A Social Environment Model of Socio-technical Performance

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Abstract

This paper analyzes the nature of social performance to explain why socio-technical systems (STSs) like chat, e-markets, social networks and wikis have been so successful. It defines the social dilemma, where self-interested acts destabilize society, and then outlines how physical society has overcome it to enable synergy or non-zero-sum gains. In the social environment model free citizens seek to satisfy both social and self-interest. It is proposed they do this, by anchoring one need then handling the other. This suggests competition while the social context is satisfied, as in markets, and community service while the individual context is satisfied. The latter, as illustrated by socio-technical systems, is proposed to be a new social form, with implications for all society.

INTRODUCTION

Introduction

Social interaction is something people do every day but supporting it online has not been so easy (Fjermestad & Hiltz, 1999). For example, in e-commerce online sellers reduce costs and online buyers get more choice, yet it remains a low percentage of all trade, though rising from 2.7% in 2006 to 3.2% in the U.S. in 2007 (Scheleur, 2007). In contrast, socio-technical systems (STSs) like Wikipedia seemed initially lost causes, as they asked people to give to something with no status for no gain. Yet they have had massive growth, with Wikipedia now challenging Encyclopedia Britannica, and open source products like Open Office now alternatives to Microsoft Office. The unexpected contrast between socio-technical success and e-commerce restraint requires new theory. The *social environment model* clarifies the otherwise arcane role of society, linking social history to modern socio-technology. This paper:

1. Introduces core socio-technical concepts
2. Finds the social dilemma inherent to social systems.
3. Outlines traditional socio-physical responses.
4. Develops the social environment model from these.
5. Applies the model to cases like Enron, the credit meltdown,
6. Suggests socio-technical systems are a new social form.

The social environment model is a useful explanatory framework for a variety of complex social situations. It applies consistently at any social level, and is relevant to anyone working with complex socio-technical or socio-physical systems.

The socio-technical approach

Sociologists, who see individuals as conduits of meaning that reflect external social structures, often see psychological, biological and physical explanations as faulty reductionism of social realities. In the extreme, this replaces the determinism of biology (Wilson, 1975), or psychology (Skinner, 1948) with *social determinism*, where society writes social agendas like communism or capitalism upon individual

tabula rasae (blank slates). However, if somehow all social thoughts were erased, society would cease to exist, just as surely as if all its members vanished physically. This has led to attempts to re-attach sociology to its psychological roots, e.g. Bourdieu's "habitus" references individual percepts of the social environment, and Giddens discusses the mental frames that underlie social life (Bone, 2005).

This "top-down" sociology movement matches a "bottom-up" movement in computing, which has long seen itself as more than hardware and software (Boulding, 1956). Computing now includes human computer interaction (HCI), which uses psychological concepts like attention and usability in web applications, and organizational computing (Kuutti, 1996). As the discipline of computing becomes more social, the new computer "user" is society itself (Whitworth, 2006).

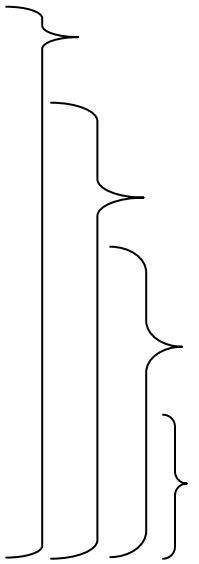
Level	Discipline	System		Combination	Examples
Community	Sociology, Politics, Business	Social		Socio-technical Systems (STS)	Culture, roles, laws sanctions
Individual	Psychology, Biology	Cognitive		Human Computer Interaction (HCI)	Attitudes, beliefs, ideas, opinions
Informational	Computer Science, Information Science	Software (S/W)		Technology (H/W & S/W)	Programs, data, bandwidth, memory
Physical	Engineering, Physics, Chemistry	Physical		Hardware (H/W)	Computer, mouse, wires, printer, keyboard

Table 1. Socio-technical levels

The socio-technical concept uses general systems theory (Bertalanffy, 1968), where one system type can *emerge* from another, as software data flows arise from hardware circuits (Whitworth 2009). Software is not hardware, although it cannot exist without hardware, e.g. to reduce software effects to hardware voltages would be like describing World War II by atomic events–both difficult and pointless. Software describes how computer systems process information more efficiently. It also offers more efficient ways to *operate* them, as software cache prediction concepts have revolutionized hardware chip design. Semantics similarly emerges from neural information exchanges (Whitworth, 2008), which justifies Web 2.0 as technology is designed to fit human meaning. Social computing suggests yet another emergent level—the community. Table 1 shows these four levels, each emerging from the previous. Physical exchanges like electricity create information, information exchanges create human meaning, and human meaning creates communities of norms, culture and identity. Each emergent level is created by those below it, and changes their significance (Whitworth 2009). Engineering, computer science, psychology and sociology are simply different system "views". The social level is the most complex, as it also contains levels: family, village, city, state, nation … A *socio-technical* system (STS) occurs when people interact via technology to create a community, as a *socio-physical* system arises when they do so physically. The social environment model applies to any social system, regardless of architecture (technical or physical).

THE SOCIAL DILEMMA

The "social dilemma" is inherent to any social system, however mediated.

Competition

In a limited resource environment, if two beetles independently seek the same food one usually wins and the other loses. Systems compete for advantage to survive. The farmer growing the food also competes with the beetles, and both compete with the bacteria that would also consume it. Limited resource environments reward more competent individuals, where competence is those properties that increase individual success and survival, e.g. strength, speed, etc. In Figure 1, *competition* for limited resources creates a need for *competence,* as individuals produce feedback from the world.

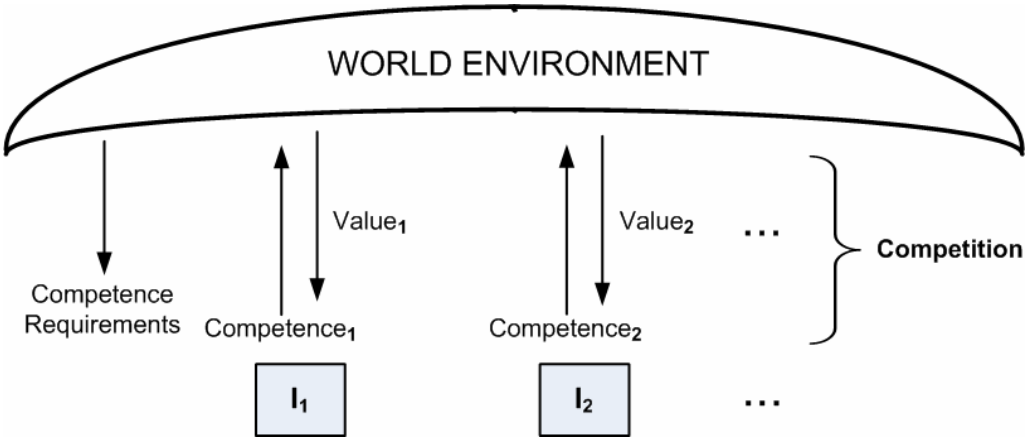


Figure 1. Individuals competing in a world environment

Homo economicus

The figure 1 model supports *homo-economicus,* an individual who does what benefits themselves, by reduced effort, increased gain, or both (Persky, 1995). Individuals seeking advantage favors the evolution of new competencies by competition. It also represents Mill's *economic man*, who seeks wealth, leisure, luxury and procreation. Adam Smith argues that such individuals in a free market also benefit society, as when people produce more so does the community (Smith, 1776/1986). They are *rational actors,* who calculate their own best interests, although people may actually use heuristics—psychologically efficient versions of rational logic (Tversky & Kahneman, 1982). The gains produced when competition drives self-interested individuals can be called *competence gains*.

That free individuals act in self-interest is a defeasible rule, which game theory describes as follows. If freely acting individuals $\{I_1, I_2 \ldots\}$ face action choices $\{a_1, a_2 \ldots\}$ with expected individual unit values outcomes $\{IU(a_1), IU(a_2), \ldots\}$, they will follow the rule:

If $IU(a_i) > IU(a_j)$ *an individual should prefer* a_i *over* a_j **<Rule 1>**

In words: *Free individuals will choose acts expected to give more value to themselves.*

The concept "value" here is deliberately left vague, so it may include any level of Table 1, e.g. psychological gains like appreciation, or social gains like reputation.

Homo sociologicus

While Rule 1 is evident in nature, social cooperation is equally common, e.g. our bodies are colonies of cells cooperating for the common good, with cancer illustrating what happens when they don't. However in the animal kingdom, only social insects like ants form massively cooperative societies as we do. They are highly successful, and the genetics that drives their behavior evolved because individuals working together can create more value than working alone (Ridley, 1996).

However for ants, the unit that competes and survives is not the individual, but the colony, e.g. soldier ants die protecting the colony, as without it they cannot survive anyway. In this model, individuals combine into a community that "performs", in evolutionary terms, based on the sum of the actions of its individual members (Figure 2). Hence biologists now argue for *multi-level selection*—evolutionary selection for groups as well as individuals (Wilson & Sober, 1994). Social cooperation changes the evolutionary reward rule—individuals still act but the acts selected are those that create value for the community. That socialized individuals can act for community value suggests a defeasible social alternative to game theory's Rule 1. In general, if a social unit S of { I_1, I_2 …} individuals faces social action choices {a_1, a_2 …} with expected social unit values of {$SU(a_1)$, $SU(a_2)$, …}, then:

If $SU(a_i) > SU(a_j)$ *then prefer* a_i *over* a_j **<Rule 2>**

In words:

Socialized individuals will choose social acts expected to give more value to the community.

Social acts reference the social unit not the individual, e.g. "defend society" is a social act that is independent of individual state. Social "castes" can be dedicated to social acts, like worker or soldier, as ants do. Value outcomes are calculated for the group as a whole, not the individual. This allows for social evolution, where for ants natural selection would "calculate" the social gain. The same can apply to human sociality, if one accepts arguments for *homo sociologicus,* individuals who prefer acts that benefit the community (Bone, 2005). This includes Marx's *communist man*, who politically seeks common acts that benefit the society. A psychology basis is Social Identity Theory (Hogg, 1990), which argues that groups form when members share a common "identity". If one attacks *one* member of such a group, *all* group members feel attacked and respond accordingly. Indeed most country's defense forces work by this rule, as servicemen and women are expected to give their lives for society. Unfortunately while in Figure 1 the individual is accountable for their own consequences, in Figure 2 society is accountable but the individual need not be.

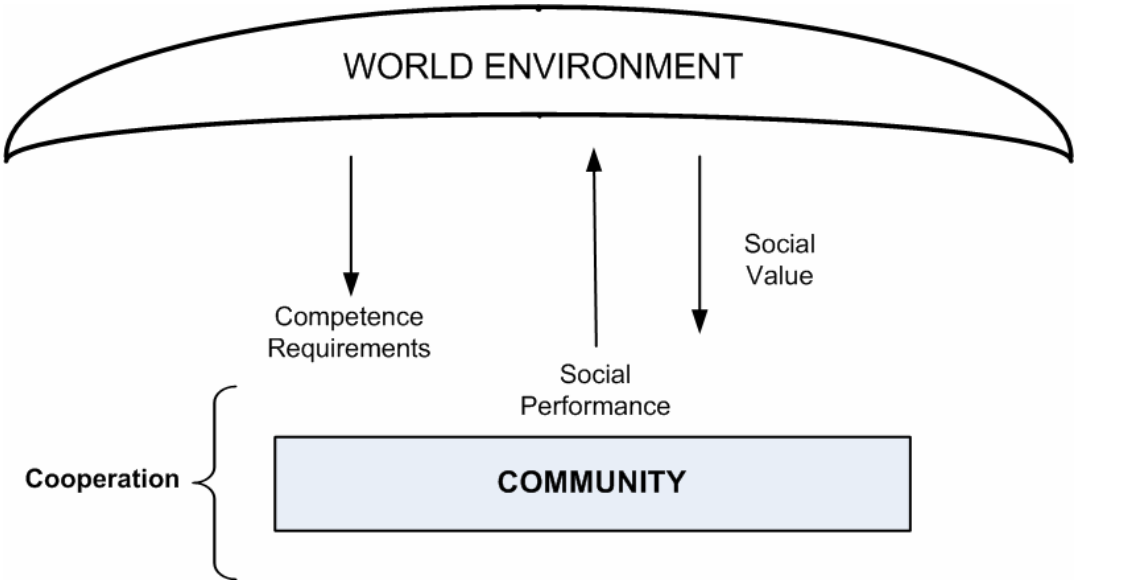


Figure 2. A community cooperating in a world environment

How these rules interact to create social dilemmas is now explored.

The prisoner's dilemma

Game theory, the systematic study of rational choices in interdependent interactions, underlies many other economic, political and group decision theories. It usefully presents the essentials of social situations for analysis. In the classic "Prisoner's Dilemma" tale two prisoners (Bill and Bob) face two year jail terms on circumstantial evidence for a crime they *did* commit. Each is separately offered a plea bargain, to testify against the other. If the other does not testify he walks free, even though his partner gets seven years jail. If both testify, both get six years (one off for testifying). In outcome utility terms the options are:

1. Bill and Bob stay silent, and each gets two years in jail.
2. Bill confesses for immunity, and Bob gets seven years.
3. Bob confesses for immunity, and Bill gets seven years.
4. Bill and Bob both confess, and both get six years jail.

Table 2 shows these outcomes as free years out of seven. If both cooperate, both get five free years, but if both defect they only get one free year. The *temptation* is for one to "defect" to get seven free years while the other cooperating "sucker" gets none.

Table 2. Prisoner's dilemma—Individual outcomes

Years free (Bill/Bob)		*Bob*	
		Cooperate	*Defect*
Bill	*Cooperate*	5/5	0/7
	Defect	7/0	1/1

Working as individuals each prisoner concludes:

- Whether the other cooperates or defects doesn't depend on my choice.
- If he defects, it pays me to defect, as then I get 1 rather than 0.
- If he cooperates, it still pays me to defect, as then I get 7 rather than 5.

Hence it always pays individuals to defect. Using Rule 1, expected individual outcomes for cooperating range from 0-5, averaging 2.5, and for defecting range from 1-7, averaging 4, so defect is chosen. If both parties follow this logic, defect/defect is the *equilibrium state*. Strangely, both individuals maximizing their profit creates the worst possible result for both.

Working as a social unit gives a different result. The social acts *for the pair* are mutual cooperation and mutual defection, with expected gains of 10 and 2 respectively (Table 3). Clearly cooperation is the preferred social act. If both parties follow this social logic, mutual cooperation is the *equilibrium state*. Indeed if social cohesion visibly increases returns, simulated agents in a prisoners dilemma situation evolve to a cooperative equilibrium (Dayton-Johnson, 2003).

While Rule 2 generates 10 free years value, Rule 1 gives only 2 free years. Traditional game theory *assumes* payoffs are calculated for individuals, but it is just as valid to calculate payoffs for the social unit as a whole (Table 3). Rule 2 is simply Rule 1 applied to social instead of individual units, so is just as logical. It is a mistake to view all alternatives to individual self-interest as by definition "irrational",

especially if what one *defines* as "self" can change (Persky, 1995). Both rules are pragmatically grounded in value outcomes, and both are equally "rational".

Table 3. Prisoner's dilemma—Social outcomes

Years free (Pair)		*Social Outcome*
Social Act	*Cooperate*	10
	Defect	2

The tragedy of the commons

The "tragedy of the commons" (Hardin, 1968) extends these concepts to the many participant case. In it, some farmers live by a common grass area, each with cows and a plot of land. If a farmer's herd also grazes the common area it grows fat, but if over 50% of farmers do so, the commons is overgrazed and dies off. This parallels many forest and river conservation problems.

Working as individuals each farmer's logic is:

- My actions are independent of those of the other farmers.
- If ≤ 50% graze it pays me to graze, as I get more value.
- If > 50% graze, it still pays me to graze, as I get more value initially.

It always pays the farmer to graze. Take a hypothetical case where 100 farmers each get a ton of beef per month grazing their own plots, and three more tons grazing the commons, which becomes barren in three months if over 50% of farmers graze it. Table 4 shows farmer outcomes by choice for 10 months. Using Rule 1, the average graze benefit is 28, while the average not-graze benefit is 10, so graze is preferred. Destroying the commons is the equilibrium point.

Table 4. Tragedy of the commons—Farmer outcomes (10 months)

Outcome		*Others*	
		49% graze	*Over 49% graze*
Farmer	*Don't graze*	10	10
	Graze	40	16

Working as a social unit, produces different outcomes. The social acts *for the village* are to overgraze the commons or not. Table 5 shows outcomes for the village as a whole. By Rule 2 the expected overgraze average is 1,6000, but the expected not-overgraze average is 2,500, so the choice is to not-overgraze. Socialized individuals following Rule 2 will not destroy the commons because it is a valuable community resource.

Table 5. Tragedy of the commons—Village outcomes (10 months)

Farmer Outcome		*Social Outcome*
Social Act	*Not overgraze*	2,500
	Overgraze	1,600

The social dilemma

Social dilemmas like the prisoner's dilemma and the tragedy of the commons are general problems in social interaction (Diekmann, 2001), e.g. in the volunteer dilemma a group needs volunteers to prosper but it pays individuals to let others do it, so the group collapses. Social dilemmas arise *when Rule 1 contradicts Rule 2*, i.e. when what is good for the individual harms group synergy.

Synergy is the difference between the total what individuals can produce as a social unit compared to what they can produce independently. Trade illustrates a positive synergy, and internal conflict a negative synergy. If synergy is positive, it pays individuals to join a social unit, while if it is negative they are better off alone, so individuals tend to leave websites plagued by conflicts.

Synergy is a property of the social interaction, not of the individuals in a society. In the prisoner's dilemma, the synergy is the loyal friendship total (10) less the defect total (2), i.e. 8 years. In the tragedy of the commons, the synergy is the cooperative total (2,500) less the competitive total (1,600), i.e. 900 tons. The social dilemma is that self-interested individuals following Rule 1 minimize synergy.

When individuals compete, the gains an individual receive can generally be attributed to its own acts. However in social situations, individuals gains increasingly attribute to synergistic acts of others. Game theory differentiates between zero-sum and non-zero-sum games. In zero-sum games, like poker, my loss is your gain, so I benefit at your expense. However in non-zero-sum games, as social dilemmas are, synergy effects occur. In zero-sum games shrinking other's slices of the reward "pie" increases one's own, but in non-zero-sum games, everyone shrinking what other's get just reduces the reward pie for all, as occurs in "dog eat dog" societies. Conversely, socialized individuals can increase the shared pie for all, making every slice larger. While "non-zero-sumness" is an unpleasant term, the argument that increasing everyone's gain underlies the prosperity of modern civilization is strong (Wright, 2001).

Modern research illustrates the benefits of synergy. Take a hypothetical case of 100 knowledge breakthroughs of equal value. Researchers following a *zero-sum model,* as private companies do, keep their research secret, lest others gain. If your gain is my loss, why let competitors benefit from my work? In contrast researchers following a *non-zero sum* model, as most academics do, give their research freely to all. In the first case, total knowledge increases by 100 units, but in the second case, it increases by 1000 units, as each researcher gets 100 new ideas. Open research give a hundred-fold knowledge synergy gain over keeping research secret. If scientists of history had kept their research secret, modern science and its benefits may not have occurred.

Social Instability

Anti-social acts, like stealing, "short-circuit" the link between social acts and synergy gains. If individuals with *instincts* for individual gain (Rule 1) are *socialized* to create synergy (Rule 2), sooner or later one will defect for personal gain. Since this reduces the benefits of others, it increases the

pressure on them to defect. If a second person then also defects, this further pressures the remainder to defect too. Hence a few defections can cause a social chain reaction that collapses the social system. Indeed a common reason given for cheating others is that "everyone else is doing it" (Callahan, 2004). Yet if crime "succeeds", the benefits it feeds on disappear, like a parasite that kills its host.

Every synergy has a defection, e.g. in trade, if sellers defect by false claims, shoddy products or bad warranties, then customers don't buy. Buyers can also defect, e.g. buy an expensive ball gown, wear it to a ball, and then falsely request a refund saying it did not fit. If customers do that sellers will refuse refunds (also defect), even though refunds benefit both seller (more sales) and buyer (less risk). In all such cases, the end point is mutual defection. Mutual synergy, despite its manifest benefits, seems inherently *unstable* for self-interested individuals. Sooner or later, like a ball balanced on a hill, a disturbance will roll it permanently down into the valley of mutual defection.

Unfortunately, *individuals alone cannot solve social dilemmas*, e.g. in the prisoner's dilemma, one person cooperating is just a "sucker". In the tragedy of the commons, one person not grazing just loses out and the commons is destroyed anyway. The choices for individuals in social dilemmas seem all bad. The path to social synergy has on both sides the cliffs of defection, yet after thousands of years humanity has stabilized massive non-zero-sum synergies like global trade. How have we, alone among mammals, crossed the *zero-sum barrier* into the lush valley of mass social synergy (Wright, 2001)?

THE ZERO-SUM BARRIER

Fortunately the homo economicus model of people, as rational individual benefit maximizers, is not what people actually do, as people in prisoner's dilemma games are more cooperative than game theory predicts (Poundstone, 1992). The conclusion that social cooperation is irrational to evolutionary self-interest (von Neumann & Morgenstern, 1944) was like physicists concluding that bumblebees cannot fly, when in fact they do. While logic found socialization "irrational", simulations suggested otherwise. Axelrod invited programs for a simulated "survival of the fittest" online social interaction "tournament", to see which survived. He found that none of the eight most successful programs initiated defection (Axelrod, 1984). While nasty programs succeeded at first, in time they ran out of victims and met only other nasties, while cooperative programs found allies and prospered. Social instincts imply what individual rationality does not: that *cooperation works*.

Social order

Rule 2 suggests that *social dilemmas can be solved if people form a higher social unit.* If the commons farmers form a village they can institute a cooperative grazing roster to preserve it. While game theory generally ignores games allowing social agreements, they are critical to solving social dilemmas (Aumann, 1998).

Social order is the degree individuals follow common social rules. In perfect social order everyone is of "one mind", like an ordered crystal whose constituent atoms all move as one. Social anarchy is like a gas whose atoms all move according to individual exigencies. Cheating represents social disorder because cheated parties rarely expect to be cheated, i.e. it is behavioral uncertainty. If a whole community acts as one (social order), whether by following religion, culture or laws, then there is no Rule 1, just Rule 2, and the social dilemma disappears, e.g. a village that gets tourist income from a common game reserve can try to stop "poaching"—individuals killing the animals for personal gain—by physical barriers like fences, but whatever barriers people throw up, others can overcome. However if the community declares the land sacred or poaching illegal, offenders who defy the gods or state make themselves an enemy of society, and can expect its punishment or banishment.

However enforcing order is blunt social instrument, that creates social synergy by making its members effectively "ants", and so like ants they become all much the same, i.e. it denies individual

diversity and hence individual evolution. A society that "socializes" citizens to follow Rule 2 engages social evolution and synergy, but if this simultaneously disengages individual evolution, its members may become weak. This struggle, between social and individual evolution, may underlie historical swings between the rise of sophisticated civilizations and their fall by the invasion of more vigorous barbarians. Social performance, in this view, requires both individual diversity and social order. Also, the central control structures of social order can invite social hijack.

Social hijack

In social hijack individuals take control of a community for their own ends, just as a virus can hijack a biological organism to serve its own purposes. Plato's ideal leader was a benevolent dictator, who enforced social order to create synergy, then justly returned the gains of society to its citizens. This both enforced social synergy and rewarded individuals contributing to it. However the worst of leaders are also dictators, who use society's performance for their own luxury or power. They maintain control by *repressing* individuality by police state tactics, and *indoctrinating* the blind service of society, by media propaganda. This coercion makes dictatorships:

1. *Unstable.* If those who create social wealth gain nothing from it, they have as Marx notes, "nothing to lose but their chains". A privileged aristocracy living in luxury while the workers who create that luxury starve invites a grass-roots revolution.
2. *Impermanent.* Kings, emperors, pharaohs, khans and other dictators eventually die, leaving a power vacuum that can cause civil wars. Royal bloodline dynasties avoid this, but inevitably over time produce incompetent or even insane offspring, who collapse the society.
3. *Unproductive.* If social coercion succeeds the society blindly follows the whims of leader(s) isolated from world realities, instead of the demands of the world, resulting in poverty.

Societies with absolute rulers like Burma and North Korea become poor when their rulers replace natural productivity requirements with their personal agendas. For example, in Zimbabwe Mugabe addressed social inequity by driving white farmers off productive farms, but then gave them to cronies who looted but did not plant, grow or harvest. Equity without productivity turned Zimbabwe from the bread-basket of Africa into the basket-case of Africa.

Social hijack is an evolutionary dead-end, changed only by the leader's death or social collapse, or both. To prosper a society needs both individual competence and social synergy. Synergy is like interest paid on the capital of competence—if there is no capital there is no interest either. Synergies from enforced social order (Rule 2) can add to the competence gains produced by natural competition (Rule 1), but cannot displace them. Yet neither is Rule 1 alone sufficient as it ignores synergy, e.g. most now reject the Social Darwinist argument that since nature weeds out the weak, so should society, i.e. that Rule 1 alone suffices. Society needs ways to combine individual freedom and social order to increase social performance.

Social inventions

Periodically society discovers new social forms to increase social performance. *Justice*—punishing unfairness—is one way society has discovered to combine order and freedom. Unfairness is here not merely inequity—the unequal distribution of outcomes—but *not distributing outcomes according to contribution,* e.g. that fit adults idly live off society while others work to support them is considered by most to be unfair. Justice addresses the problem that forming a social unit disconnects individual accountability. Studies suggest people have a natural justice perception, of whether value gained matches contribution made, and tend to avoid unfair situations (Adams, 1965). That people even prefer fairness to personal benefit (Lind & Tyler, 1988) suggests they prefer situations where Rule 2 works.

In contrast, chimpanzees are simple outcome maximizers, following Rule 1 entirely (Jensen, Call, & Tomasello, 2007).

Selfish individuals make society unstable but justice changes the dynamic by punishing unfair acts. If individuals seek revenge on those who 'wronged' them or their family, cheating is less profitable over time, as today's defection is paid back with interest tomorrow. If a society can make unfair interactions a bad choice, selfish people will prefer mutual synergy to mutual conflict, i.e. justice aligns individual and social good. Unfortunately in "eye for an eye" cultures one revenge act creates another, giving endless vendetta cycles, as in the Middle East.

Revenge is a primitive form of justice, but rather than individuals administering justice themselves, it is better for the social group to do so, by punishing defectors using impersonal laws. The case has been made that our entire justice system of police, laws, courts and prisons aims to do precisely this - *deny unfairness* (Rawls, 2001). State justice allows a society to synergize selfish individuals.

State justice gains are calculated at the social level not the individual level, e.g. depression reduces individual productivity but no laws deny it as it affects people not communities. Conversely, if someone steals $100 and is caught penniless, a court may still sentence them to a year in jail. Yet if police, trial, and incarceration costs are over $100,000, and the robbed get no return, where is the value? If everyone loses, why waste money prosecuting? The error here is to take an individual perspective to a social function. From a community perspective $100,000 is not much to pay for social order. Prosecuting defectors is about *changing social interaction contingencies,* not about individual profit or loss. The 1980 clean up of New York crime changed the entire social environment, from one where shootings were common to one where it was safe to walk the streets. The increased productivity of an entire city was worth it.

Democracy, like justice, is another social "invention" (Mandelbaum, 2002), to reduce social hijack. If a community selects leaders by vote, the power to control the community ultimately invests in the community itself. Democracies also have constitutions limiting terms of office. A dictatorship has a "centre" to hijack, but a democracy that distributes power among the people does not. This is better than trusting central elites, however benevolent. It enables anarchy free transitions of power, and avoids dynastic incompetence. Given a human history of bloody power struggles, it is always amazing to watch a democratic government voted out of office peacefully hand over its power to a successor.

Democracies combine individual freedom, social order and resistance to hijack. They produce more because free people contribute more work, more ideas and more research, and they also self-regulate more, reducing security costs (Tyler, 1999). The allied democracies overcame the Axis dictatorships in World War II by producing more, not by being more right. Democratic U.N. nations have increased over time again not because democracy is "nice", but because it is productive.

The golden rules

The golden rule: "*Do unto others as you would they do unto you*" has been expressed in many ways at different times and in different cultures:

1. Rabbi Hillel's sum of all rules: "*If you don't like it done to you, don't do it to others*".
2. Kant's proposal: "*Act only on that maxim by which you can at the same time will that it become a universal law*", i.e. *if everyone does it, is it still successful?*
3. Pareto's optimality principle: "*Good actions benefit at least one other and do no harm*."
4. Rawl's "*veil of ignorance*" requires state justice to be "blind" to individual needs.
5. Harsanyi's approach rules out immoral or anti-social acts from consideration (Harsanyi, 1988).

These and other forms suggest a solid universal social principle equally applicable to information technology (Siponen & Vartiainen, 2002). Anti-social acts fail all golden rule tests, e.g. Hillel rejects stealing as one does not wish to be stolen from, Kant finds it wrong as if everyone does it, it doesn't work, and Pareto finds it harms another. Rawls from behind his veil of ignorance cannot advocate it without knowing who is stealing from who, and Harsanyi finds stealing an anti-social act. Rule 3 rejects stealing because it is overall a social loss, given disruptive losses, like renewing credit cards when a wallet is stolen.

All golden rules sit above the individual economics of game theory. Kant distinguished his "categorical" imperative from "hypothetical" ones, i.e. the rule is *not* "Do unto others *so* they will do likewise unto you". Such "deals" are merely *instruments* to individual benefit. Kant's imperative in contrast is *categorically* "the right thing to do", regardless of the outcome for oneself. Golden rules ask free individuals to act in terms of something higher than themselves. Asking people to hypothetically "flip" the interaction outcome equation, to see if it still works for them the other way, asks individuals to equate themselves with others. It asks the individual to look from the perspective the society as a whole, as in Rule 2. This is not just "nice", it is also logical and productive. It is logical because Rule 2 is just Rule 1 applied to the social instead of individual unit. It is productive because community synergy benefits, like sunshine, flow down to all. Ethics, in this view, is simply pragmatics at a social level. In our social history, the ship of human society has navigated a middle way between the social rocks of pure self-interest and pure community-interest.

A SOCIAL ENVIRONMENT MODEL

Individuals in Figure 1 compete in the world, and in Figure 2 form a unified society, which combined makes society an *environment within an environment* (Figure 3).

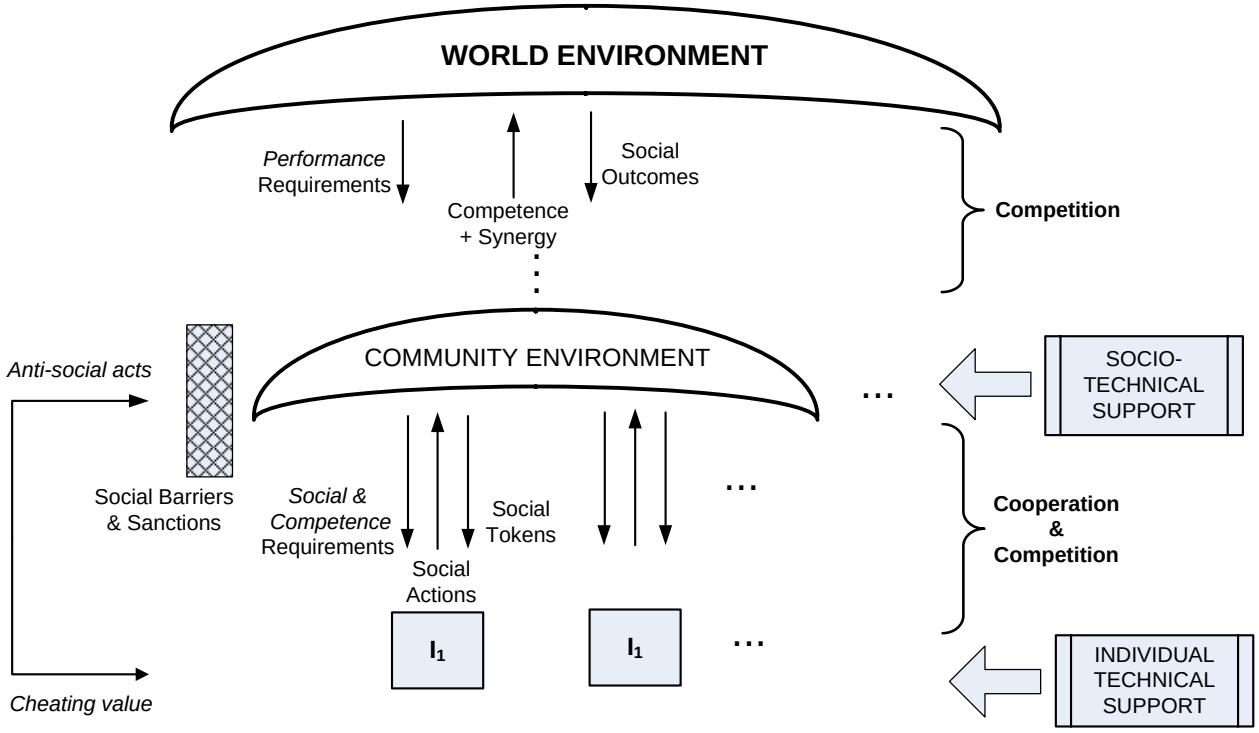


Figure 3. Social environment model

The social environment

A social system is an "environment" to its members, as it imposes requirements on them (laws and norms), and dispenses gains and losses (salaries and taxes). The role of the social system is to create synergy—more value for all. It distributes social *tokens,* like money, which can be exchanged for world value, like food. A social system within a world environment can fail by incompetence, as a wasteful company going bankrupt. It can also fail to create synergy by allowing crime or conflict, causing instability or internal revolution. As Figure 3 shows, people in a society operate under two distinct environments, one rewarding them for competing, and the other rewarding them for cooperating. This suggests that *citizens* follow a hybrid of Rules 1 and 2.

Table 7 cross-tabulates individual by community outcomes. This categorizes not just social but also biological behavior, as the first row choices are symbiosis, commensalism and predation respectively. Rule 1 directs the individual to choose the first *row*, and Rule 2 directs the individual to choose the first *column.* The question is how to optimally combine them in a way that is also cognitively feasible. The utilitarian ideal of "*the greatest good for the greatest number,*" popularized by Dr Spock's Star Trek sacrifice, simply gives Rule 2 precedence. However what is the "greatest good" across a society of millions? For individuals who view from an individual perspective, such rules are difficult to apply.

A simple AND of Rules 1 and 2 is feasible but not optimal, as people would then only act to benefit *both* themselves and society. Another option is some sort of weighted trade of social utility against individual utility, which raises complex questions like how much social good is worth my individual loss, and how much individual good warrants a social loss? It is proposed that people resolve such cases by cognitive *anchoring*, fixing one rule then applying the other (Tversky & Kahneman, 1974), as follows:

If $\{SU(a_i) \geq SU(a_j)$ *and* $IU(a_i) > IU(a_j)\}$ *then prefer* a_i *to* a_j **<Rule 3a>**

OR

If $\{IU(a_i) \geq IU(a_j)$ *and* $SU(a_i) > SU(a_j)\}$ *then prefer* a_i *to* a_j **<Rule 3b>**

In words:

Choose acts that:

a. Don't harm society significantly but benefit oneself

OR

b. Don't harm oneself significantly but benefit society

Following the first part (3a), individuals will seek opportunity provided they don't harm society, which society itself defines by its own good conduct laws, i.e. one competes by the rules. Following the second part (3b), individuals help others in society (service), provided it is not too much trouble. Again, it is usually clear what helps others, and whether one is able to easily do it. This *free-good-citizen rule* is easier to apply than calculating the greatest good for the greatest number. Applied to Table 6, Rule 3 produces the options *synergy, opportunity and service*. While some are self-interested criminals, and some accept kamikaze sacrifice, most are free-good-citizens, who espouse neither crime nor altruism. As citizens, they try to get ahead while not disobeying laws, and help others when free to do so. If the majority followed Rule 1, crime would prevail and society would collapse, while if the majority followed Rule 2, we would still be under kings and pharaohs. Our social evolution seems based upon the pragmatic combination of free individualists and socialized cooperative into free, good citizens.

Table 6. Individual choices by self and community outcomes

		COMMUNITY		
		Gain	*Minor effect*	*Loss*
S E L F	*Gain*	Synergy	Opportunity	Anti-social
	Minor effect	Service	Null	Malice
	Loss	Sacrifice	Self-harm	Conflict

Social merging

In the well known political conflict of capitalism and communism, free competitive value (Rule 1) is presumed the opposite of social value (Rule 2). However in the social environment model they do not conflict, as one applies to the individual and the other to the community. Indeed they need to combine, as a community that produces little but shares it fairly is little better than one that produces a lot but shares it unfairly. Better than wealthy inequality or poor equality is *wealthy equality*.

Adam Smith linked individual and public good, by suggesting the "invisible hand" of individuals in a market maximizing profits also guides the group to greater value (Smith, 1776/1986). The social environment model accepts this, as competence is a world requirement that all societies must transmit. Yet Smith's argument *for* competition is not an argument *against* cooperation. Just as competitive sport imposes fairness by referees and penalties, so "free" markets require common good rules, e.g. the Stock Market punishes insider trading. Like playing fields, competitive environments work best when "level" to the players. Hence economic sociologists like Granovetter argue that individual economics is always embedded in a larger social context outside any competitive framework (Granovetter, 1985).

In the social environment model, Smith's link also works the opposite way, as community infrastructures benefit competing individuals by supporting social synergy. Rule 3 replaces the *capitalist* view of society as self-interested individuals, and the *communist* view of society as ant-like cooperatives, with *free good citizens,* who help both themselves and society. This is neither pure capitalism (Rule 1) nor pure communism (Rule 2), but a hybrid. If pure communist societies have lower productivity, and pure capitalist societies have lower socialization, then a hybrid of competence and synergy will perform better socially. If communist countries move to "communism with a business face", and capitalist countries move to "public good capitalism", both will meet in the middle. In this model, social performance improves when the "invisible hand" of market competition works together with the "visible hand" of public good.

Levels of virtue

The vertical ellipsis in Figure 3 indicates a social environment can contain another, e.g. a worker in a company in a stock market. The company is a social group to its members, and also a member of the stock market social group. Both social systems add value and share it with members. Companies reward employees with pay, and stock markets reward companies with share prices that increase public investment. Equally both environments place requirements on members, as companies ask employees not to steal their value, and stock markets ask companies not to steal their value (by falsely reporting profits). Rule 3 then can apply at more than one social level, and be "universalized" to the multi-environment case where S_1 contains $S_{2\ ...}$:

If $\{\{SU_1(a_i) \geq SU_1(a_j)$ *or* $SU_2(a_i) \geq SU_2(a_j) \ldots\}$ *and* $IU(a_i) > IU(a_j)\}$ *then prefer* a_i *to* a_j **<Rule 4a>**

OR

If $\{ IU(a_i) \geq IU(a_j)$ *and* $\{S_1U(a_i) > S_1U(a_j)$ *or* $(S_2U(a_i) > S_2U(a_j)...\}\}$ *then prefer* a_i *to* a_j **<Rule 4b>**

In words:

Choose acts that don't significantly harm higher environments but benefit oneself

OR

Don't significantly harm oneself but benefit higher environments

The Enron debacle, with estimated losses of over $60 billion, occurred when Enron executives cheated the stock market by reporting false profits to raise their stock price. Other companies laid off staff to "compete" with imaginary profits of over 80%. Within the stock market social system, Enron defected on the rule by which the stock market creates synergy, as if everyone made false claims, no one would invest. If false reporting were not illegal before Enron it would have to be made so, for the stock market to survive. The stock market had to act against Enron or collapse itself.

If business did operate by a purely competitive model (Rule 1), then Enron's innovative methods of obtaining value in the stock market environment would be a competitive advantage, as would be their paying zero U.S. tax for seven years. However the business maxim "Greed is good" does not apply to defecting on a social contract. Cheating one's colleagues is not "competitive advantage", as on the bottom line, such acts lose value for society. Enron hypocritically asked its workers to serve the company, but did not itself serve its social environment, the stock market. Gangs like the Mafia have a similar hypocrisy, demanding loyalty and service internally, while themselves pillaging society.

Wildlife poaching in Africa illustrates social levels. It is a classic tragedy of the commons situation, yet public ownership has generally been a disaster for conservation in third world countries (Ridley, 1996). Under nationalization, the government could not stop locals poaching the large animals that damaged their crops. The trend was only reversed when wild-life titles were "privatized" to local communities, like the Campfire program of Zimbabwe, where hunters purchase the right to kill game from local villages (Ridley, 1996 p236). When the village owned the animals, it looked after its resources, prevented members poaching, and wildlife numbers increased. By contrast, whales roam international oceans not owned by any country, so there is every danger we will hunt them to extinction. If a global humanity owned the whales, it would be as foolish to hunt them to extinction as for a farmer to kill all the cows in his herd.

Rule 4 can be idealized to define categorically good acts as those that give value "all the way up", not just for oneself, but for the community, for humanity, and even the planet we live upon. The principle that there are levels of "good" was made clear in the Nuremburg trials—where citizens following national laws were convicted of "crimes against humanity", i.e. held to a higher standard of right and wrong.

If social environments are within a world environment, is then the highest good to serve the world? Is this not Rule 1, which also satisfies the world? No, as in Rule 1 one satisfies oneself by meeting the world's requirements—but what the world needs and what individuals need remain separate. Individuals following Rule 1 seek their own gain, not the gain of their environment, although this may occur, as the world as a whole also evolves. Is then the highest good simply Rule 2 extended, doing what is best at the highest level? However for individuals to genuinely see what is in the interests of a nation, of humanity, or even the planet, unclouded by personal needs, is difficult. Another problem is that one must survive lower environment demands to serve higher ones. Perhaps the pragmatic ideal is to serve the needs of highest environment one can conceive, while surviving the demands of lower ones.

Social health

Social synergy advances are only possible if social health increases. If "social capital" is the *"... norms and networks facilitating collective action for mutual benefits*" (Woolcock, 1998), then social

health is how successful those norms and networks are. Unlike ants, people must learn to socialize, e.g. with young soccer players a "cloud" of players trails the ball, as each individual tries to score a goal. Inevitably, they obstruct each other and the results are poor. Only with training do players learn positions like forward or fullback, and social acts like passing the ball. While soccer competence still counts, soccer teams need to cooperate to succeed.

Just as one rates individual competence by testing what they can do, so one can rate community synergy by testing what it can do. In particular, to what degree will a community of free individuals support social synergy? For example, if a group offers cheap coffee on an "honesty" system, where each person leaves 25¢ per cup, what percentage cheat, and take the coffee but leave no money? If everyone defects and takes the coffee for free, the synergy (and coffee) fails. Conversely if everyone contributes, people continue to get cheap coffee. A business example is the coffee self-service model, where customers help themselves to coffee, milk and sugar. This increases serving speeds, as servers need only give customers a cup, and drastically reduces lines. However if social health is low, individuals loot the offered resources, so beverage resources must be kept behind the counter, for servers to apply, making customer lines longer. Similarly, the social invention of super-markets required a degree of a social health. Traditional shopkeepers kept goods behind the counter to prevent theft. Only when most customers didn't steal could goods be put out on shelves for customer self-help, improving efficiency enormously. Social health—*percentage who defect on social synergy*—affects social performance.

The combination of social and economic health is important to any community, as social systems in a world environment they may be subject to natural selection, as individuals are. Given open borders, capable people will flow into societies that offer members more value, increasing their prosperity and size. A physical barrier like the Berlin Wall can prevent such flows, but its physical and political cost may not be sustainable. Social systems, like individuals, can thus fail if they do not perform, with the Soviet Union's collapse an example (Diamond, 2005). Social systems must generate competence and synergy from their citizens over time to survive and prosper.

Social inflation and rectification

A social environment cannot insulate its members from the demands of *its* environment, and the demands of outer environments ultimately "cascade" over inner ones. Social environments that ignore the demands of *their* environment experience *social inflation*, where the value of tokens distributed to members loses external value. Monetary inflation illustrates social inflation, as money (a social token) loses value relative to external standards (like a loaf of bread). Grade inflation occurs when professors give all students A's regardless of competence, and the token "A grade" loses value in the University's environment, e.g. with employers. Internally giving high grades seems to benefit everyone, as grading is easier, students are happier, and high pass rates attract more students. Yet externally it gives no value, so is unsustainable. While crime and corruption contradict society's requirements, social inflation contradicts the requirements of its environment. It can build gradually, like a choir slowly going off-key together, but can end suddenly, in the failure of the entire social unit.

In social inflation the social unit as a whole goes against its environment. Unless there is an internal rectification, eventually there must be an *external rectification*. World events like the great depression and the world wars illustrate rectifications, and the current credit meltdown shows the principles. This world gives gains at the cost of risk, but banks and credit companies began offering loans almost regardless of risk. Internally this seemed to benefit everyone—lenders got more interest, lendees got needed money and bank popularity increased. As some banks increased lending, others followed suit to keep in the market. However, when companies could not recover their loans, bad debt decreased the "share" token's value. The expected result of letting this external rectification "run its course" is the collapse of the global credit system, followed by depression or war. Knowing this, the US and other

governments stepped in with billion dollar bailouts, but without an accompanying internal rectification, this only delays the inevitable external rectification.

Fiascoes like the credit crunch and Enron illustrate how the social environment model can clarify. When Wall St's credit froze up, by its own errors of judgment, Main St stepped in to pay the $700 billion heating bill, quoting the public good. When the naughty boys at Enron, playing with the matches of cheating, nearly burnt down their market house, the state again stepped in, again for the public good. However public good is important all the time, not just when there are problems. And if in times of trouble the nation must pay the piper, then it should also be able to call the tune. In the case of corporations cheating, this means implementing fair-play public-good rules, like rules of honest financial disclosure, or that no company can pay zero tax. In the case of banks giving unrealistic credit to increase profit, the bailout should be contingent upon accepting global rules that combat credit inflation.

It is interesting that when businesses leaders cheat society of billions they are removed, but when they lose even more by risk management incompetence, they are not. In the current social system, the same people who engineered the credit collapse can still draw bonuses based on their business "skills". Yet just as Enron was a higher level of unethicality, so the credit collapse is a higher level of incompetence. In the social environment model, competence gains and synergy gains are both equally important to social performance. While society need not *punish* bank leaders for negligent risk management, it should remove them for the same reason it removes criminals—the good of society. A society that fails to act in its own interests invites its own collapse.

Legitimacy

Traditional society devotes considerable resources to denying anti-social acts: police, prison, court and legal systems all support synergy by punishing the anti-social acts that degrade it. Yet if the goal is synergy, why not seek it positively rather than negatively? Human "rights" are positive social goals that support *legitimate interaction,* defined as *fairness plus common good* (Whitworth & deMoor, 2003), e.g. freedom—that individuals own themselves—is legitimate as it is both fair to individuals and productive for society. Fairness, as earlier noted, is the antithesis of cheating, but legitimacy is not just fairness. Duels are fair but still outlawed as they harm society by killing its members. In sociology, the term legitimate applies to governments that are well justified, and not just based on coercion (Outhwaite, 1994). It is a political concept of social "rightness" beyond mere power or legality (Barker, 1990), e.g. Mill talks of the *"...limits of power that can be legitimately exercised by society over the individual.*" (p. 302) (Somerville & Santoni, 1963), Jefferson writes that: *"... the mass of mankind has not been born with saddles on their backs, nor a favored few booted and spurred, ready to ride them legitimately ...*" (p. 246) (Somerville & Santoni, 1963), and Fukuyama argues that communities ignore legitimacy at their peril (Fukuyama, 1992).

If our social past sought largely to deny individual self-interest, the present seems more positively focused on enabling legitimate rights. There has been a change in the social lens, from citizens as selfish individuals to be controlled and repressed, to citizens as socialized participants, whose kindliness needs only to be kindled. Modern socio-technology implements the second world view.

FREE GOOD CITIZEN SYSTEMS

Socio-technology

While traditional technology like word processing supports individual competence, socio-technical systems support some sort of community synergy and have defenses against anti-social defection (Table 7). If users just followed Rule 1, such systems would not succeed, as why give knowledge to others for no self gain? Conversely, if people just followed Rule 2, these systems would not defend

against anti-social defections, as they do. As shown, socio-technical systems both engage community synergy and put up anti-social defenses.

Table 7. Socio-technical synergies and defections

Aim	Examples	Synergy	Defection
Communicate	Email, Chat, ListServ, IM	*Shared communication*: People send messages they otherwise would not	*Spam*: Spammers waste others time, giving spam filters.
Learn	WebCT Moodle Blackboard,	*Shared learning*: Students help others learn, reduce teacher bottlenecks	*Plagiarism*: Students copy other student's work, giving systems like Turnitin.com.
Knowledge	Wikipedia, Tiddlywiki	*Shared knowledge*: Taps knowledge of the group, not just a few "experts"	*Trolls*: Wikipedia's monitors and rights fight "trolls" who damage knowledge.
Friends	Facebook, Myspace	*Relationships*: People keep in touch with friends and family	*Predation*: Social network predators find victims, giving reporting and banishing
Keeping current	Digg, Del.icio.us	*Shared bookmarks*: Social bookmarks let people see what others look at.	*Advocates*: Who "digg" a site because of a vested interest, e.g. they own it.
Play	Second Life, MMORPG, Sims	*Shared play*: An avatar experiences things impossible in reality.	*Bullies/Thieves*: "Newbies" robbed by veterans don't return, so need "safe" areas.
Trade	E-Bay, Craig's List, Amazon	*Item trading*: People from anywhere exchange more goods.	*Scams:* Scammers are reduced by online reputation systems.
Work	Monster	*Work trading:* People find and offer work more easily.	*Faking***:** Padded CVs and fake job offers need online reputation systems.
Down-load	Webdonkey, Bit-Torrent Napster,	*Shared down-loading*: Groups share the processing load of file downloads.	*Piracy***:** Napster was in conflict with society's copyright laws, so closed down.
Media Sharing	Flickr, YouTube podcasting	*Shared experiences:* People share photos/videos with family/ friends.	*Offensiveness*: Editors remove offensive items—violence, porn, scatology…
Advice	Tech help boards like, AnandTech	*Shared technical advice:* People who have solved problems can help others more easily.	*Confusers:* People who start new tracks rather than checking existing ones are relocated and scolded.
Express opinions	Slashdot, Boing-Boing, Blogs	*Shared opinions:* People express and read others opinions more easily	*Caviling*: People who "peck" new ideas to death—karma systems deselect them.

Synergy and size

Synergy gains arise from participant interactions not participant members, so while competence gains increase linearly with group size, synergy gains increase non-linearly. Hence as group size increases, synergy gains become more important relative to competence gains. When the Internet allows a critical mass of millions to synergize, and as Shirky says: "Here comes everybody" (Shirky, 2008), the synergy values become enormous. Everyone with a problem goes to Google to see who else has solved it.

This has led to new business models, based on serving the community instead of, or as well as, milking it for profit. The power of this approach is illustrated by Google, which started as a free service for everyone, and now rivals Microsoft in influence. For example, much current research on trust frames the problem as how to get customers to trust sellers. Yet if this were possible, sellers could trick customers for selfish profits. An approach that *requires* customers to be socially foolish is neither desirable nor sensible for any community, which gets more value from savvy than from stupid citizens. Some blame this "business" approach for the dot.com bubble collapse. In contrast community based business models change the question from how to trick customers to give us money, to how to

synergize with customers. Instead of competitors who must be kept in the dark or misled, customers become partners in value creation. Socio-technical successes like eBay show how to do this.

As increasingly more people use computers to socialize, socio-technology will not just *support* society but *be* society. This follows the social evolutionary trend to stabilize synergy for larger groups, from hunter-gatherer tribes to mega-states like Europe, India, China and America (Diamond, 1998). At each stage, more complex social mechanisms were needed. If today's global technologies are to enable an *earth cosmopolitan,* they must be based on a valid model of social performance.

Free good citizens

A notable feature of today's social Web is people's willingness to help others they have not met and may not meet again, e.g. experts helping others with hardware problems on online boards. Neither Rule 1, nor its social contextualization in Rule 3a, explain this. Yet people commonly help others in trouble in physical society too, e.g. most people in a city give lost visitors directions, even knowing they will probably never see them again. That we like to help, as per Rule 3b, means content people will willingly help others. This certainly need not be so, yet it is. While individuals in markets may accommodate legal requirements, the core motivation remains self-interest. Rule 3b turns the logic of Rule 3a on its head, suggesting that if individual needs are met, there is a positive urge to social value. *Granted* free people are self-interested, they still actively help others if able to. For example, in BitTorrent systems users help each other download large files. Though the Torrent community lets individuals 'download and leave" it survives because many don't. Even in a community of mainly opportunistic users downloading free content, people choose to help. Initiatives like SETI illustrate this, as do FLOSS (Free, Libre, Open Source Software) community sites like SourceForge and FreshMeat. The Creative Commons lets individuals freely give their work to others (synergy), provided receivers do not copyright or sell it (defect).

Socio-technical systems succeed because free people are willing to be good citizens. They invite us all to be "small heroes", doing small selfless acts of service for a community. The technology then adds up these many small good deeds to create manifest value. If the free-good-citizen rule did not apply, socio-technical systems would not be the success they are. That such systems work is an important social discovery, with implications for all human society. We knew from history that enforcing order creates synergy, and we know today that markets and democracies work, given contextual legal systems to prevent injustice. What we did not know was that people will freely help each other without personal incentives. We knew people could be forced to be good citizens, or enticed by reward or punishment to be so, but not that they would freely be so. Systems like Wikipedia, that throw themselves upon the goodwill of their citizens, don't just survive they prosper. They illustrate both that "virtue" is productive, and that it can be supported by technology (Benkler & Nissenbaum, 2006). This is an important social discovery.

The availability of this new social interaction option may reflect an evolution in social health. A thousand years ago the democracies of today were not just unthinkable, but also unworkable. Instituting freedom would have quickly led to anarchy, as occurred after the French revolution. Yet today democracies work, and we find it hard to imagine why our predecessors would settle for less. Information democracy is more productive than information autocracy for the same reasons physical democracies out-produce autocracies (Beer & Burrows, 2007). Yet socio-technical systems, which are today transforming the Web (Kolbitsch & Maurer, 2006), differ in significant ways from current physical society. They are more decentralized, more transparent, more available, and more *participative.* They deny all forms of social control, whether of acts (repression) or of information (propaganda), and *believe* simply in free people doing the right thing. This is not communism, because no centre maintains social control. It is not socialism, as individuals can take value and leave with nothing expected of them. It is not anarchy, as there are anti-social defenses supported by code. It is

not altruism because no-one has to sacrifice for the rest. Socio-technical systems are *a new social form*, that succeeds by changing the social focus, from denying deviance to enabling good citizens.

Summary

The social environment model can be summarized as follows:

1. *Rule 1*. Free self-interested individuals acting in competition evolve competence value.
2. *Rule 2*. Socialized individuals cooperating in the community interest create synergy value.
3. *Synergy*. The difference between what individuals produce as a social unit vs. independently.
4. *Social dilemmas.* Occur when individual gains (Rule 1) contradict social gains (Rule 2).
5. *Social instability.* Social systems generating synergy are unstable to anti-social chain reactions.
6. *Social order.* Social systems can enforce order and synergy at the cost of individual freedom.
7. *Social hijack.* Leaders who hijack a society for their own ends maintain control by:
    a. *Repression:* Force individuals not to follow Rule 1.
    b. *Brainwashing*: Convince individuals to blindly follow Rule 2.
8. *Social inventions.* Ways to combine synergy, competence, and hijack resistance:
    a. *Justice*: Punish unfair anti-social interactions by state laws, police, and sanctions.
    b. *Democracy*: The freely acting group periodically changes its leaders by voting.
9. *The golden rules.* Present Rule 2 acts as "good" interaction choices for free individuals.
10. *Social environment model.* Social units are environments within other environments.
11. *Rule 3*. Free good citizens combine Rules 1 and 2 by anchoring one and applying the other:
    a. If social laws are not broken, compete for individual advantage (markets).
    b. If one has free time or money, give to others in the community (service).
12. *Rule 4.* Extends Rule 3 to apply at any social level in complex, nested social structures.
13. *Merging.* The tendency for idealized Rule 1 and 2 political systems to merge.
14. *Social health.* The percentage of individuals in a community that freely support social synergy.
15. *Social inflation and rectification.* When a social unit doesn't satisfy the needs of *its* environment, its social tokens lose external value, eventually giving either an internal or external rectification.
16. *Legitimacy.* Good citizen interactions are:
    a. *Fair.* Consequences match the contribution to them (maintains Rule 1).
    b. *In the public good*: Benefit society as a whole (maintains Rule 2).
17. *Group size.* Synergy gains increase more than competence gains as groups get bigger.
18. *Socio-technology.* A new social form, illustrated by online systems, that increases social performance by focusing more on good citizens than bad.

Future directions

Game theory's specification of the strategic relations of "rational" decision makers gives a common heritage to group decision making in business, economics and politics. Yet its applicability is limited by the demonstrable existence of social dilemmas, where rational self-interest fails utterly. That people

in fact ignore its guidelines, suggests that *homo-sociologicus,* who recognizes social good, can extend game theory's *homo-economicus,* who only recognizes self-interest. This embodies a higher social level rule, which is just as rational as the original individual level rule. The social environment model suggests that people in society recognize both these rules, and combine them by anchoring one and applying the other. Anchoring social good then applying self-interest explains the highly profitable market trade systems of the last century, where individuals seek profit under social good laws. However contented individuals could anchor individual good, and then seek community benefit. The latter is proposed to underlie the surprising successes of socio-technical systems.

Technology advances minimize effort and magnify outcomes, forcing humanity to resolve social issues, as the nuclear threat of mutually assured destruction (MAD) forced nations to abandon the illusion of world domination and accept international diplomacy. In a similar way, technology today is increasing both negative and positive synergy. Profit focused market systems have created much wealth for many people over the last few hundred years. These systems give individuals reward tokens to increase social performance. However when people focus on individual profit their inevitable ideal is to get something for nothing—Enron, World Corp and the credit crunch banks all sought a perpetual profit machine. However, just as perpetual motion contradicts physical laws, so perpetual profit contradicts social laws—everyone taking from everyone else cannot generate value. Those who seek this illusion only delude themselves and others. If online interaction becomes a "cheating culture" (Callahan, 2004) it *will* collapse, as such a culture is not, and has never been, socially sustainable.

Inevitably, as the benefits of modern technology rise, so do the dangers. As more people find more ways to use technology for personal profit, the chances of global social collapse increase. Current social systems, based on individual profit within a social context, may be ending their useful life. The focus on reward tokens like money distract from the real goal of social synergy. Socio-technical systems suggest that the environment model's theoretical alternative is feasible: to forget individual profit entirely and go directly to community profit. Instead of bribing individuals with tokens like money, just ask them directly to help others. When technology makes service easy and outcomes immediate, the virtue incentive can be that it works. However the real advantage is that systems that offer no individual incentives have nothing to steal. If they involve no central control mechanisms, there is nothing to hijack. If they are transparent, then anti-social acts or attempts to hijack the system become apparent. Explicitly replacing the ideal of doing good for oneself with the ideal of doing good for the community, as socio-technical systems do, is more honest. There is no need to pretend that helping society is in people's interest if it manifestly is. The question now, is if it works online, can it work everywhere? Do systems without reward tokens, run by no-one, visible to all, work? The Internet says they do, that no "centre" is needed, that we needn't pay people to help each other, and that a community will defend itself. If so, just as socio-technology can learn from physical society, perhaps society can also learn from socio-technology.

ACKNOWLEDGEMENTS

Thanks to Rob Carter, NJIT, for advice on the golden rule, to Elizabeth Whitworth and Karen Patten for early help, and to Marcus Foth, Guy Kloss and my wife Siew for helpful comments.

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