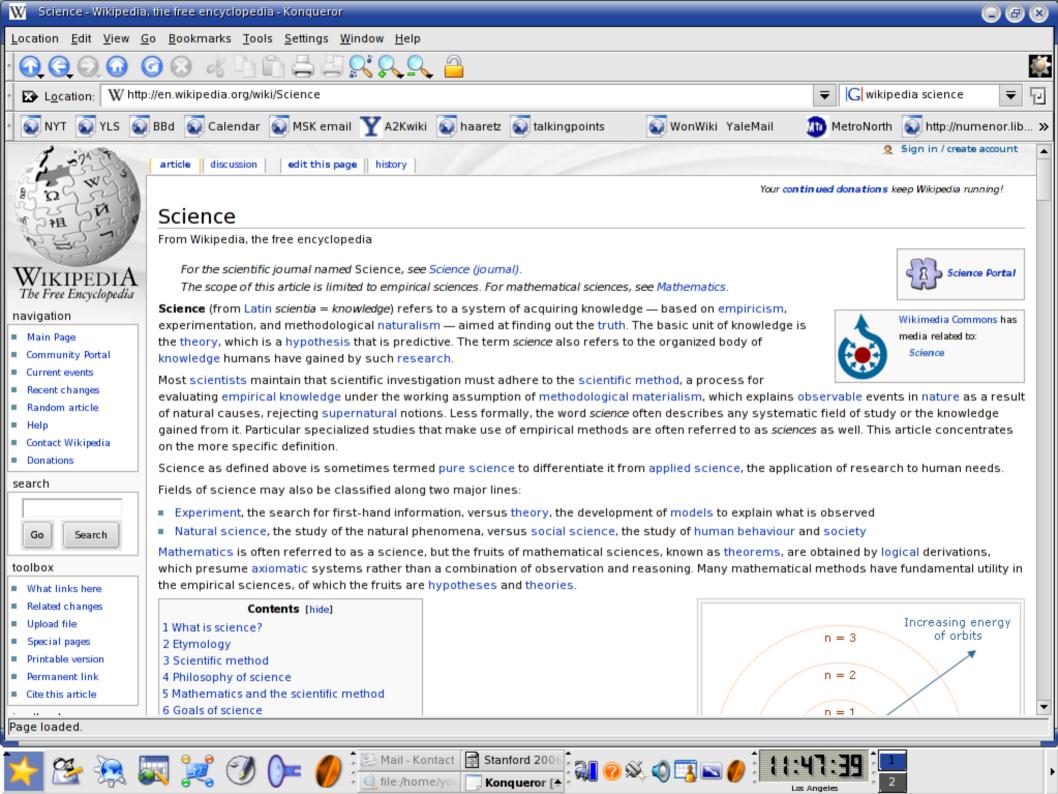
The most important inputs, into the core economic activities, of the most advanced economies, are widely distributed in the population

Social action shifts from the periphery of the economy to a stable element in the core because newly effective

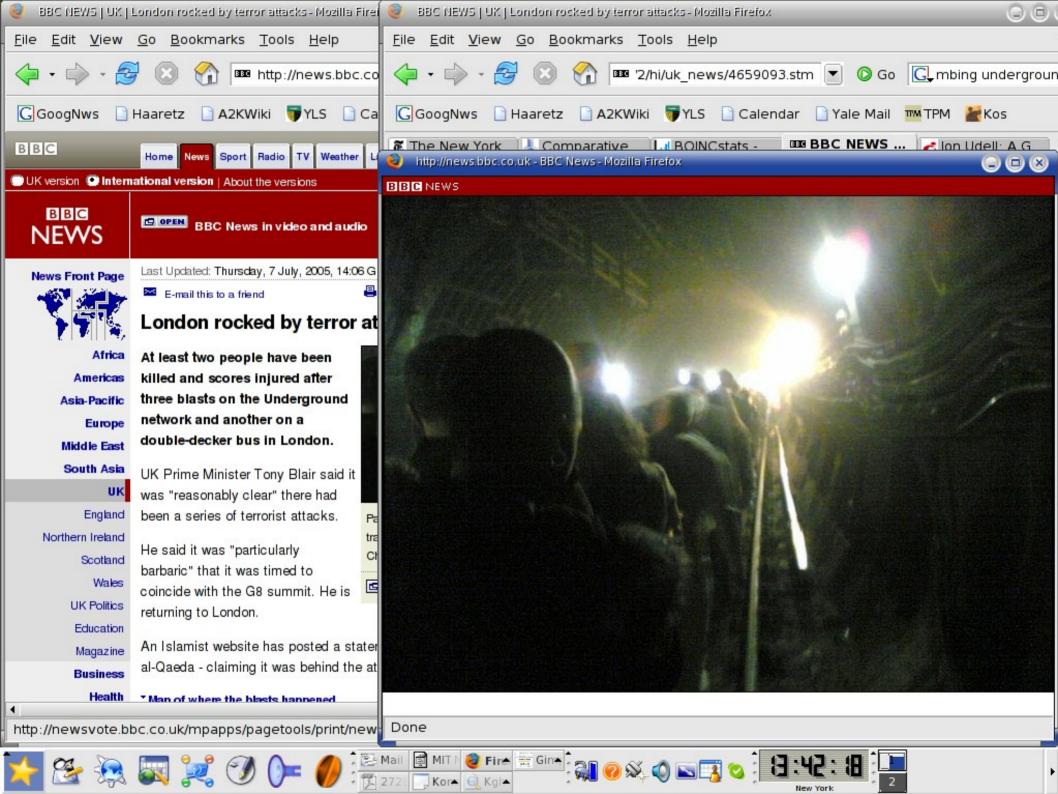
Free/Open Source Software

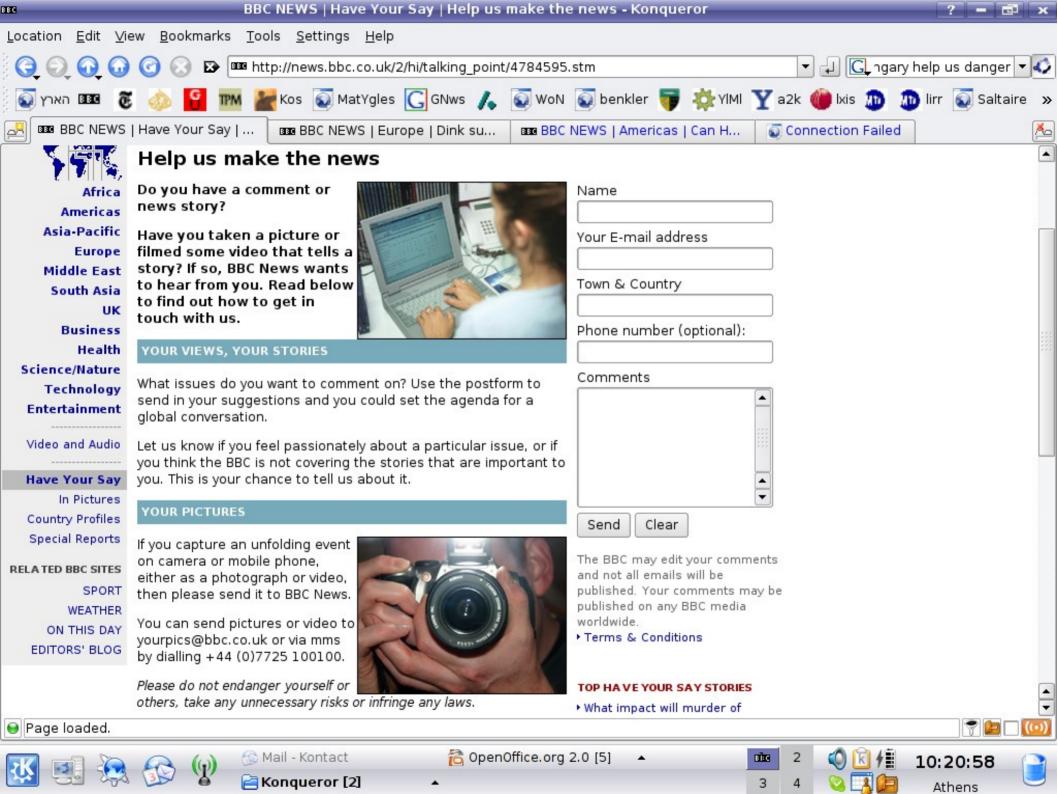


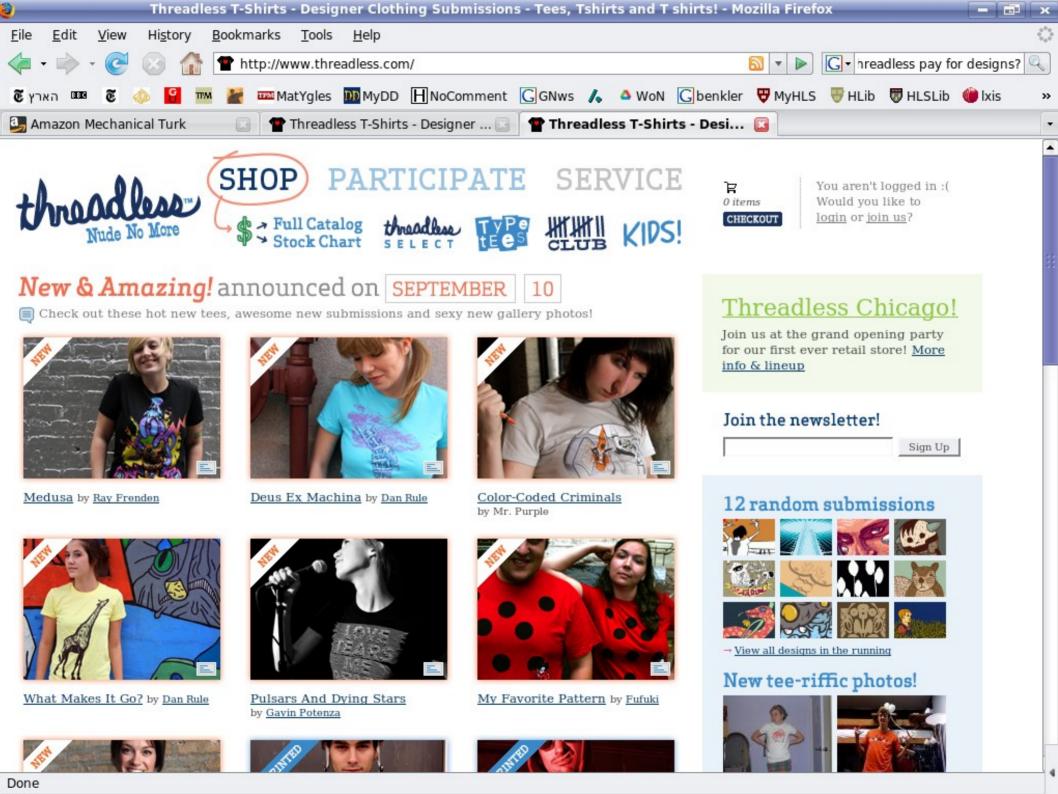
Apache market share 1995-02/2007 Source: Netcraft Survey April 2008

















PARTICIPATE SERVICE



E 0 items CHECKOUT

You aren't logged in :(Would you like to login or join us?

You wear their designs, now read their thoughts!



Yeoh Guan Hong from Wanganui, New Zealand

Yeoh Guan Hong has won 4 times ...

Love*Rain, Nature Call!, Finding Rhinoceros, After Show



Rodrigo William Rimes Rezende

from Rio de Janeiro, Brazil http://www.rwr2.com.br

Rodrigo William Rimes Rezende has won 1 time...

Pexe



From their brains TO YOUR BODY!



Mr. Toxic Waste by Jan Avendano



Ross Zietz

from Baton Rouge, LA, USA www.rosszietz.com

Ross Zietz has won 17 times...

Squeaked, Eighty One Gemini, Pandamonium, A Fathom Farewell, Fred and the Giant Eel, Piece of Meat, On The Plains, Loch Ness Imposter, Regrowth: Katrina, Vegetarians are Eating the Rainforests, 99 Luftballons, Satan's Little Helper, Infinity MPG, In A Comic, Home Is Where The Heart Is, Phascolarctos Cinereus, Strength In Numbers



Kristy Anne Ligones

from Cagayan de Oro, Philippines http://www.freewebs.com/subconagileverie

Kristy Anne Ligones has won 1 time... Dead Sucker



Aled Lewis from London

http://www.aledlewis.com/

Aled Lewis has won 5 times...

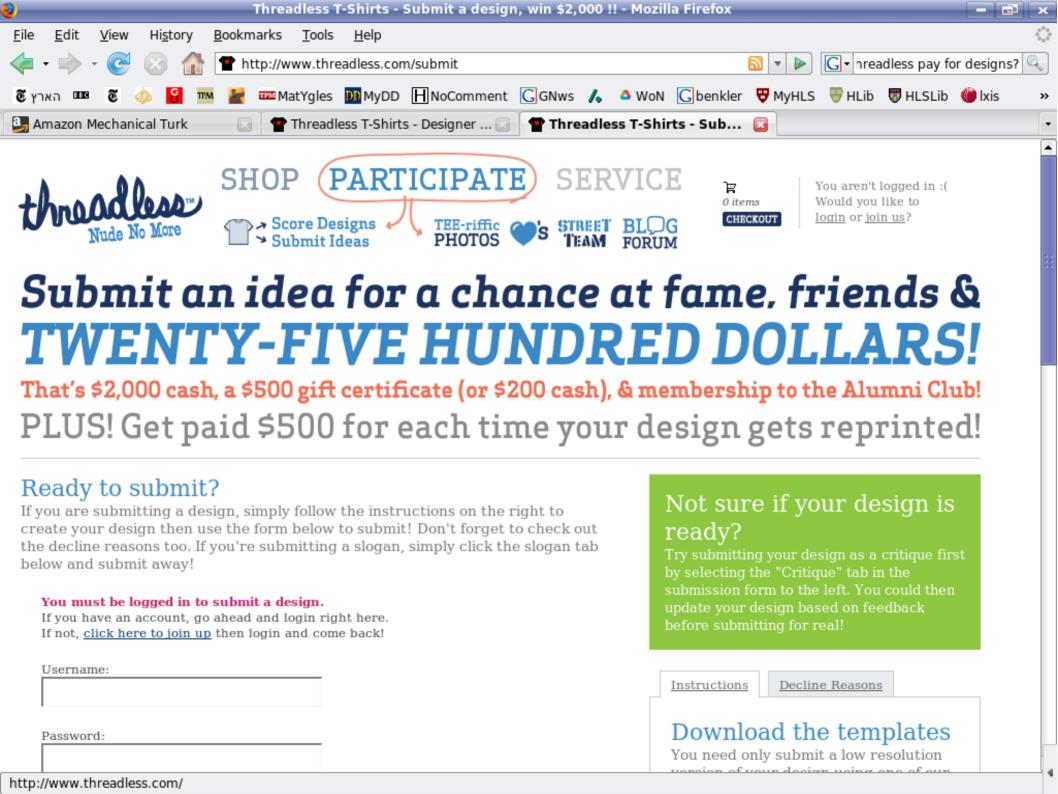
Party Pieces, I'm Sure I Used To Fit, Keening It Real Rhings Hunt In Dacke She

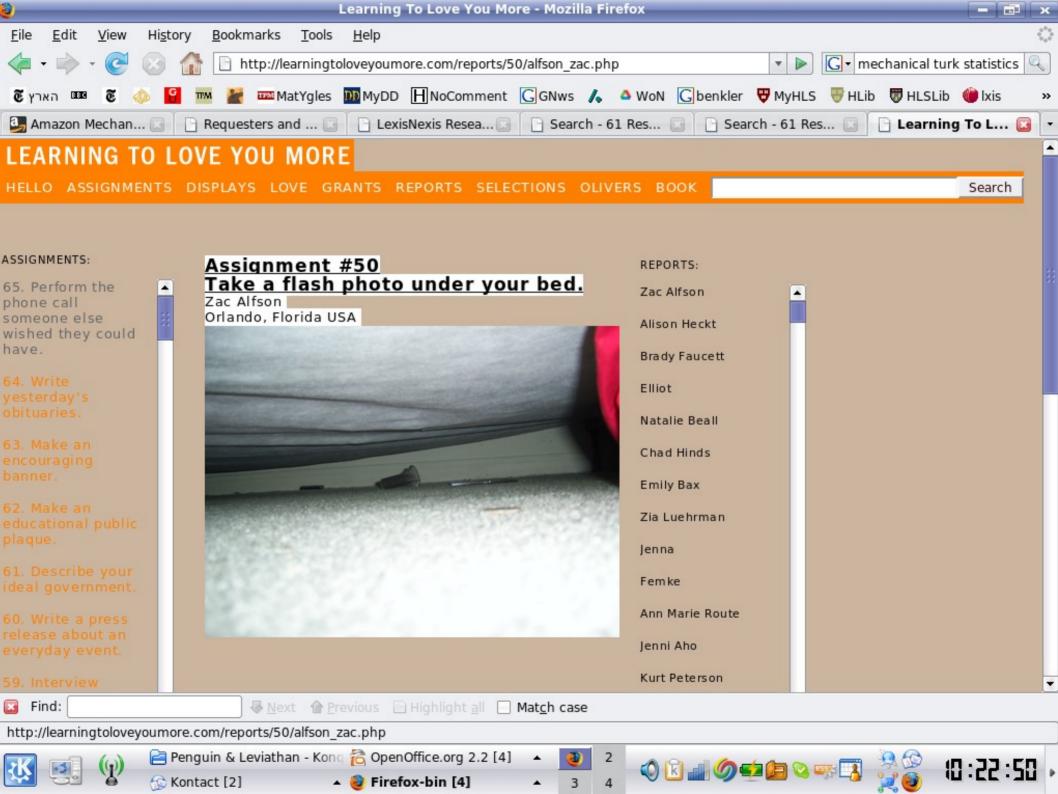


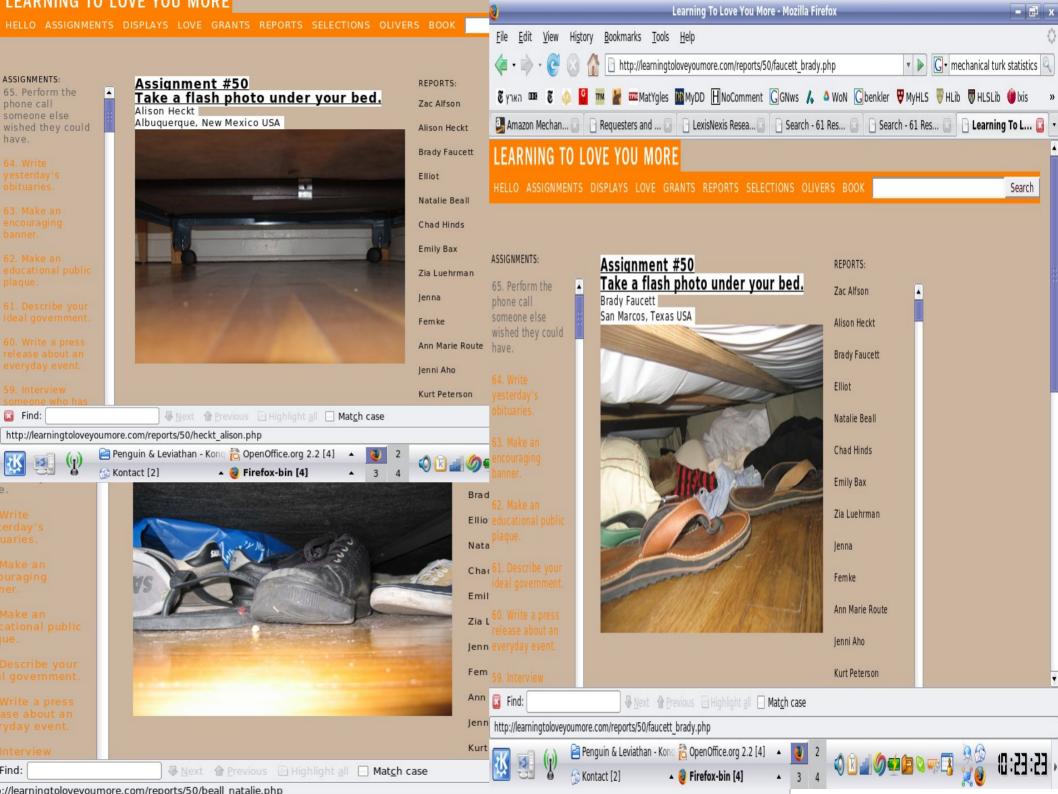
Para Poppins by Stanislas GIROUX

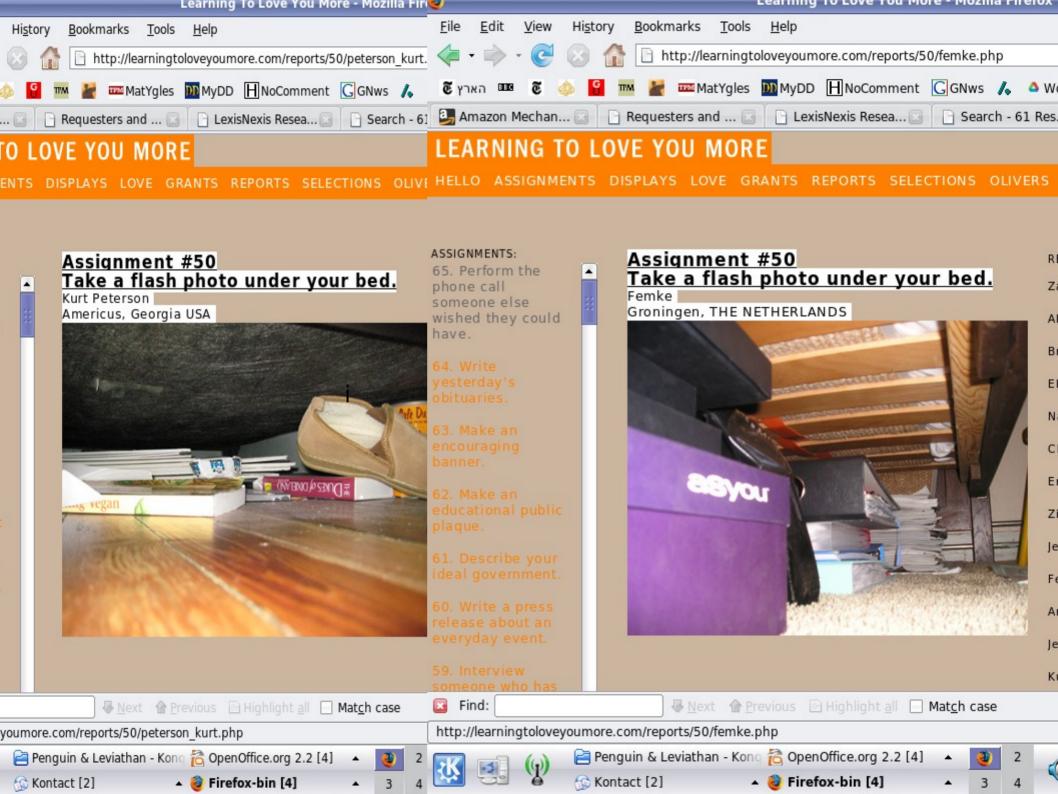


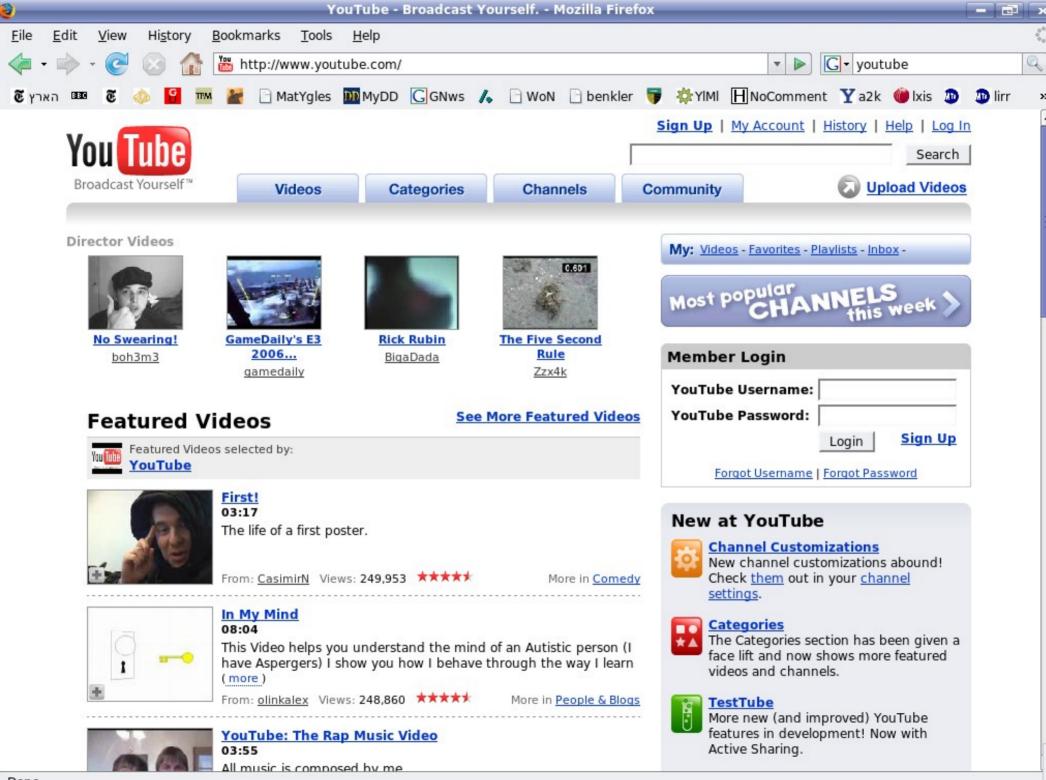


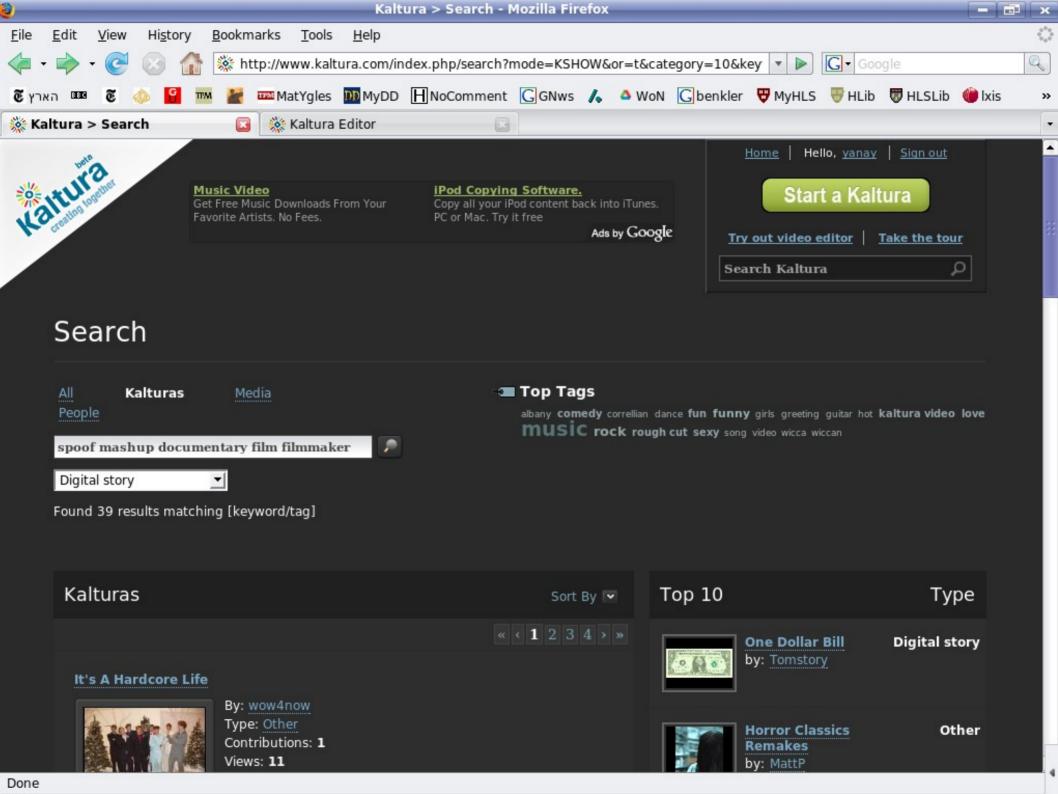


















About

In the beginning

Founders

Glenn Reynolds N.Z. Bear

Pork Issues

Pork Hall of Shame HHS Earmarks Who Put a Secret Hold on Government Transparency?

WHO IS THE SECRET HOLDER?

Senators Tom Coburn and Barak Obama have proposed <u>s.2590</u>, legislation that would create a single website with access to information on nearly all recipients of federal funding. The bill cannot proceed, however, because <u>one or more Senators placed a "secret hold" on it.</u>

Who is the secret holder? We want to know, and we want your help finding out. Call your Senator, and ask them to go on the record denying that they placed the hold. Then <u>e-mail Porkbusters</u> and let us know what they said! Senators who issue denials will be removed from the suspect list --- and those who do not, won't!

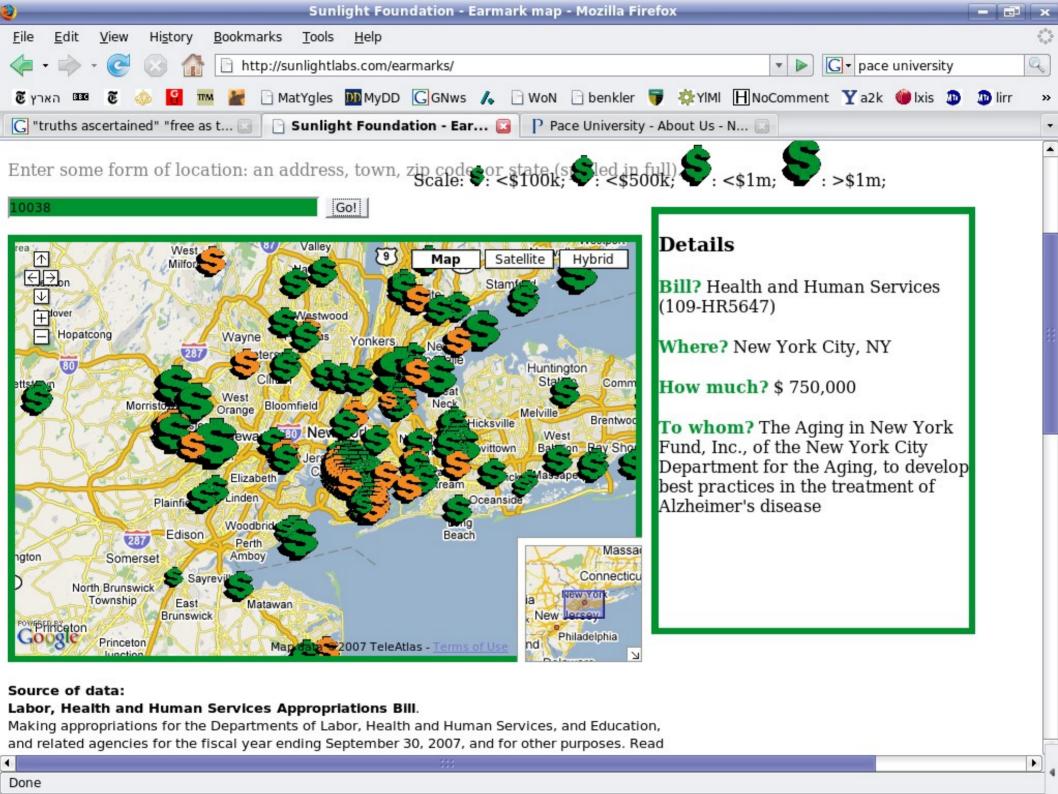
UPDATE 8/30 pm:

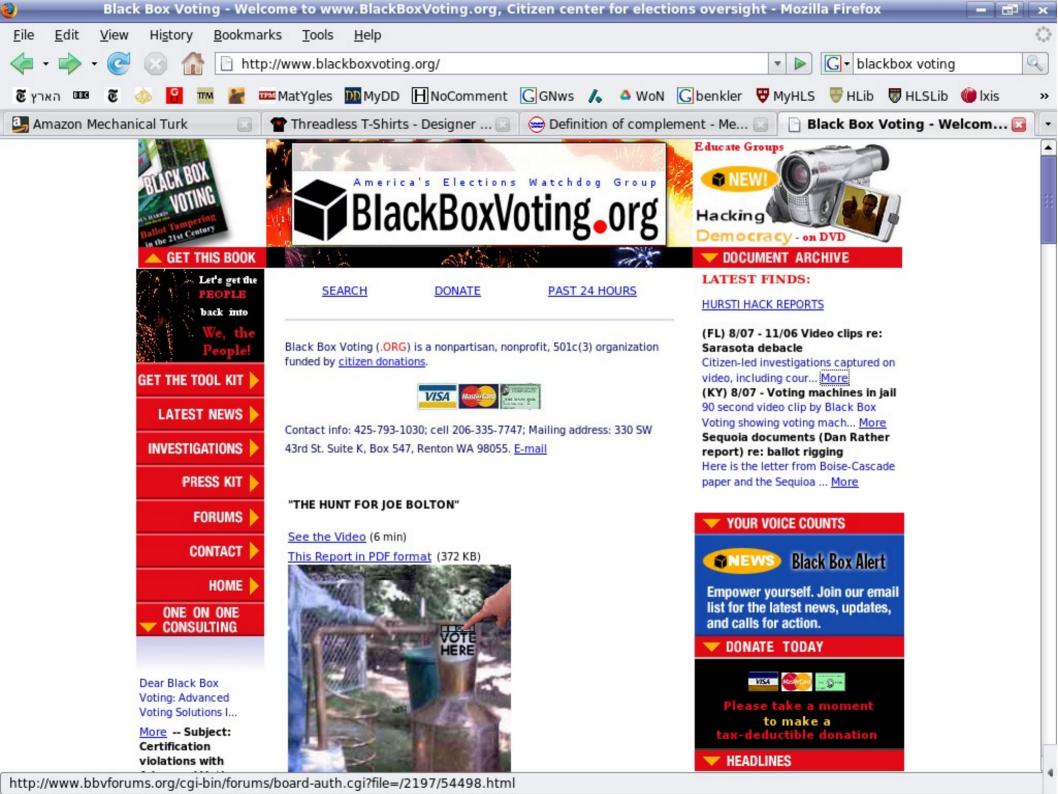
Revealed! Senator Ted Stevens' staff acknowledges that he has placed a hold on the bill.

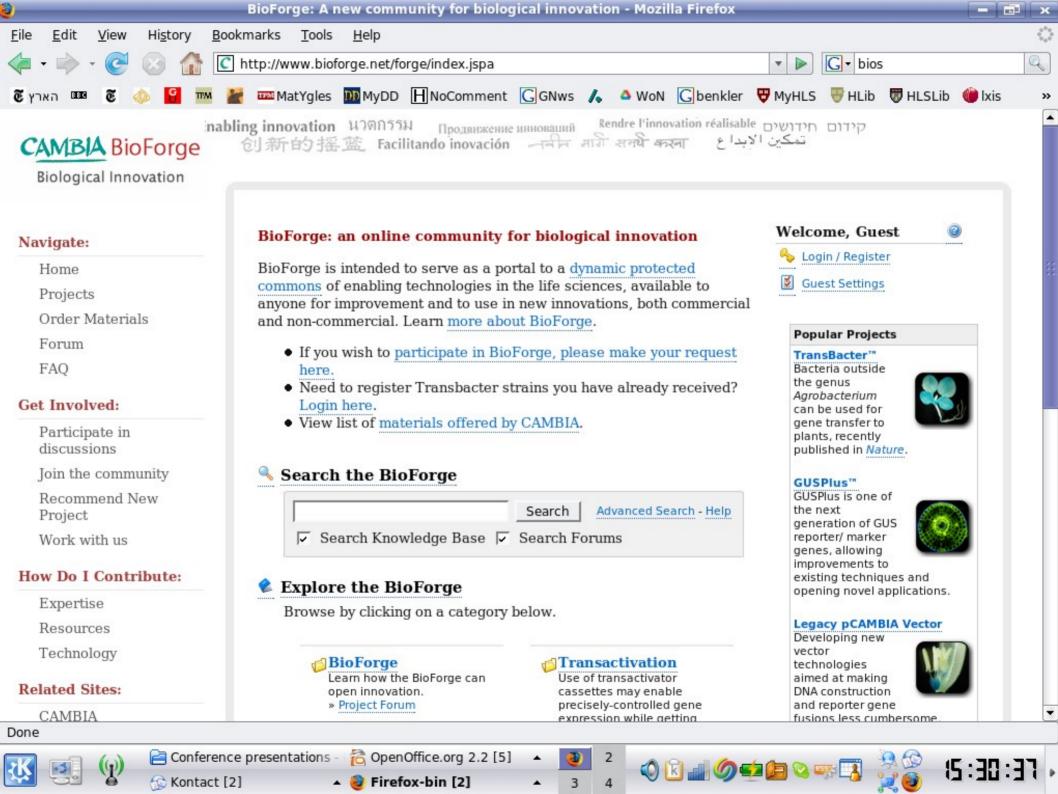
General Pork



Done







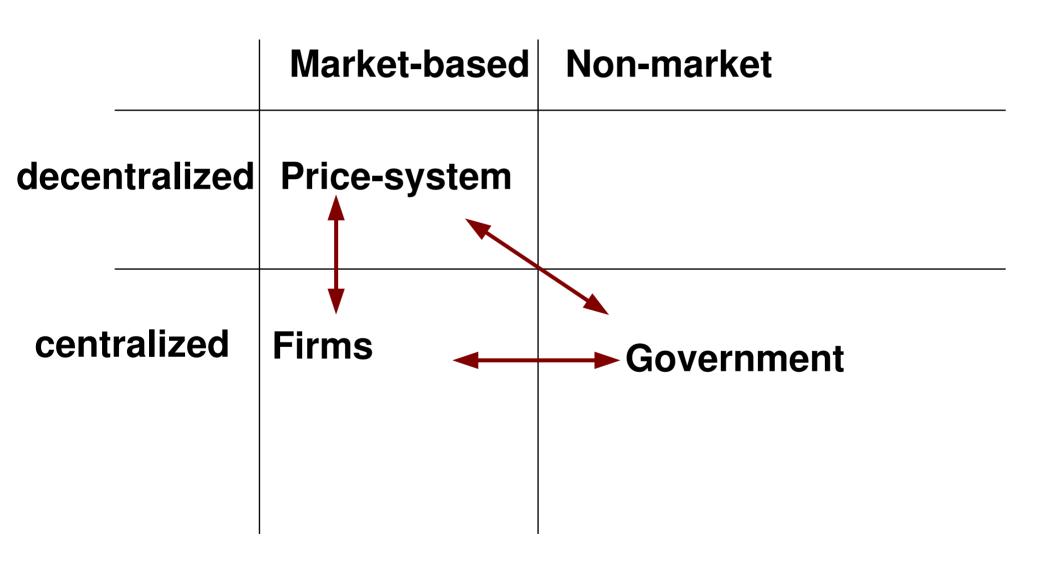
Four transactional frameworks

	Market-based	Non-market
decentralized	Price-system	
centralized	Firms	Government; Non-profits

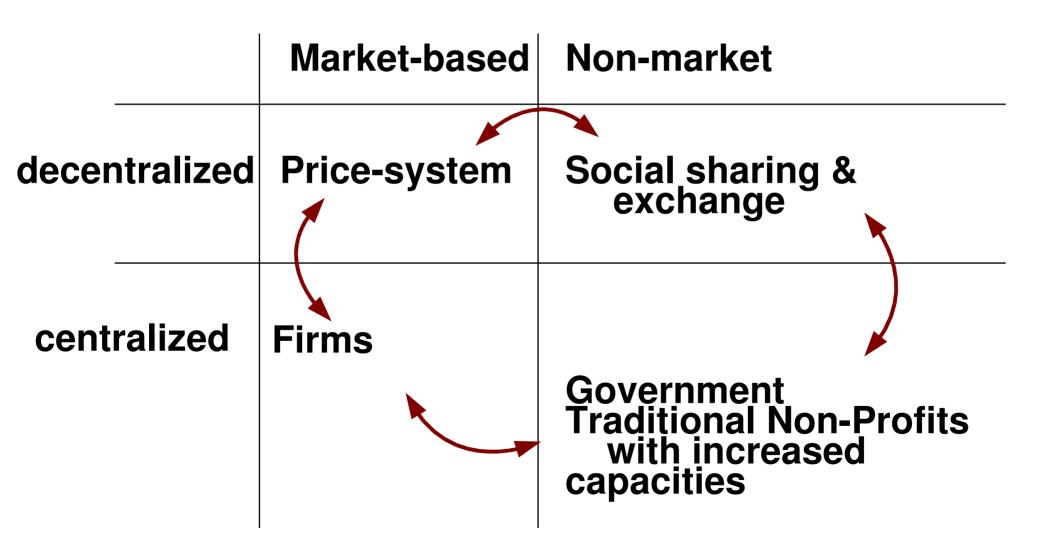
Four transactional frameworks

	Market-based	Non-market		
decentralized	Price-system	Social sharing & exchange		
centralized	Firms	Government; Non-profits		

Four transactional frameworks

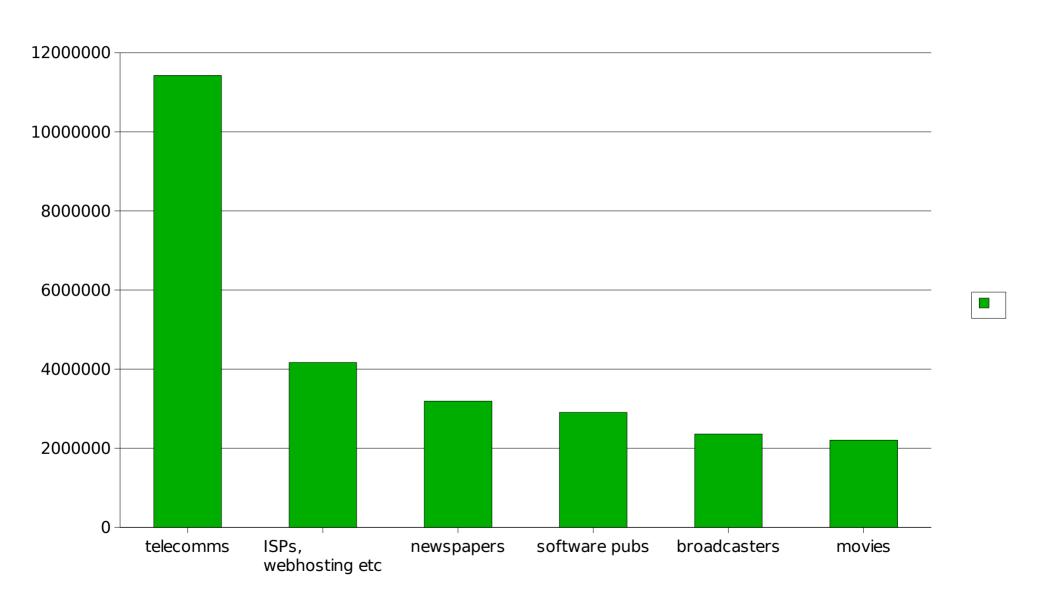


Four transactional frameworks

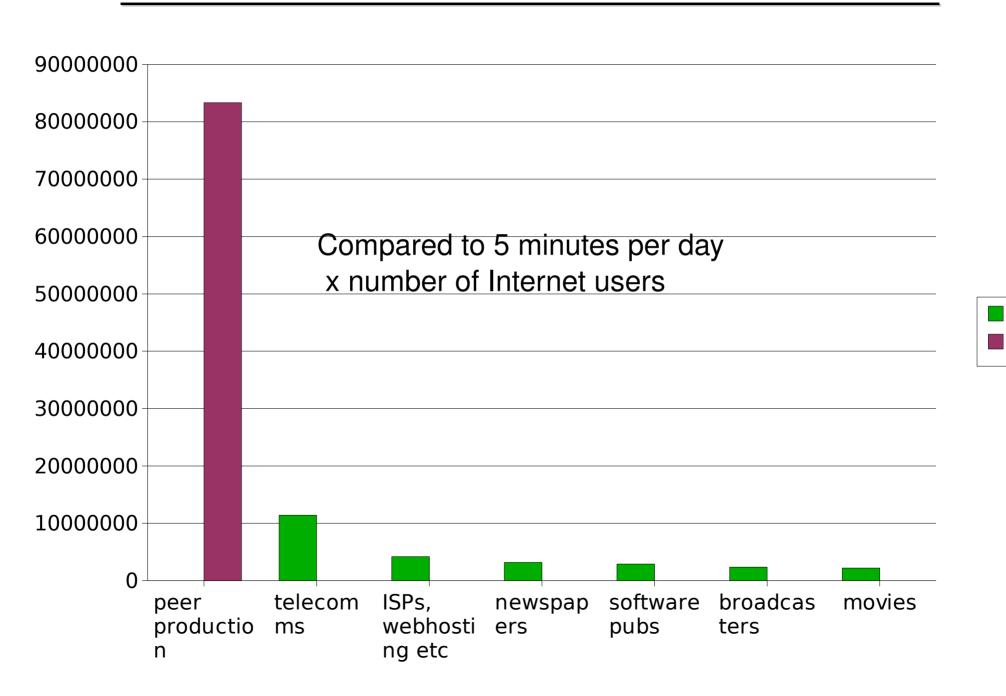


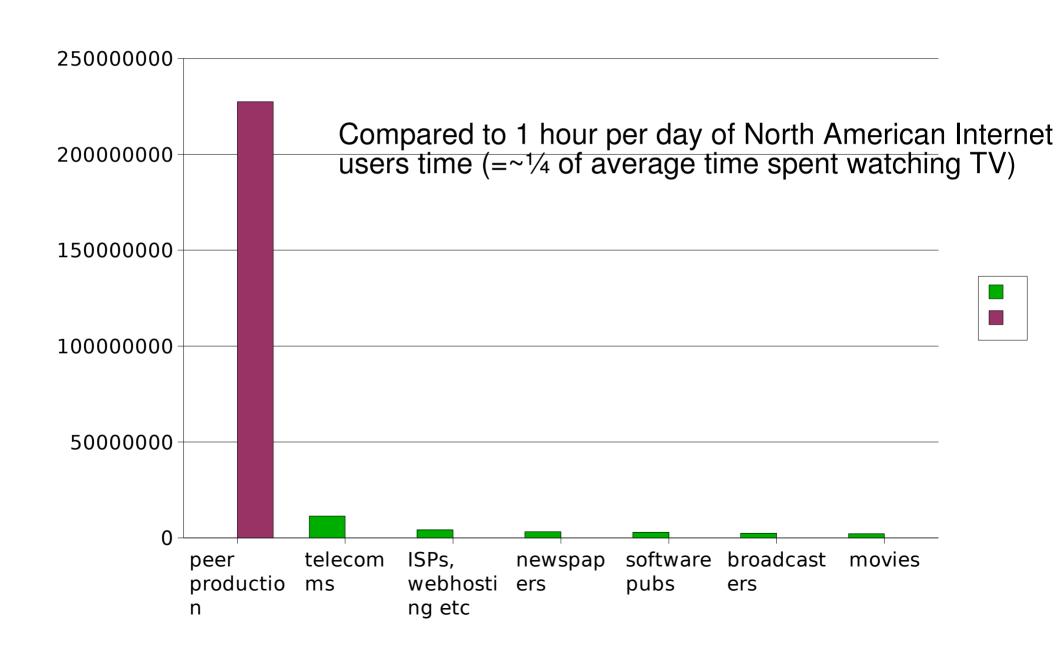
Social sharing & exchange as a modality of economic production

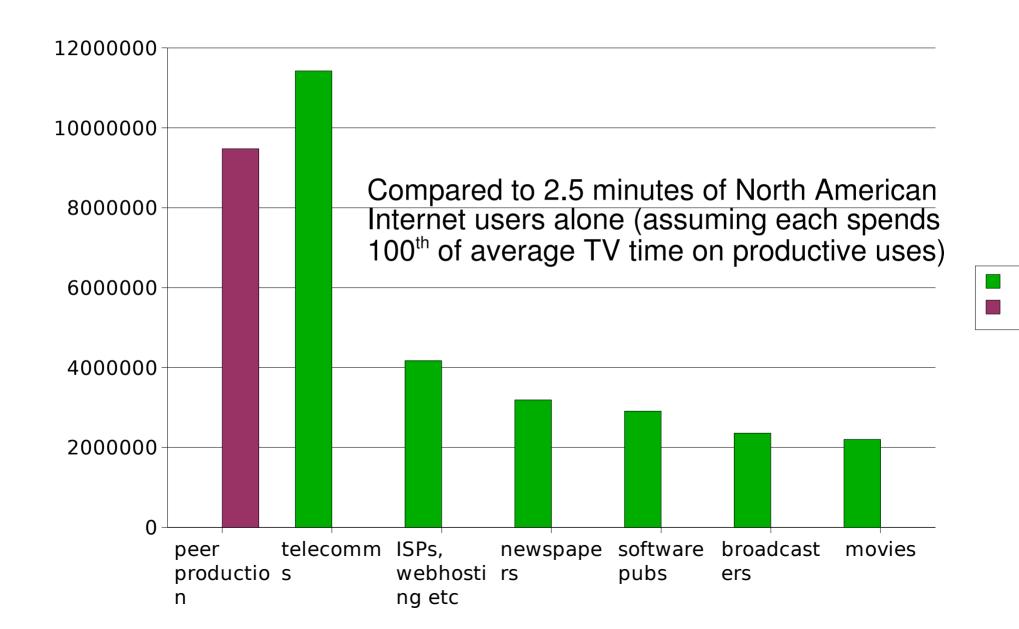
- Decentralized authority and capacity to contribute to effective action
 - Instead of property: "may I create?," you have "here are tools plus a technical/social platform"
 - Harnesses large quantities of underutilized resources
 - Pew studies
 - -27,000,000 bloggers in the U.S alone
 - ->50% of US teenagers actively contributed to some site



32 Economic Census; Paid employees per industry times 8 hours





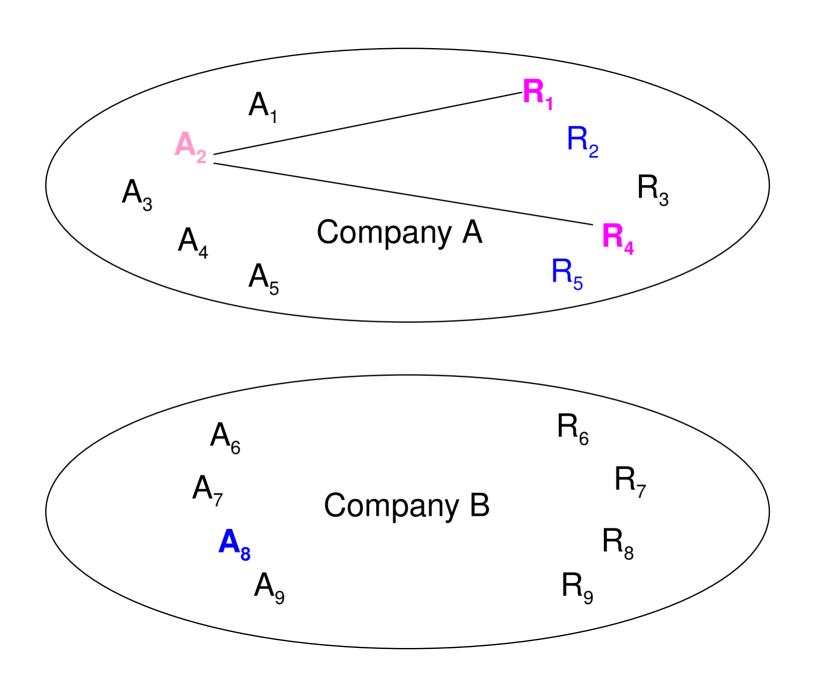


Social sharing & exchange as a modality of economic production

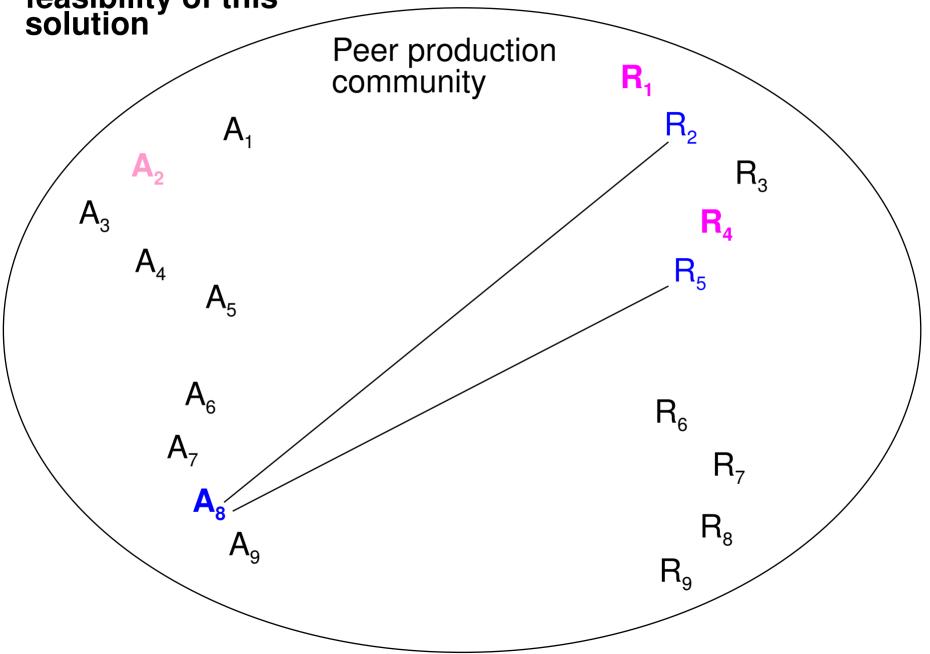
- Decentralized authority and capacity to contribute to effective action
 - Quantity
 - Quality
 - Creativity, intellectual effort, judgment incontractible
 - Concepts of the networked organization; learning organization; Toyota system; capabilities-building widely adopt social-cooperation-oriented solutions within firms
 - Individual employees constantly sense, experiment, discuss
 - Greater autonomy to act and make mistakes
 - Structured communication about what works

distributed sensing of opportunities for action, solutions, experimentation, adaptation

Agents and resources separated into firms



Agents and resources in common enterprise space: decentralized authority and capacity to act central to the feasibility of this solution



Mapping peer production

Flow

 (1) Many to one; (2) some to some/many; (3) many to many

Effort

• (1) minimal; (2) middling; (3) high

Type

(1) minimal Turing test; (2) judgment; (3) knowledge, creativity

Motivation

(1) extrinsic/money; (2) mixed; (3) intrinsic

Governance

(1) corporate outsourcing; (2) benevolent dictator;
 (3) "community"/ collective self-governance

Collaboration

 (1) collated independent action; (2) co-dependent contributions; (3) active cooperation

Mapping peer production

mechanical turk ◀	Google Digg	Threadle I	ess nnocei	Learning to love you more ntive	FOSS Kaltura	Wikipedia •
F1	F1	F1	F0	F1=> F2?	F2; F3 F2	F3
E1	E1	E2,3	E3	E2,3	E2,3 E2,3	E1,2,3
T1,2	T1, 2	T2,3	Т3	Т3	T3 T3	Т3
M1	M3	M2	M1	M3	M1,2,3 M3	M3
G1	G1	G1	G1	G2	G2,3 G3	G3
C1	C1/C2	C1	C1	C1	C2,3 C3	C3

Mapping peer production

rnechanical turk	Google Digg	Threadless Inn	ocent	Learning to love you more tive	Kaltura	FOSS	Wikipedia
/ - F1	F1	F1	F0	F1=> F2?	F2	F2; F3	F3
E1	E1	E2,3	E3	E2,3	E2,3	E2,3	E1,2,3
T1	T1, 2	T2,3	Т3	Т3	Т3	Т3	T3
M1	M3	M2	M1	M3	M3	M1,2,3	M3
G 1	G1	G1	G1	G2	G3	G2,3	G3
C1 crowdsourcin	<u>C1/C2</u> g	C1	C1	C1	C2,3	C3 eer produc	C3 etion

Decentralization of Capacity and authority to act is critical:

practically effective human agency

Commons-based strategies move to the core

Peer production / large scale cooperation

Loosely-coupled systems with permeable boundaries

organizational, institutional, technical, social

Faster learning and innovation

a more participatory culture

Not utopia, but a **more**democratic public sphere

loosely-coupled systems that allow practical human agency allow greater freedom to help and harm common goals; require **motivated cooperation**

Innovation, knowledge, culture, because of poor specifiability of actions, require **diverse** motivations, with a strong emphasis on intrinsic motivation

Requires a new focus on technical platforms, business processes, and legal rules as

human systems, designed for cooperation

integrated, rather than interdisciplinary

Sources: many disciplines; observational; experimental; theoretical

Organizational sociology in the 1980s (Toyota Production System; networked organization; thirdway) (Sabel; Powell)

Experimental economics: playing games with well-specified strategies, observing deviations; manipulating (Prisoner's Dilemma; Ultimatum and Trust games; Dictator Games; Public Goods Games) (Fehr; Bowles; Gintis) (since mid-1990s); cooperative game theory (Rabin)

Sources: many disciplines; observational; experimental; theoretical

Political Science of commons in particular (both observation of commons and experiments) (Ostrom)

Anthropology (long standing on Gift; more recently Boyd & Richerson; Henrich)

Social software; peer production; FOSS

Sources: many disciplines; observational; experimental; theoretical

Human evolutionary biology (from selfish gene to indirect reciprocity and group selection; observational, theoretical; mathematical) (Sober & Sloan Wilson; Nowak, Sigmund; Bowles & Gintis)

Neuroscience (imaging studies of subjects in cooperation; McCabe; Rilling)

People are diverse

Some behave like homo economicus (~30%?);

More than half behave on some model of cooperation, either conditional/reciprocity-based or unconditional

Cooperation is sensitive to context

Whether proclivity to cooperate is innate/

dispositional (irrespective of how it arises), it is at least also situational—context manipulations can lead to greater compliance with the cooperative behavior or to deterioration to dog-eat-dog

Cooperation Strategic mutualism

- the object of mechanism design/game theory

Heuristic reciprocity

- self-interested mutualism without accounting

Committed mutualism

-commitment to success of other consistent with success of self

Collective efficacy

-intentional orientation toward success of a common goal transcending the agent's specifiable individual success

Altruism

-action oriented to achieve the flourishing of other as self, irrespective of success of self

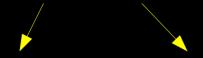
bracket ontological questions

are we by nature selfish or cooperative

bracket questions of ultimate causes

Evolutionary forces; culture and history; mixed

Can we extract from the various manipulations and differences characterized, a set of **design levers** likely to improve the degree to which a given group of people, in a given situation, will cooperate?



Dialectic view of principles, policies, preferences (Ps) Mechanism for other levers



Mechanism for other levers

Dialectics of (Ps)

Intrinsic motivation=> affective commitment to cooperation

Empathy/Humanization

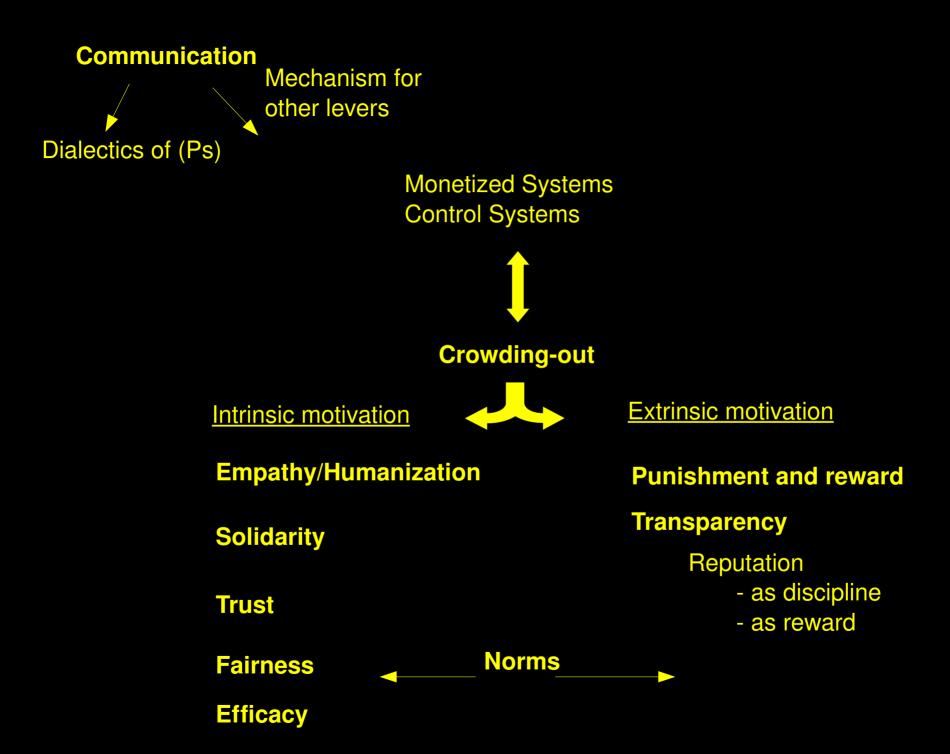
Solidarity

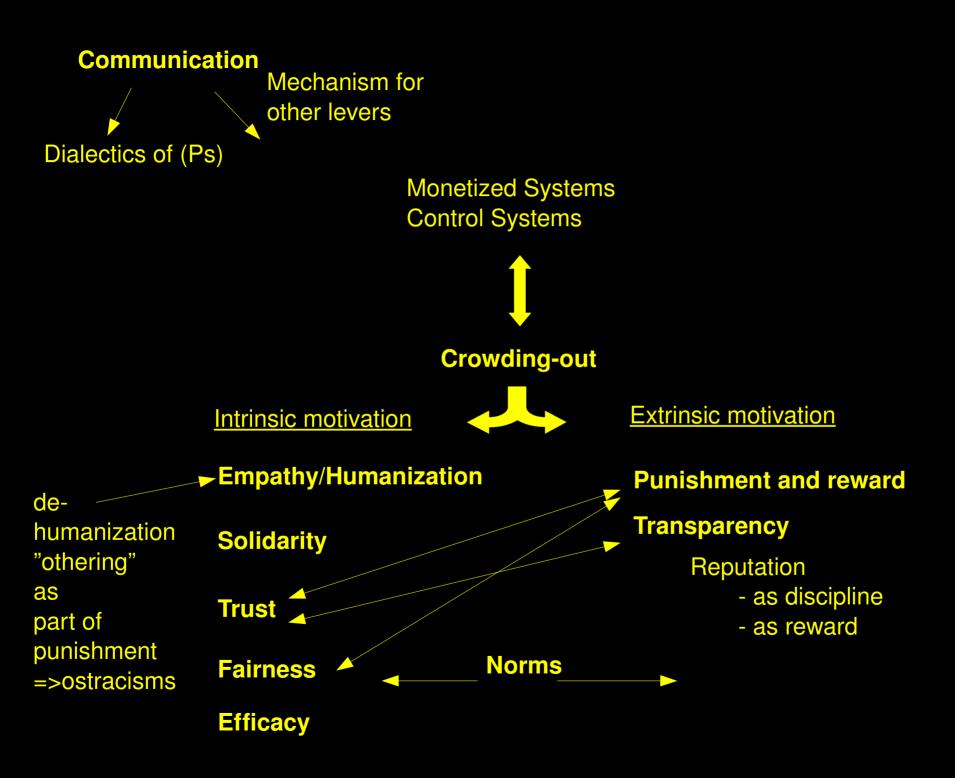
Trust

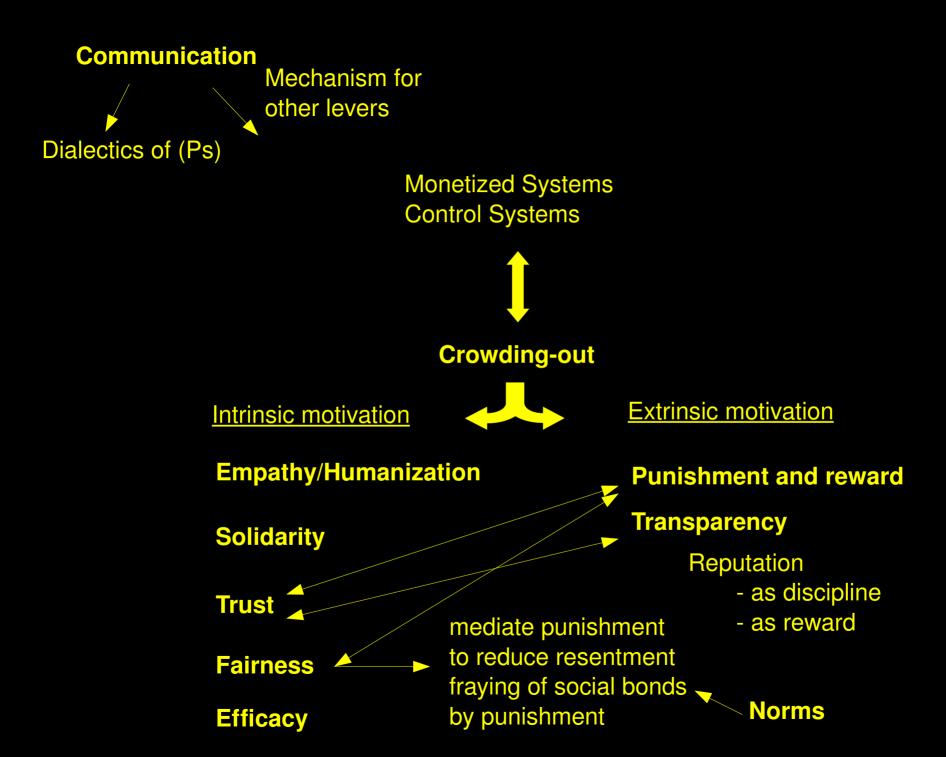
Fairness

Communication Mechanism for other levers Dialectics of (Ps)

Extrinsic motivation=> Intrinsic motivation=> social control affective commitment to cooperation **Punishment and reward Empathy/Humanization Transparency Solidarity** Reputation - as discipline **Trust** - as reward **Norms Fairness** self-chosen arbitrary coordination points (Schelling) **Efficacy** externally derived (Gossip) internalized "integrated regulation"









Intrinsic motivation

Crowding-out

Extrinsic motivation

Empathy/Humanization

Punishment and reward

Solidarity

Transparency

Trust

Reputation

Fairness Norms

- as discipline

- as reward

Cost

Leadership/ asymmetric contribution

Intrinsic motivation

Crowding-out

Extrinsic motivation

Empathy/Humanization

Punishment and reward

Solidarity

Transparency

Trust

Reputation

- as discipline

Fairness Norms

- as reward

Cost

Leadership/ asymmetric contribution

exit/entry

-graduated capabilities

Intrinsic motivation

Crowding-out

Norms

Extrinsic motivation

Empathy/Humanization

Punishment and reward

Solidarity

Transparency

Trust

Reputation

- as discipline

- as reward

Fairness

Cost

Leadership/

asymmetric contribution

exit/entry

Intrinsic motivation

Crowding-out

Extrinsic motivation

Empathy/Humanization

Punishment and reward

Solidarity

Transparency

Trust

Reputation

Fairness Norms - as discipline

- as reward

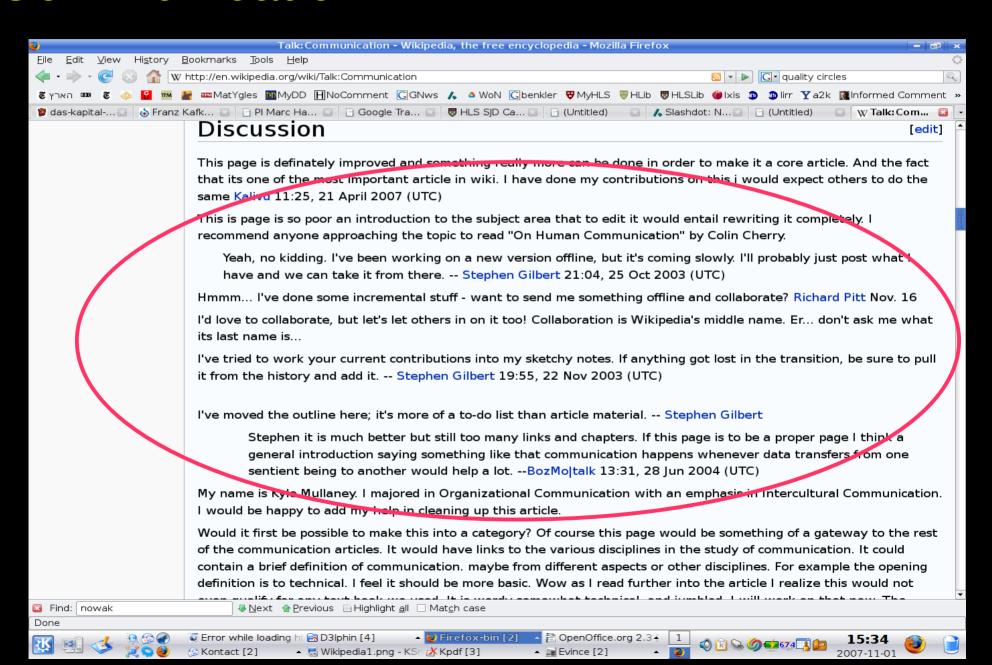
Freedom as practical human agency

loosely-coupled systems designed for cooperation change and unpredictability

meta-analysis of PD experiments (Sally 1995): communication alone (without enforceable commitment) has a large predictable effect on increasing cooperation

horizontal, discursive communications lines, as compared to lines of authority, central to organization/management studies

--communication likely combines several of the following levers



quality circles

"Talk" page in Wiki

excluding statements made in context of settlement negotiation from later litigation mediation rather than litigation

the fact that communication matters does not sit completely neatly with either reciprocity or punishment as dominant mechanisms

could be merely opportunities to achieve other design levers

could be indication that preferences/principles/goals are a product of communication and dialog

communication is necessary for "cooperation" to be even a meaningful concept in certain philosophical accounts of joint intentional activity (Bratman)

Empathy/Humanization

face-to-face has large effects on cooperation (Sally 1995; Ostrom 1998)

Bohnet & Frey: anonymous partner; silent identification; communication in PG & DG games:

```
PG = anon => 12%; silent ID => 26%; comm => 78%

DG = anon => 26%; silent ID or comm => ~50%

Later: DG only;

anon => 26% on average of endow; 28% gave 0

silent facial ID => 35% of endow; 11% gave 0

personal info shared => ~50% of endow; 0 gave 0.
```

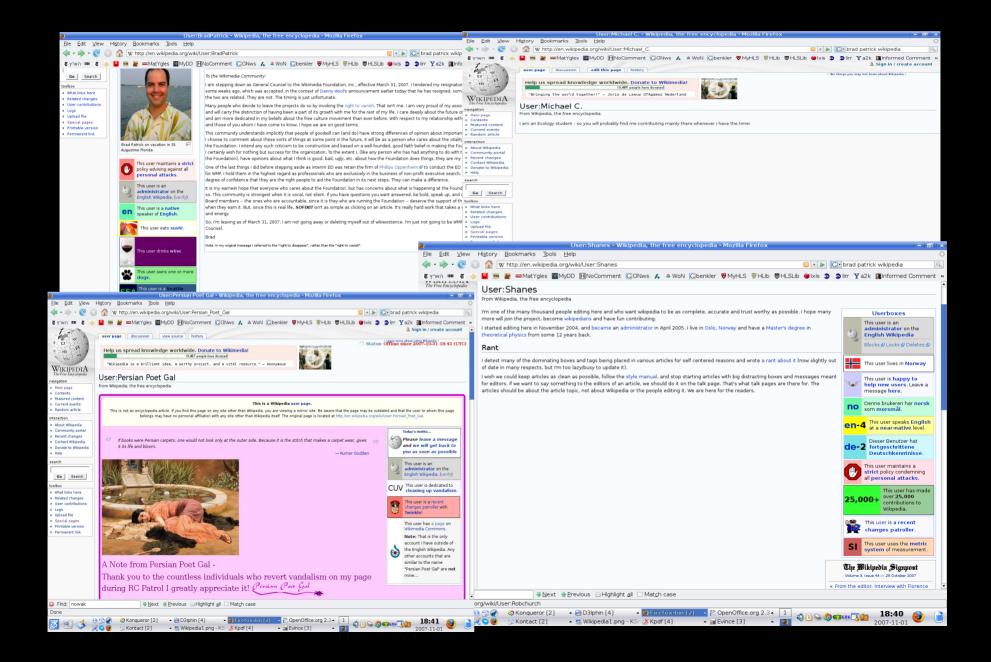
Empathy/Humanization

face-to-face has large effects on cooperation (Sally 1995; Ostrom 1998)

Bohnet & Frey: anonymous partner; silent identification; communication in PG & DG games:

Rilling et al => fMRI studies light up differently when cooperating with human partner

Humanization



Humanization

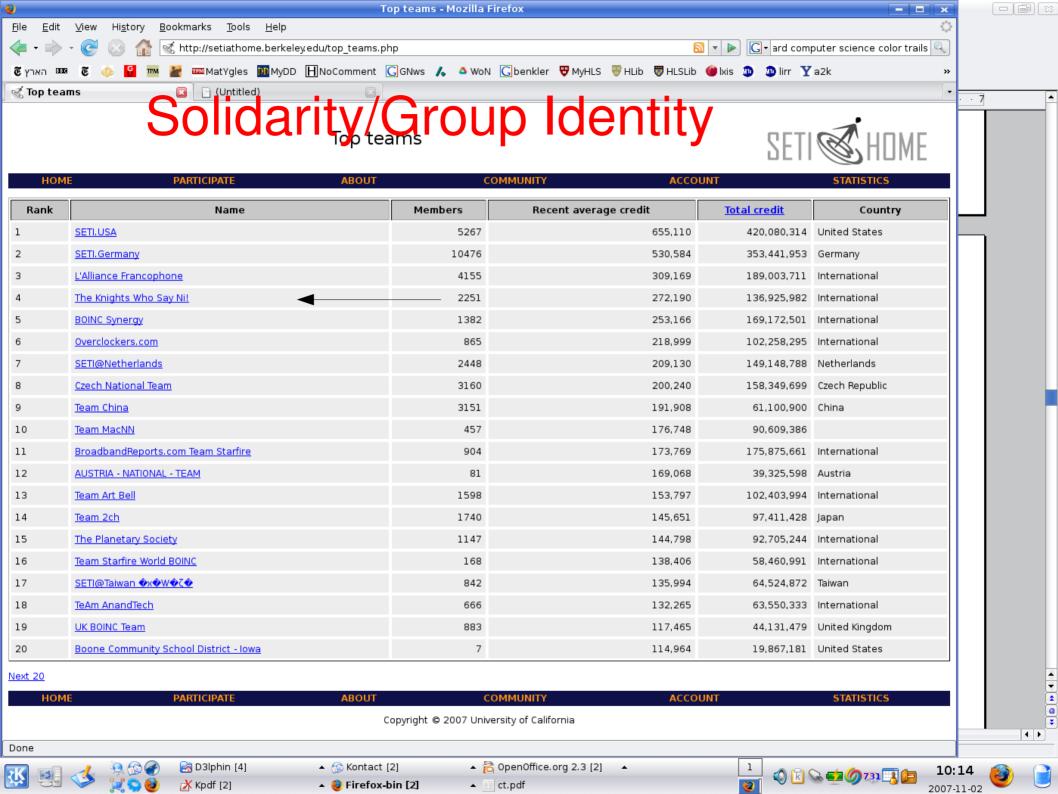
company picnic; happy hour; power breakfast
=> food sharing

profile page; avatars?

"the Defendant/Plaintiff": Adversarial Trial dehumanizes

=> move toward restorative justice

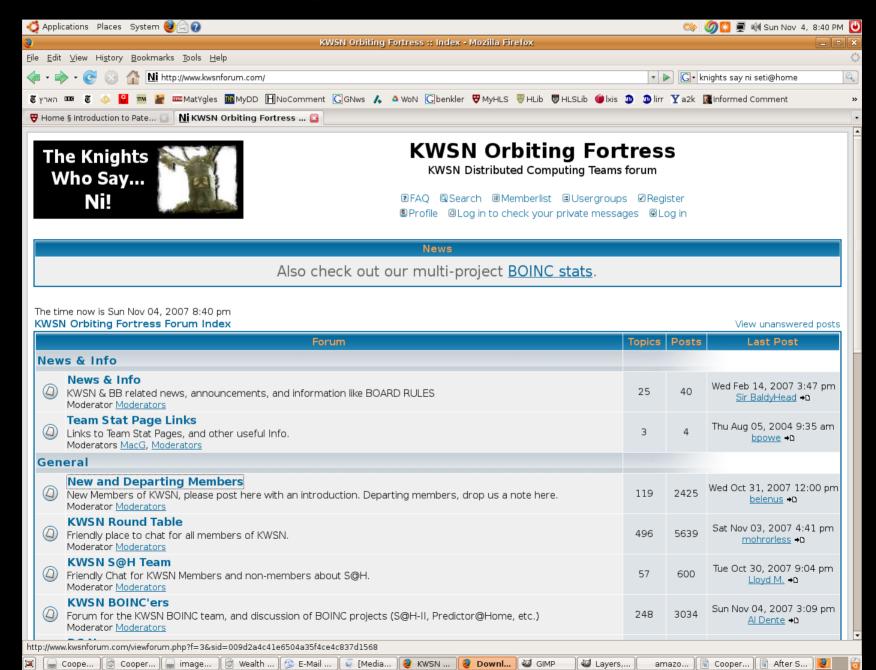




Solidarity/Group Identity



Solidarity/Group Identity



Solidarity/Group Identity

Work in organization psychology (Haslam, Tajfel)

- => knowledge of a group coupled with emotional significance of belonging
- => Yamagishi experimental work: heuristic reciprocity?

Bowles & Gintis; Boyd & Richerson: group selection in early human conditions supports centrality of group identification

double edged?

introducing competition into cooperation introducing real conflict (Bowles & Gintis *Community Governance*)

wide range of literatures; different usages

As a *design lever* is NOT:

characterization of the type of system that is cooperative (e.g., trust-based organizational model; trust-based exchanges as compared to markets)

=>does not identify "trust" as a design lever, but offers a synonym for this kind of system as a whole

range of literatures; different usages

As a *design lever* is NOT:

confidence in the outputs of the system, irrespective of human will to the contrary

=> as commonly used in computer security

A belief people hold about what others will do to them or for them when *not determined by the* system of interaction

e.g. credit card vs. "I'll pay you Friday"

risk is a precondition to trust

"confidence building measures" are a series of relatively low-stakes opportunities for mutual risk taking with transparency built in to allow observation

"Intrinsic" to the extent that it plays the role of anticipatory cooperation that is "reciprocated" by the anticipating cooperator

- -Wikipedia editing policies
- -5-10% prenuptials;
 - even if systematic error in assessing risk, why take it?
- -incomplete contracts/unenforceable agreements to agree
- -"stop the line" in Toyota Production System





Fairness

substantial work in economics

outcomes relative to

- other individuals (Fehr & Schmidt; Falk et al) inequality aversion
- the group (Bolton & Ockenfels)
- my condition without your help (Rabin)
- how well off you made yourself (Falk Fishbacher)
- relative to what a selfless actor would have done (Charness & Rabin)

Fairness outcomes

- culturally contingent; cross-culturally diverse; susceptible to framing
 - market-integration correlated with norm of equal division of windfall gains (Henrich et. al Foundations)
 - sensitive to culturally-recognized reasons for deviation
 - -in small-scale societies wide divergence
 - -in market society luck or "desert" shift focal point
 - -false consciousness/hegemony, anyone...?

Fairness outcomes

- creates major potential source of change in the analysis of justice and welfare
 - -fairness a precondition to productive engagement
 - -fairness perceptions are both effective and historically contingent
 - -explicit norms can affect perceptions, action, and outcomes

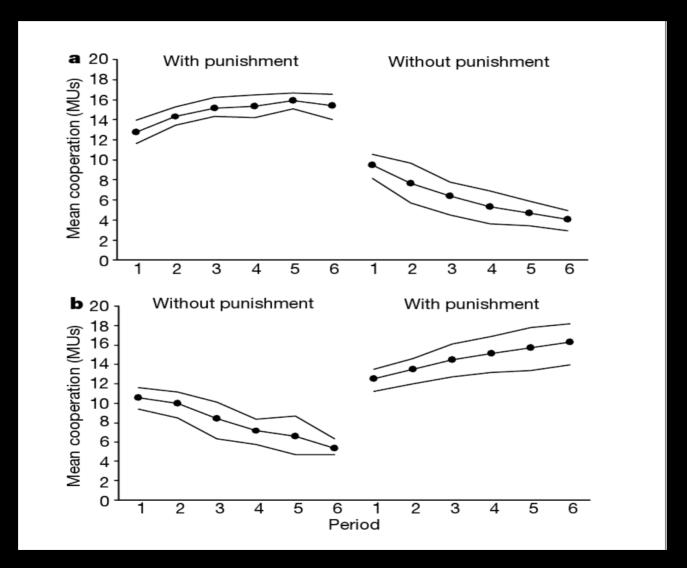
Fairness intentions

- -where bad intentions excluded (e.g., roll of dice) negative reciprocity triggered less (but cumulative, not exclusive of, outcomes)(Fehr & Schmidt)
- -equality, intention, and self-sacrifice
 - -Falk, Falkinger, & Fehr 2000 (UG where options were 50:50 compared to 80:20 v. UG with 80:20/20:80 as sole options (20% still reject 80:20)
 - -Herschel's cookie

Fairness

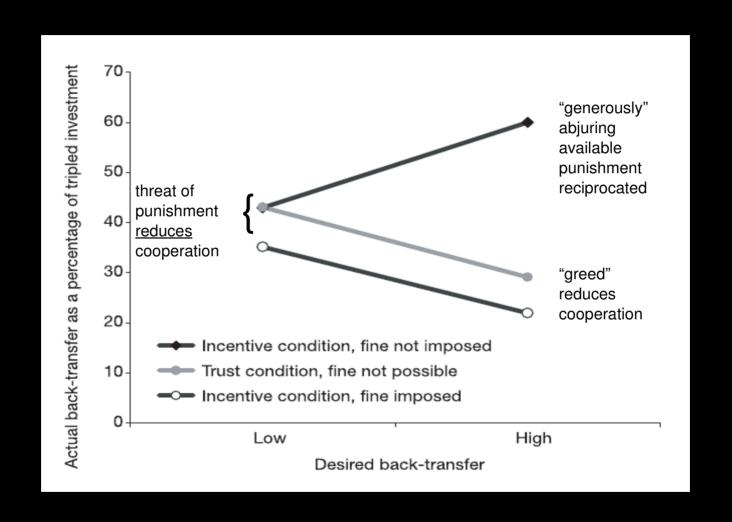
Processes?



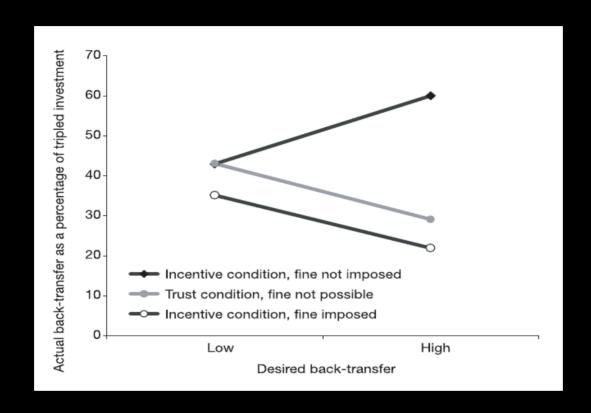


Public Goods Game: Fehr & Gachter (Altruistic Punishment 2002)

- -punishment is a second-order public good
 - -this is where we get "strong reciprocators"
 - -strong reciprocators whip selfish actors into shape



punishment crowds out trust? Fehr & Rockenbach (Detrimental Effects 2002); (Yamagishi 1986)



punishment crowds out trust? Fehr & Rockenbach (Detrimental Effects 2002); (Yamagishi 1986)

In trust game, perceived greed plus threat to punish *reduce* cooperation the most

sometimes defectors punish, though less when punishment is more costly (Falk et. al. 2005)

Increasingly studies show cross-cultural differences in the quality of punishment and extent of defectors punishing cooperators or indiscriminately (Gaechter et al 2005; 2008;)

Multiple rounds of punishment and retaliation lead to increased cooperation but lower overall payoff (Drebner et al 2008)

Ostrom 1991: graduated sanctions important

Punishment and strong reciprocity is not the whole of the story (*homo reciprocans* is part, but not the whole)

Punishment needs to be handled carefully; but where effective, may be too valuable to avoid

Characterizing the population; the type of game (PG where threat of punishment is cooperation in the second order PG; or TG, where threat of punishment can be seen as personal affront)

Transparency

Need to know Who is doing What, to and With whom, to what effect, by which mechanism

- => Nowak & Sigmund (2005): did indirect reciprocity push cognitive development because of need to keep track of multiple layers of action and reciprocal response?
- => Fehr & Gaechter: Cooperation sustained sooner and longer in "Partner" than "Stranger" treatments

Transparency

Need to know WhO is doing What, to and with whom, to what effect, by which mechanism

- transparency of agents, actions, processes, and outcomes
- =>tension, if not conflict, with privacy
- =>central to the discussion of common property regimes; law and social norms literature
- =>how related to trust?
 - => crowding out as with discipline or
 - => crowding in by social exhibition of cooperation plus threat to non-cooperators?

Transparency + Memory = Reputation

identity/reputation systems central to collaboration => work on trading networks (Greif; Bernstein)



Transparency + Memory = Reputation

identity/reputation systems central to collaboration

- => work on trading networks (Greif; Bernstein)
- => not necessarily "real" identity; but stable (Resnick/Zeckhauser on eBay; Clippinger/Higgins)



Norms

Social Norms literature grounded in long-standing communities; mechanisms intertwined

Q: what do "norms" mean/do for a designed system, rather than an organic one?

at a minimum coordination (Schelling) norms

e.g. mining codes in California 1848-49 (McDowell)

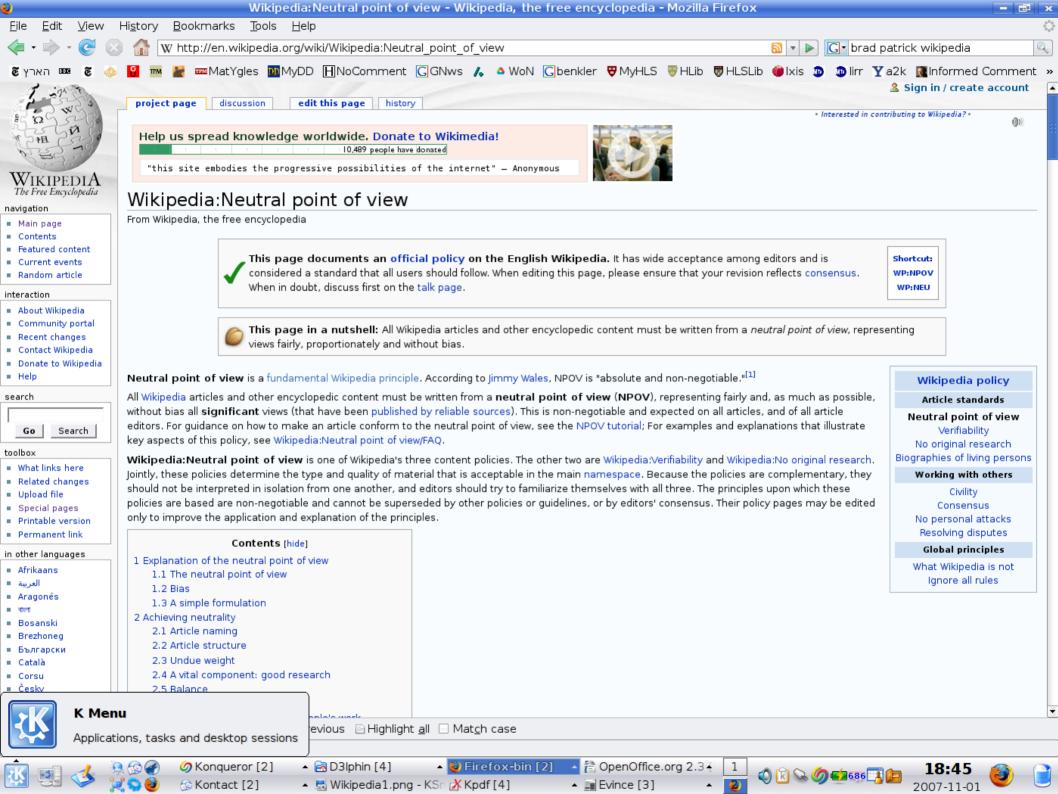
Norms

- explicit statements about what counts as cooperation allow participants to
 - coordinate on cooperative behaviour
 - identify what behaviour is cooperative and what is defection
 - reciprocate
 - characterize intentions
 - characterize what is "fair" in complex endowment/contribution contexts

Norms

Crisp/clear norms matter for purposes of assessing action. Ostrom (1991)

Self-chosen norms selected by the group Ostrom, Walker & Gardner 1993;
McDowell Gold Mines



Crowding out

Inter-system: a social cooperation system may be crowded out by a market or government system

Titmuss-Arrow debate

Taiwanese irrigation;

Deci=>Frey psychological model (intrinsic/extrinsic) social capital model

Intra-system:

discipline vs. trust

Cost of cooperation

Unlike behavioral economics, cooperation is modelled for rational actors who are not all selfish, within a beliefs, preferences, constraints model (Gintis)

In PD, payoff structure matters: the opportunity cost of cooperating affects outcome (Fehr & Camerer)

In peer production, modularization and minimal granularity, which determine minimal unit cost of contribution, matter

Common property regimes (Ostrom 1991) and scattered fields (Smith 2000)

Leadership/ Asymmetric contribution

Not in experimental literature or evolution

=> clearly not a necessary precondition to cooperation

Strong claims in some observational work, particularly online and management studies

=> Linus always invoked

Leadership/ Asymmetric contribution

Need to study; step away from hierarchical "leadership" (e.g. Maccoby & Heckscher 2006 sibling-type leadership)

Reinterpret asymmetric contribution from "free rider problem" to how unequal contribution translates into unequal participation

- => Minimal: Shirky on Free Riding Gnutella
- => Beyond: building on "Big Man" gifting?

Self-selection/entry and exit

Experimental and observational work shows easy entry and exit helps cooperation (Ostrom 1998 review)

IF there are opportunities for contribution, but not useful defection, there is self selection of cooperators

Burlando & Guala 2005 (homogeneous groups of cooperators, reciprocators, selfish act predictably)

Big IF... Where opportunities for defection by exit exist credible commitment not to exit matters (e.g., lifetime or stable employment NUMMI plant; stable supplier relations)

Self-selection/entry and exit

Depending on context, either easy exit/entry will lead to beneficial self-selection of cooperators and reciprocators, or

Mechanisms may be necessary for graduated and costly entry/exit, to improve mix of participants (Shirky 2003)

May be an externally determined design constraint, rather than a design lever

=> parent in a school district; subject of a Wikipedia entry

Freedom as practical human agency

loosely-coupled systems

change and unpredictability

Freedom as practical human agency

loosely-coupled systems designed for cooperation

change and unpredictability

=> "share nicely;" self-sacrifice => basic, pervasive cultural norms and education to support cooperative, other-regarding action

<= pushed back by "scientific policy making" from management to administration to perfect market and selfish rational actor modelling

- => diverse business and social models begin to challenge the efficiency, efficacy, growth of the products of "scientific" selfishness
- => science begins to push back on selfishness with theoretical, experimental, and observational work

=> time for design—social, business, technical, and legal—to begin to adapt, and then adopt, cooperation as a basic design approach