

A Social Environment Model of Socio-technical Performance¹

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Abstract

This paper analyzes the nature of social performance, to explain how socio-technical systems (STSs) like chat, e-markets, social networks and wikis can succeed despite being free of charge. It defines the non-zero-sum synergy gains of cooperation and how self-interested acts can collapse the society that creates them. How physical human society dealt with this "social dilemma" then relates to the socio-technical advance. In this model society is a social environment within a world environment, so its citizens face the dual requirements of self-interest and social-interest, which can be satisfied by anchoring one demand then managing the other, e.g. competing within a social context, as in markets, or community service within an individual context of sufficiency. The latter, it is proposed, is the new social form that socio-technical systems illustrate and which could be the future of humanity.

INTRODUCTION

Introduction

Social interaction is something people do every day, but supporting it online isn't easy (Fjermestad & Hiltz, 1999). Online e-commerce reduces seller costs and gives buyers more choice, yet remains a minority of all trade, growing from 2.7% in 2006 to 3.2% in the U.S. in 2007 (Scheleur, 2007), and still struggling to get over 5% in 2011. In contrast, socio-technical systems (STSs) like Wikipedia were lost causes that asked people to give to something for nothing gain, but today Wikipedia challenges Encyclopedia Britannica and Open Office is an alternative to Microsoft Office. The unexpected contrast between socio-technical success and e-commerce lethargy requires a new theory. The *social environment model* specifies the arcane role of society, and links it to modern socio-technology, by:

1. Defining core socio-technical concepts
2. Outlining the social dilemma inherent to social systems.
3. Summarizing traditional socio-physical responses.
4. Developing a social environment model.
5. Applying the model to cases like Enron and the credit meltdown,
6. Suggesting that socio-technical systems are the new form of an old inspiration.

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The social environment model applies to traditional and modern situations, it applies consistently at any social level, from small groups to societies of millions, and is useful to anyone working with socio-technical or socio-physical systems.

The socio-technical approach

Sociologists see individuals as conduits of meaning that reflect external social structures, so see psychological, biological and physical explanations as faulty reductionism of social realities. They replace 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). Yet if all individual thoughts were erased, and psychology ceased to exist, society would also cease to exist, as surely as if all its members had vanished physically. This has led to attempts to re-attach sociology to its psychological roots, e.g. Bourdieu's habitus references the individual percepts of the social environment and Giddens's mental frames underlie social life (Bone, 2005).

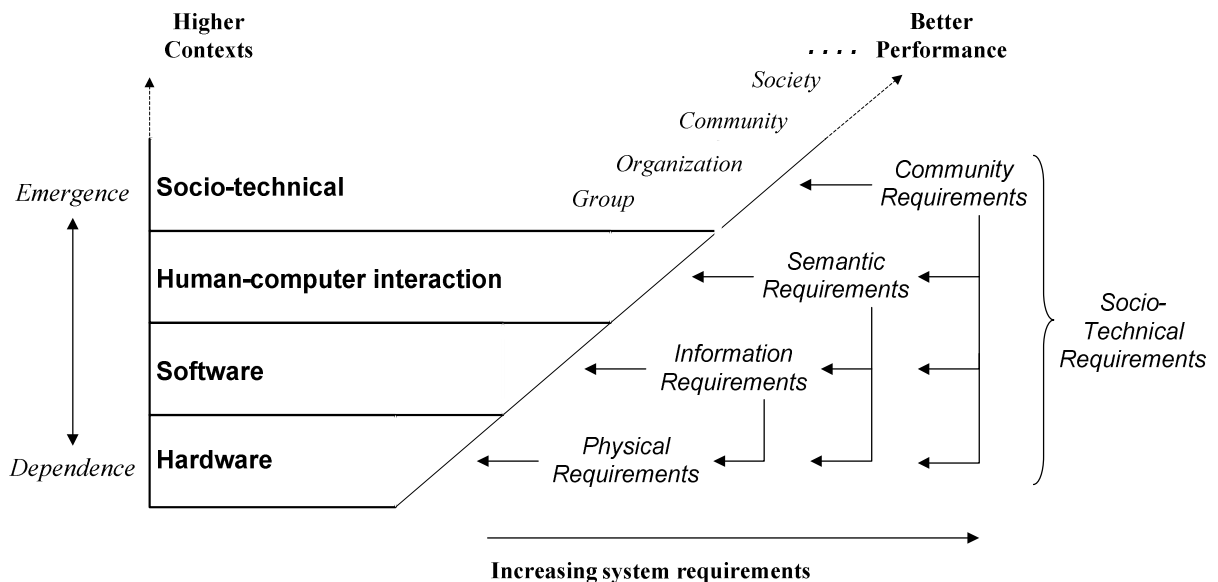


Figure 1. Socio-technical system levels

The top-down connecting of sociology to its roots matches an equally vibrant bottom-up movement in computing, which has long seen itself as more than hardware and software (Boulding, 1956). In computing today, human computer interaction (HCI) uses psychology ideas like attention and effort in web applications. Organizational computing (Kuutti, 1996), leads to the next socio-technical step, by general systems theory (Bertalanffy, 1968). Each system level emerges from the previous, as software data flows arise from hardware circuits (Whitworth 2009):

1. *Hardware systems*, based on physical energy exchange, face problems like overheating.
2. *Software systems*, based on information exchange, emerge from hardware to face problems like infinite processing loops.
3. *HCI systems*, based on meaning exchange, emerge from software systems to face problems like misunderstanding or information overload.
4. *Socio-technical systems*, based on community normative exchange, emerge from HCI systems to face problems like mistrust, unfairness and injustice.

As the discipline of computing becomes social, the new “user” of computing is society itself.

Software can't exist without hardware, yet is itself more than hardware. Reducing information to hardware voltages is like describing World War II by atomic events – both difficult and pointless. Software not only *described* computing systems efficiently, it offered more efficient ways to *design* and *operate* it, e.g. software cache prediction revolutionized hardware chip design. Semantics emerges from information exchange in the same way (Whitworth, 2008), as Web 3.0 is technology designed for meaning exchange not just information exchange. Social computing suggests another emergent level — the community, i.e. Web 4.0.

In Figure 1, each level comes from the previous: physical exchanges of electricity give information, information exchanges give meaning, which gives the norms, culture and identity of communities. Each level emerges from the one below it, but by its nature changes the entire system (Whitworth 2009). So engineering, computing, psychology and sociology are just different system “views”.

The social level is the complex not just because it contains more lower levels but because a social unit set can form into a larger one: people form families, families form villages, villages form cities, and cities form nations. A *socio-technical* system (STS) occurs when people interact via technology to create a community, as a *socio-physical* system arises when they do the same physically, combining the complexity of technology and the sophistication of society. Yet the social environment model applies to any social system, regardless of architecture (technical or physical).

THE SOCIAL DILEMMA

Social dilemmas are here proposed to be inherent to any social system, however mediated. xxx

Competition

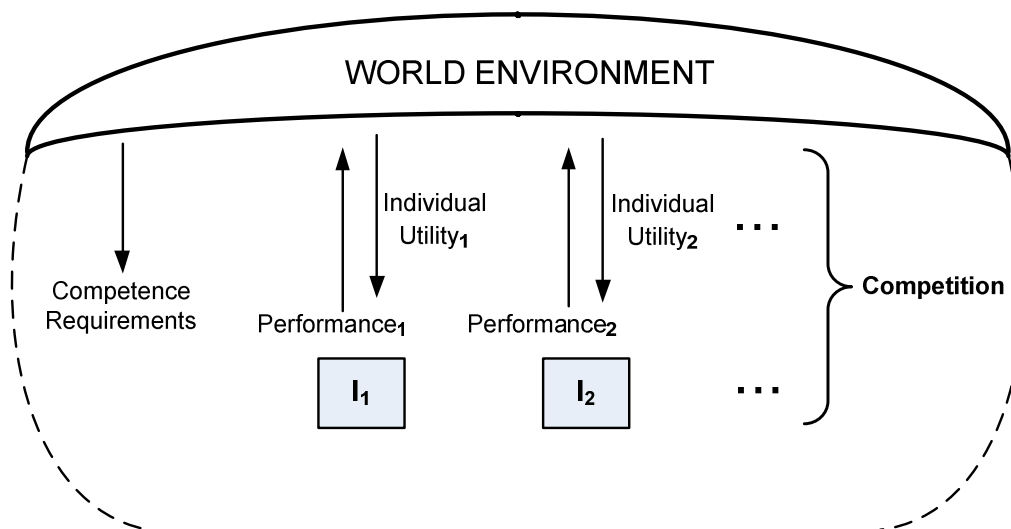


Figure 2. Individuals competing in a limited resource environment

In a limited resource environment, if two beetles independently seek the same food and one wins it then the other loses out. If the beetle with the food is more likely to survive, the result is "natural selection" where systems compete for advantage. The farmer growing the food also competes with the beetles and both compete with bacteria that would also consume it. Limited resource environments reward individuals that develop competencies like strength or speed that increase success and survival. Note that these competencies exist as a *web of system performance*, as the diversity of nature reflects

(Whitworth, Fjermestad, & Mahinda, 2006). In Figure 2, *competition* for limited resources creates an individual need for *competence* to succeed based on feedback from the world.

Homo economicus

Figure 2 suggests a *homo-economicus* model of society where individuals do what benefits themselves by reduced effort, increased gain, or both (Persky, 1995). Individuals seeking advantage favors the evolution of new competencies by competition. It represents Mill’s *economic man*, who seeks wealth, leisure, luxury and procreation above all else. Adam Smith argued that such individuals in a free market also benefit society, as if people individually produce more, so must 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* and the evolutionary process is one of natural selection.

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

If $IU(a_i) > IU(a_j)$ then prefer a_i over a_j **<Rule 1>**

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

The concept “value” here is deliberately left vague, so it may include physical gains like food, social information tokens like money, 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. In the animal kingdom, only social insects like ants form massively cooperative societies as we do, but they are highly successful, accounting for at least one-third of all insect biomass. The genetics that drives their behavior evolved because individuals working together can create more value than working alone (Ridley, 1996). 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 can’t survive anyway. In this model, individuals combine into a community that “performs”, in evolutionary terms, based on the sum of the actions of its members (Figure 3).

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, not those that create value for the individual. That socialized individuals can generate community value suggests a defeasible social alternative to game theory’s Rule 1: if a social unit S of $\{I_1, I_2 \dots\}$ individuals faces social action choices $\{a_1, a_2 \dots\}$ with expected social utilities $SU(a_1), SU(a_2), \dots\}$, then the rule is:

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

In words:

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

Value outcomes calculated for the group as a whole, not the individual, allow social evolution. So for ants, natural selection favors acts that increase community gain not individual gain. Social acts reference the social unit, not the individual, e.g. “defend society” is a social act independent of any individual state. Social “castes” can be dedicated to social acts, like worker or soldier, as ants do.

The same can apply to human society given *homo sociologicus* who prefer acts that benefit the

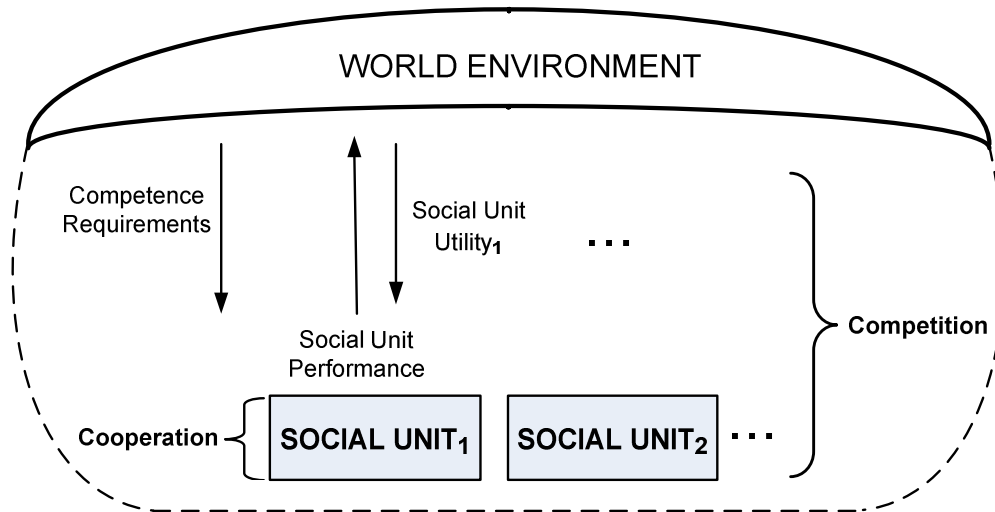


Figure 3. A community cooperating in a world environment

community (Bone, 2005). This is Marx’s *communist man*, who is politically motivated to common acts that benefit society. A psychological basis for this is Social Identity Theory (Hogg, 1990), where 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. While in Figure 2 individuals reap the physical consequences of their own acts, in Figure 3 society bears the physical consequences of its social acts, as productivity outcomes, which then reflect to its individual members.

That these pragmatic rules, one at the individual level and one at the community level, interact to create all social dilemmas is now proposed.

The prisoner’s dilemma

Game theory, the systematic study of rational choices in interdependent interactions, underlies many 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 but 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 1 shows these outcomes as free years out of seven. If both keep quiet, or *cooperate*, both get five free years, but if both testify, or *defect*, they only get one free year each. The *temptation* is for one to defect and get seven free years, while the other cooperating “sucker” gets none.

Working as individuals who follow Rule 1, 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.

Table 1. Prisoner's dilemma—Individual outcomes

<i>Years free (Bill/Bob)</i>		<i>Bob</i>	
		<i>Cooperate</i>	<i>Defect</i>
<i>Bill</i>	<i>Cooperate</i>	5/5	0/7
	<i>Defect</i>	7/0	1/1

So by Rule 1 it always pays individuals to defect. Expected outcomes for cooperating average 2.5 but for defecting average 4, so defection is preferred. If both parties follow this logic, defect/defect is the *equilibrium state*. So individuals maximizing their profit creates the worst possible result for both.

Working as a social unit and following Rule 2 gives a different result. The available social acts for the pair are mutual cooperation and mutual defection, with expected gains of 10 and 2 respectively (Table 2). If both parties follow Rule 2 mutual cooperation is the equilibrium state. Indeed if the degree of social cohesion is known, simulated agents in a prisoners dilemma situations do evolve to a cooperative equilibrium (Dayton-Johnson, 2003).

It can be seen that while Rule 1 gives only 2 free years of value, Rule 2 generates 10 free years, a considerable improvement. Traditional game theory *assumes* rational beings calculate payoffs for themselves as individuals, but it is just as rational to calculate payoffs for the social unit as a whole (Table 2). Rule 2 is simply Rule 1 applied to the social unit instead of individual units, so is just as logical and just as pragmatic. It is egocentric to take the person as the unit of value calculation, and label alternatives to individual self-interest "irrational", when we are ourselves a biological society of cells, and what one *defines* as "self" can include the community around us (Persky, 1995). it follows that both rules are equally rational and both are equally pragmatically grounded in value outcomes.

Table 2. Prisoner's dilemma—Social outcomes

<i>Years free (Pair)</i>		<i>Social Outcome</i>
<i>Social Act</i>	<i>Cooperate</i>	10
	<i>Defect</i>	2

The tragedy of the commons

The "tragedy of the commons" (Hardin, 1968) extends the two-person prisoner's dilemma concepts to many people in a group. 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 $\leq 50\%$ 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 3 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 3. 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 available to *the village* are by what percentage to graze the commons. Table 4 shows the expected village outcome for overgrazing is 1,600 tons over 10 months, the expected sustainable grazing average is 2,500, making it the preferred choice. Socialized individuals following Rule 2 will not destroy the commons because it is a valuable community resource.

Table 4. 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 generic 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 is not good for the group.

Let *social synergy* be the difference between the total utility a set of individuals produce working as a social unit compared to what they produce working independently as individuals. Synergy can be positive or negative. Trade illustrates a positive synergy and social conflict a negative synergy. If synergy is positive, it pays individuals to join the social unit while if it is negative they are better off leaving it, e.g. 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.

In a competition, the gains individuals receive can be attributed to their acts, but synergy gains attribute mainly to the 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 if you lose I gain benefit at your expense. However in *non-zero-sum games*, when social dilemmas occur, your loss is my loss. In zero-sum games, shrinking another's slice of the reward "pie" increases one's own, but in non-zero-sum games, shrinking the reward pie affects everyone. Indeed if everyone does it, everyone becomes poor, as "dog eat dog" societies evidence. Conversely, the vast wealth of modern "civilized" societies arises when enough socialized individuals increase the shared pie for all, making every slice larger. Ordinary workers today have better food, healthcare and entertainment than the richest aristocrats of the middle ages, while the aristocrats of today have more money than they know what to do with. While *non-zero-sumness* is an unpleasant term, the argument that increasing social synergy is the secret to modern prosperity is strong one (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 should competitors benefit from my work? In contrast, most academic researchers follow a *non-zero sum* model and 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 from others. Open research is a hundred-fold gain in knowledge synergy over keeping research secret. If the scientists of history had kept their research secret, benefits of modern science like electricity may not have occurred. Yet even today, human genome research was nearly kept secret for commercial gain.

Social Instability

Anti-social acts like stealing arise when individuals take from society but don't give anything back, i.e. aim to forever get something for nothing. This "short-circuit" of the link between social acts and synergy outputs can easily cascade as individuals with *instincts* for personal gain (Rule 1) are only *socialized* to create synergy (Rule 2). If one defects they not only gain personally but also reduce the gains of others, increasing the pressure on them to defect. If another then also defects, this increases the pressure on the remainder to also defect. Indeed a common reason given for cheating is that "everyone is doing it" (Callahan, 2004). Hence a few defections can cause a social chain reaction that destabilizes the entire social system. Yet if a crime-wave "succeeds", the social benefits it feeds on dry up, like a parasite that kills its host, i.e. the idea of getting something for nothing is a "lie".

Every social synergy has a corresponding 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 didn't fit. If many customers do that sellers will refuse refunds (also defect), even though refunds benefit both seller (more sales) and buyer (less risk). In such cases the end point is mutual defection and zero synergy. Is mutual synergy, despite its benefits, inherently *unstable* for self-interested individuals, like a ball balanced on a crest that sooner or later rolls permanently down into the valley of mutual defection? Or can kindness cascade too, as the movie Pay it Forward suggests?

Certainly *individuals alone cannot solve social dilemmas* as one person cooperating in a prisoner's dilemma is just a "sucker". In the tragedy of the commons, the farmer who doesn't graze just loses out and the commons is destroyed anyway. If the choices for individuals in social dilemmas are all bad, how have we achieved synergy at all? After thousands of years of struggle, modern civilization has

evolved to stabilize massive non-zero-sum synergies like global trade. If the path to social synergy has on both sides the cliffs of defection, how have we, alone among mammals, crossed the *zero-sum barrier* into the lush valley of massive social synergy (Wright, 2001)?

THE ZERO-SUM BARRIER

Humanity is fortunate that reason pulled us out of the dark ages but equally fortunate to have something beyond reason, so we are not *only* rational individual gain maximizers, e.g. people in social dilemma games are much more cooperative than game theory predicts (Poundstone, 1992). One reason that people have evolved not to rely entirely on reason is its fragility facing equivocal problems, where one is either uninformed or misinformed, as is common in business (Whitworth, Van de Walle, & Turoff, 2000). Another is that kindness works: 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. Indeed, mothers caring for their child at their own cost is critical to all nature. So concluding that social cooperation is “irrational” (von Neumann & Morgenstern, 1944) is like deducing from the laws of physics that bumblebees can’t fly, when in fact they do. It is time to change the laws, as human instincts know what human logic does not: that *cooperation works*.

Social order

By rule 2 *social dilemmas are solved when people form into a higher social unit*. If the common farmers form a village, they can institute a cooperative grazing roster to preserve it. While game theory generally excludes such social agreements, they are critical to solving social dilemmas (Aumann, 1998).

A society's social *order* is the degree its members follow common rules. In perfect social order everyone is of “one mind”, like an ordered crystal whose constituent atoms all move as one. Social *anarchy* in contrast is like a gas, whose atoms all move randomly according to individual exigencies. *Freedom* lets members of a society *choose* whether to act as one or in opposition, and allows creative acts against the norm. Enforcing order avoids anarchy, but also reduces freedom and creativity.

Cheating increases social disorder because cheater and cheated parties act differently. Equally one does not expect to be cheated, i.e. it is behavioral uncertainty. If a whole community acts as one (social order), whether by voluntarily following a religion, culture or law, or by the force of a despotic dictator, the social dilemma disappears and synergy arises, e.g. a village with a common game reserve that stops “poaching”—individuals killing the animals for personal gain—can conserve the resource that creates for example tourist income. This can be by physical barriers like fences, but whatever barriers human ingenuity throws up others can overcome, as email spam illustrates (Whitworth & Liu, 2009). However if the community declares the land sacred or poaching illegal, offenders who defy the gods or state become enemies of society, and can expect its punishment or banishment.

However enforcing order, even psychologically, is blunt 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, freedom and choice. A society that “socializes” citizens to follow Rule 2 engages social evolution to synergy but simultaneously disengages individual evolution of competence and creativity. This struggle, between social and individual evolution, may underlie historical swings between the rise of sophisticated civilizations and their fall at the hands of more vigorous barbarians. Social performance, in this view, requires both individual diversity and social order.

Social hijack

Centralizing control structures to create social order invites social hijack, where individuals take control of a community for their own ends 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, i.e. both enforced social synergy and returned it to those who created it. Yet dictators are also the worst of leaders when they use society's performance for their own personal luxury or power ends. Since this is unfair, they must *repress* individuality by police state control tactics, and *indoctrinate* the masses into the blind service of society by media propaganda. This 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 a civil war. Royal bloodline dynasties avoid this, but inevitably over time produce incompetent or even insane offspring, whose foolish acts collapse the society.
3. *Unproductive*. When a society blindly follows the whims of leader(s) who are isolated by wealth from the world's realities, it becomes incompetent and fails to generate produce from the world.

Societies with absolute rulers like Burma and North Korea become poor when their rulers replace natural productivity requirements with their personal social agendas, e.g. in Zimbabwe Mugabe addressed social inequity by driving white farmers off productive farms, 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 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. Yet natural "fitness" involves a web of performance criteria (Whitworth, Bañuls, Sylla, & Mahinda, 2008), so nature shows extraordinary diversity and tolerance for many different life forms, and underneath its competition is a basic synergy. So the problem is how to merge these two strategies effectively.

Social inventions

Periodically society discovers new social forms that increase social performance. *Justice*—punishing unfairness—is one way society has discovered to combine social order and individual 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 while forming a social unit engages synergy, it disconnects individuals from the consequences of their acts. 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 destabilize society, but social justice changes the dynamic by punishing unfair acts. If individuals seek revenge on those who 'wronged' them or their family, this makes cheating 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 good 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 personally it is better for society to punish defectors by impersonal laws. The case has been made that our entire justice system of police, laws, courts and prisons aims to do precisely this - *deny unfair acts* (Rawls, 2001). State justice allows a society to synergize selfish individuals.

Hence state justice gains must be calculated at the community 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 may be a small price to pay for social order. Prosecuting defectors is about *changing social interaction contingencies*, not about individual profit or loss, e.g. 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. Few would argue that the increased productivity of an entire city was not worth the effort.

Democracy, like justice, is another social "invention" (Mandelbaum, 2002). 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 turns out to be better than trusting central elites, however benevolent, not because it is more efficient but because it allows stable evolutions, i.e. anarchy free transitions of power that avoid episodes of dynastic incompetence. Given a human history of bloody power struggles, it is always amazing to watch a government that has lost a democratic vote peacefully hand over 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 because they producing more, and democratic nations have increased over time again not because democracy is "nice", but because it is productive.

THE SOCIAL ENVIRONMENT MODEL

Individuals in Figure 2 compete in the world and in Figure 3 form a unified society, which combined makes society an *environment within an environment* (Figure 4).

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 5 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. The "selfish" Rule 1 directs an individual to choose the first *row*, while the "good" Rule 2 directs the individual to choose the first *column*. The question raised is how to optimally combine them in a way that is also cognitively possible. The utilitarian ideal of "the greatest good for the greatest number," popularized by Dr Spock's Star Trek sacrifice, seems a simple calculation but what is the "greatest good" for millions, especially over time? Is an aircraft crash that loses lives but causes safety changes that save more future lives "good"? The rule is hardly calculable by anyone, let alone a majority. Nor does a simple AND of Rules 1 and 2 work well. It is feasible but not optimal, as if people acted only to benefit *both* themselves and society, they would often not act at all. Equally some sort of weighted trade of social utility against individual utility raises complex questions, like how much social good is my individual loss worth, or how much individual good warrants a social loss?

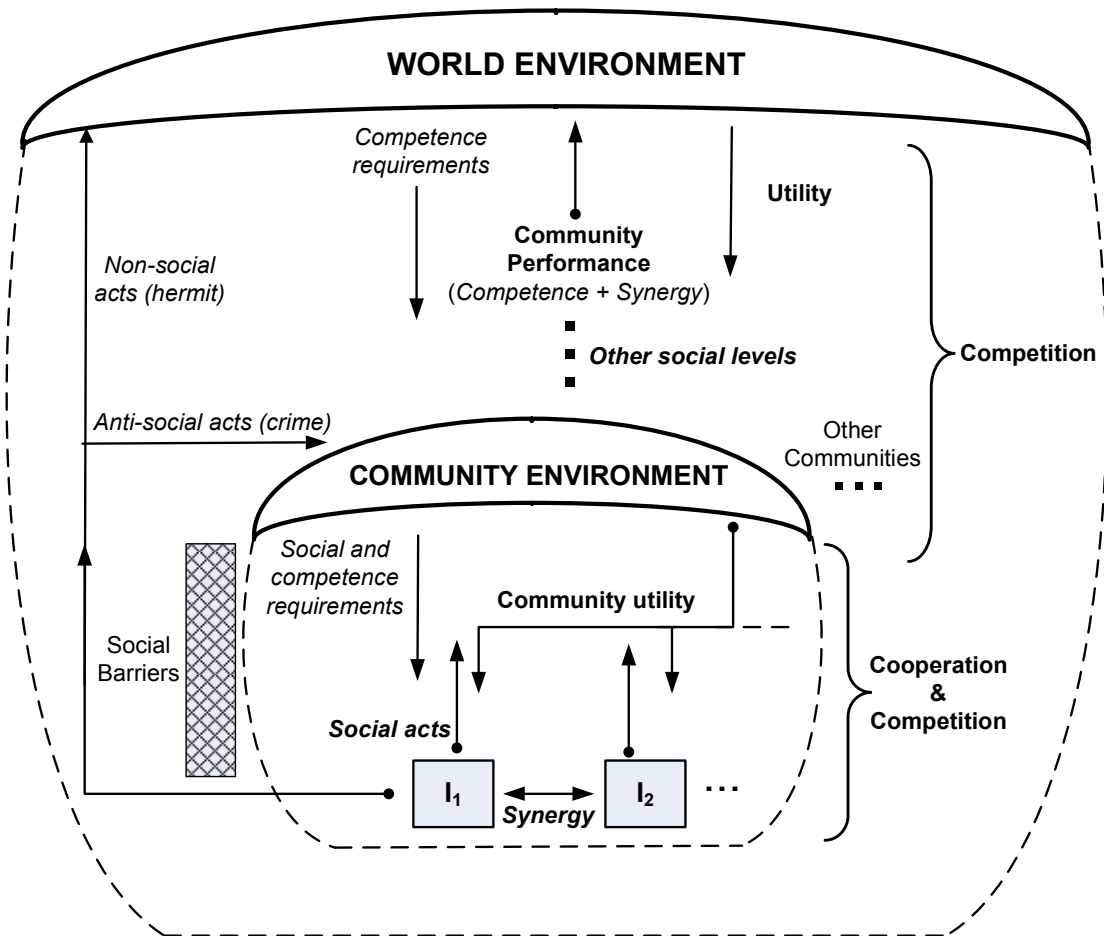


Figure 4. Social environment model

What is needed is a combination that is simple enough for the human mind to embrace. It is proposed that people resolve such cases by cognitive *anchoring*, fixing one rule then applying the other (Tversky & Kahneman, 1974), as follows:

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

OR

If $\{IU(a_i) \geq IU(a_j) \text{ and } SU(a_i) > SU(a_j)\}$ 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 Rule 3a, individuals will seek opportunities provided they don't harm society, which society usually makes clear by its own good conduct laws, i.e. one competes by the rules. Following Rule 3b, individuals will help others in society (service), provided it doesn't involve too much personal loss. Again, it is usually clear what helps others, and whether one is able to easily do it. This rule is easier to apply than ideals of calculating the greatest good for the greatest number.

Applied to Table 5, Rule 3 produces the options *synergy, opportunity and service*. So while some may follow Rule 1 exclusively, to become self-interested criminals unconcerned that their acts may collapse society, and others may follow Rule 2 exclusively, willing to sacrifice themselves for society at any time, most people 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 they have to go to war they will, but will make every effort to personally survive. If we only followed Rule 1 crime would prevail and society would collapse, while if we only followed Rule 2 we would still be locked in under genetically bred kings or pharaohs. Our social evolutionary path seems rather a pragmatic combination of individual freedom and community cooperation, here called the *free-good-citizen*.

Table 5. Individual choices by self and community outcomes

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

Communism and capitalism

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 need not conflict, as one applies to the individual and the other to the community level. Indeed they are underneath the same, as Rule 2 is simply Rule 1 applied to the social rather than the individual unit. Hence they need to combine, as a community that produces little but shares it fairly is hardly better than one that produces a lot but shares it unfairly. Given a choice between wealthy inequality or poor equality why not choose *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), as if everyone produces more so must the group. The social environment model accepts this, as competence is a world requirement that all social environments 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 combines the *capitalist* view of society as self-interested individuals, and the *communist* view of society as ant-like cooperatives, with a view of *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 with the "visible hand" of public good.

Social levels

The vertical ellipsis in Figure 4 indicates that a social environment can be contained in another, e.g. many people can form a company, and many companies can form a stock market community. 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 product value (stock), and stock markets ask companies not to steal their product value (ratings) by falsely reporting profits. Rule 3 can be "universalized" to the multi-environment case where S_1 contains $S_2 \dots$:

If $\{ \{ SU_1(a_i) \geq SU_1(a_j) \text{ or } SU_2(a_i) \geq SU_2(a_j) \dots \} \text{ and } IU(a_i) > IU(a_j) \}$ then prefer a_i to a_j <Rule 3'a>
OR

If $\{ IU(a_i) \geq IU(a_j) \text{ and } \{ S_1U(a_i) > S_1U(a_j) \text{ or } (S_2U(a_i) > S_2U(a_j) \dots) \}$ then prefer a_i to a_j <Rule 3'b>

In words:

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

OR

Don't significantly harm oneself but benefit higher environments

New problems arise when social dilemmas operate at higher social levels, e.g. 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 Enron's 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 the bottom line it produces is a loss of value for society. Enron hypocritically asked its workers to serve their social environment, the company, but did not itself serve its social environment, the stock market. Gangs like the Mafia have a similar hypocrisy, demanding strict loyalty and service within their community, while as a group pillaging the community they are in. In general, a social rule that does

not apply at every level creates an inconsistency that must eventually be resolved, e.g. the U.N. is inconsistent in giving non-democratic member states democratic rights.

Wildlife poaching in Africa also 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 the 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. So as nations hold local power, perhaps rights should be “privatized” to nations, who would then physically prevent whale poaching in their zone.

Rule 3' 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? If so, does not Rule 1 also satisfy the world? No, as in Rule 1 one satisfies oneself by meeting the world’s requirements—but what the world needs remains separate. Individuals following Rule 1 seek their own gain, not the gain of their environment. So while the natural environment has evolved, it did so unconsciously, in that the life struggling to get ahead within it had no concept of the evolution occurring on the earth. Yet extending Rule 2, suggests that the highest good is to serve the highest level environment, not just family, tribe, nation or humanity but perhaps even the planet. However to do this, one must first survive the demands of lower more immediate environments. Perhaps the pragmatic ideal is to serve the highest environment one can conceive, while surviving the demands of lower environments one experiences.

Social health

Social synergy advances require social health. 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 to engage in social acts like passing the ball. While soccer competence skills still count, 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, which drastically reduces lines. However if social health is low, selfish individuals loot the offered beverage resources, which then must be kept behind the counter. Now servers must pour and apply the milk and sugar the customer wishes, which makes customer

lines much 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 don't steal can 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 are subject to natural selection, as individuals are. Given open borders, capable people will flow into societies that offer them more value, increasing the prosperity of that country. A physical barrier like the Berlin Wall can prevent such flows, but its physical and political cost are not 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 both competence and synergy from their citizens over time to survive and prosper.

Social inflation and external rectification

A social environment cannot permanently insulate its members from the demands of *its* environment, as the outer environment's demands 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 external rectifications, as does the recent current credit meltdown. 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. Finally, 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 unless an accompanying internal rectification addresses the core problems, this will only delay the inevitable external rectification.

It is a concern that when businesses leaders cheat society of billions they are removed, but when they lose even more by risk management incompetence they are not. If the same people who engineered the credit collapse still draw bonuses based on their business “skills”, no correction has been made. Just as Enron was a higher level of unethicity, 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.

Fiascoes like the credit crunch and Enron highlight the issue of private business and the state. When Wall St's credit froze, by its own errors of judgment, the state stepped in to pay the \$700 billion heating bill, quoting the public good. Similarly, when Enron's naughty boys, playing with the matches of cheating, nearly burnt down the entire market house, the state again stepped in, again for the public

good. However to expect state bailouts in hard times but want no state "interference" in good time is like a child who wants to be left alone but still wants its parents to pay its bills. If public good is important, then it is important all the time, not just when business is in trouble. And if in times of trouble the nation pays the piper, then in times of plenty it can call the tune. In the case of corporate cheating this means implementing fair-play public-good rules, like honest financial disclosure or that no company can pay zero tax. In the case of corporate incompetence this means replacing the incompetent by those with real skills. Any society that fails to act in its own interests in such ways 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? This positive social goal can be called *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). Human rights are essentially statements of legitimacy. As Fukuyama argues, communities ignore legitimacy do so at their peril (Fukuyama, 1992).

If our social past sought to achieve synergy by denying individual self-interest, the present seems more positively focused on enabling legitimate rights. There has been a change in the social lens, from people as selfish primitives that must be controlled and repressed like wild beasts, to people as citizens whose freely offered kindness need only be kindled. Modern socio-technology, it is proposed, taps into the second world view.

The golden rule

Yet this positive approach also has a long social history, in the golden rule:

“Do unto others as you would they do unto you”

It has been expressed in many ways at different times and in different cultures and contexts:

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 overall it is a social loss, e.g. when a wallet is stolen there is not just the money lost but also disruptive losses like renewing credit cards.

This generic golden rule sits 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. The golden rule asks free individuals to think and act in terms higher than themselves, to hypothetically “flip” the social interaction equation to see if it still works the other way. It asks people to stand not only in the shoes of others, but of the society as a whole. Modern society shows that this is not just “nice” or “good”, it is also logically 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 really works. Ethics, in this view, is simply pragmatics at a community level. Based on the golden rule, which advocates a good choice, the ship of human society has navigated a middle way between the social evolution dead-ends of endless selfish tribal conflicts and mindless, ant-like social conformity.

FREE GOOD CITIZEN TECHNOLOGY SUPPORT

Socio-technology

While traditional technology like word processing supports individual competence, socio-technical systems support community synergies of some sort, and also defend against anti-social defection (Table 6). If users just followed Rule 1, systems like Wikipedia would not succeed, as why give knowledge to others for no self gain? Conversely, if people just followed Rule 2, these systems would not need to defend against anti-social defections, as they do. Socio-technical systems aim to both engage community synergy and put up anti-social defenses.

Synergy and size

Synergy gains arise from the number of participant interactions so while competence gains increase linearly with group size, synergy gains increase non-linearly. Interactions increase non-linearly with group size, so synergy becomes more important than competence for bigger groups. When the Internet allows millions to synergize then as Shirky says: “Here comes everybody” (Shirky, 2008), and the synergy values become enormous. Google illustrates the power of this approach. It began as a free service but now rivals Microsoft in influence, because if the knowledge of humanity is on the Internet, then Google is the doorway to it.

This has led to new business models, based on serving the community instead of, or as well as, milking it for profit, e.g. much current research on trust frames the problem as how a seller can manipulate customers to trust them to make a sale. Yet if this were possible, such customers would soon go bankrupt buying foolish things, and so no more be customers. Even if propaganda can con a community, creating *stupid* customers is neither desirable nor sensible, as such a community will collapse and take the business with it. Some blame this “business” approach for the dot.com bubble collapse, which found that customers are more savvy than stupid. In contrast community based business models change the question from how to trick customers to give us money, to the more sustainable how to synergize with customers? Instead of seeing customers as competitors, who must be kept in the dark or misled, new business models see them as partners in value creation. Socio-technical successes like eBay show that to do this one should not try to manipulate or “manage” the community, as in the saying of Lao Tse:

"One should govern a state as a cook fries small fish, that is without scaling or cleaning them."

As increasingly people use computers to socialize, socio-technology will not just *support* society but *be* society. It will support the social 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 designed in a spirit of service.

Free good citizens

A notable feature of today's social Web is the willingness of people 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 Rule 3a contextualization explain this. Yet people commonly help others in physical society too, e.g. most city people give lost visitors directions even knowing they will probably never see them again. That Rule 3b works is shown by the fact that people do willingly help others provided they don't lose too much themselves. That individuals in markets *unconsciously* help society, as Adam Smith argues, is distinct from Rule 3b, which turns the logic of Rule 3a on its head to say that when individual needs are met, a positive urge to social value remains. Granted free people are self-motivated, they are also socially-motivated to actively help others if free 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 web content, people choose to help. Initiatives like SETI, and FLOSS (Free, Libre, Open Source Software) community sites like SourceForge and FreshMeat illustrate the same. The Creative Commons shows that people will freely give their work to others (synergy), provided receivers do not copyright or sell it (defect).

Table 6. Socio-technical synergies and defections

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

Socio-technical systems only succeed because free people are willing to be good citizens. The invitation to be a "small hero", to do a small selfless act of service for a community, is taken up. The technology then adds up these many small good deeds into positive synergy. If the free-good-citizen rule did not work, socio-technical systems would not be the success they are. That such social systems are possible is an important social discovery, with implications for all humanity.

We knew from history that enforcing order allows synergy. The pyramids of Egypt show what people working together can do. We also know today that markets can synergize people by individual incentives, given contextual legal systems prevent injustice. What we didn't know was that contented people, not subject to coercion, nor enticed by personal incentives, will freely synergize community value. 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. That "virtue" is both productive and can be supported by technology (Benkler & Nissenbaum, 2006) is an important social discovery.

This new social evolution 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 that 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. By being more decentralized, more transparent and more available they become more *participative*. They deny all forms of social control, whether of acts (repression) or of information (propaganda), and *believe* quite simply that free people will do the right thing. This is not communism as individuals are free to express themselves without social control. It is not socialism, as individuals can take value for themselves and leave if they want to. It is not anarchy, as there are anti-social defenses to oppose disorder. It is not altruism, as no-one is expected to sacrifice for the community. Socio-technical systems as *a new social form* based on legitimate rights, tolerance of individual freedom, community decision transparency and support for social order, suggest new strategies for physical society. For example, transparency means that the account of those who take community wealth as beneficiaries is public knowledge - as one can hardly claim that public monies accepted is private information. One wonders of the effect of a yearly "community return", of what the community paid the citizen, as well as a tax return of what they paid the community. While an individual-community balance sheet listing medical costs as "Paid for by the State", giving a total owing of zero, might seem a waste of time, simply making the information known might encourage individuals to give back to society with registered service groups. Transparency means that everyone in a community has a right to know how its synergy is being spent.

Future directions

Game theory's specification of "rational" decision making inspires many decision strategies in business, economics and politics, but fails utterly to explain how humanity solved the social dilemma to achieve the synergies of modern civilization. This is only explained if *homo-economicus*, who only recognizes self-interest, exists alongside *homo-sociologicus*, who recognizes social good. While the first may seem "selfish" and the latter "good", the rules embodying both their behaviors are essentially pragmatic, i.e. service is just as rational as selfishness, and indeed for large groups can give even greater rewards.

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.

As technology advances minimize the effort of social acts and magnifying their effect, this forces humanity to resolve its choices. As the mutually assured destruction (MAD) of nuclear weapons forced nations to abandon illusions of world domination, so today's technology support for negative synergies like spam challenge the new illusion of profit focused market systems, that one can get something for nothing, wealth without effort. Social reward tokens like money only increase social performance up to a point. If people focus exclusively on individual profit their inevitable ideal is to get profit for nothing—Enron, World Corp and the credit crunch banks all sought perpetual profit machines. Yet just as perpetual motion contradicts physical laws so perpetual profit for no effort contradicts social laws—everyone taking from everyone else can't create value. Those who propagate this illusion, like pyramid profit schemers, perpetuate a lie to delude others and themselves. If online interaction becomes a "cheating culture" (Callahan, 2004) it *will* collapse, as this is not and never has been sustainable.

Inevitably, as more people find more ways to use technology for personal profit, the chances of global social collapse increase. Systems based on individual profit within a social context may be ending their useful life, as focusing on reward tokens like money distracts from the real goal of social synergy. If one offers peanuts one gets monkeys, but if one offers honey one gets wasps. The

theoretical alternative of social environment model, to forget individual profit entirely and go directly to community profit, avoids this side-effect. Instead of bribing individuals to do good with money tokens, just make it easy for them to help others. When technology makes service easy, and outcomes are immediate, the incentive to virtue is that it works. Systems that offer no individual incentives have nothing to steal. If they use no central control mechanisms there is nothing to hijack. If they are transparent then anti-social acts and attempts to hijack or misuse the system become apparent. People who do these things will be shamed. Explicitly denying individual reward diminishes propaganda that offers it. There is no need to pretend that helping society is in people's interest if it manifestly is.

So if this works online, can it work anywhere? Can people, without central control, create synergy? Can a transparent society, where *public* decisions are made transparently, create synergy? Can systems without reward tokens, run by no-one, visible to all, work? The Internet says they can, that we needn't pay people to help each other, and that a community will defend itself if given the means to do so. If so, as socio-technology can learn from physical society, so society can learn from socio-technology.

Glossary

It may be useful to summarize some of the key terms of the social environment model:

1. *Rule 1.* Competing self-interested individuals evolve competencies (individual evolution).
2. *Rule 2.* Cooperating socialized individuals evolve social synergies (social evolution).
3. *Synergy.* The difference between what individuals produce as a social unit vs. independently.
4. *Anti-social acts.* Taking individual benefit from society without contributing to its synergy.
5. *Social dilemmas.* When individual gains (Rule 1) contradict social gains (Rule 2).
6. *Social instability.* Social systems generating synergy are unstable to anti-social chain reactions.
7. *Social order.* That all members of a social group act as one.
8. *Social freedom.* That members of a social group are free to act from their own choice.
9. *Social hijack.* When leaders hijack a society for their own ends, and maintain control by:
 - a) *Repression:* Forcing individuals not to follow Rule 1.
 - b) *Brainwashing:* Convincing individuals to blindly follow Rule 2.
10. *Social inventions.* Ways to combine social synergy, world competence and evolution :
 - a) *Justice:* Punish unfair anti-social interactions by state laws, police, and sanctions.
 - b) *Democracy:* The group periodically changes its leaders by freely voting.
 - c) *Legitimacy:* The allocation of "rights" that are:
 - i. *Fair.* Individual consequences match the individual contribution (Rule 1).
 - ii. *In the public good:* Benefit society as a whole (Rule 2).
11. *The golden rule.* That individuals can freely choose to serve an environment above themselves.
12. *Social environment model.* That social units are environments within other environments.
13. *Rule 3.* That free-good-citizens combine Rules 1 and 2 by anchoring one and applying the other:
 - a) *Rule 3a.* If social laws are not broken, compete for individual advantage (markets).
 - b) *Rule 3b.* If one has free time or money, give to others in the community (service).
14. *Rule 3'.* Extends Rule 3 to apply to complex, nested social structures.

15. *Rule merging*. That communism and capitalism are extremes, and a hybrid is better.
16. *Social health*. The percentage of individuals in a community that *freely* support social synergy.
17. *Social inflation*. If a social unit doesn't satisfy *its* environment's needs its social tokens lose their external value.
18. *External rectification*. When the consequences of a society's collective incompetence eventually impact upon individual members directly.
19. *Technology*. Magnifies both negative synergies, like spam, and positive synergies, like wikis.
20. *Socio-technology*. A social system mediated by a technical system. Allows a new social form that primarily increases synergy and secondarily denies anti-social acts, rather than the reverse.

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