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Managing the Virtual Commons: Cooperation and Conflict in Computer Communities

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1. The Problem of Cooperation

Computer-mediated communication systems are believed to have powerful effects on social relationships. Many claim that this new form of social interaction encourages wider participation, greater candor, and an emphasis on merit over status. In short, the belief is that social hierarchies are dissolved and that flatter, more egalitarian social organizations emerge. Networked communications, it is argued, will usher in a renewed era of democratic participation and revitalized community. But as with earlier technologies that promised freedom and power, the central problems of social relationships remain, although in new and possibly more challenging forms.

One of the most basic questions in the social sciences is the problem of cooperation. In the face of temptations to behave selfishly, how might a group of people ever manage to establish or maintain cooperative relations? The character and qualities of this problem are different when groups use computer-mediated communication to interact, but the differences do not guarantee a uniformly positive effect or resolve many of the long standing problems of cooperation. Indeed, we will show that there is a double edge to computer-mediated interaction: many of its central qualities make it easier both to cooperate and to behave selfishly. Thus, computer-mediated interaction raises political, practical, and sociological problems in new ways and with new stakes.

At the root of the problem of cooperation is the fact that there is often a tension between individual and collective rationality. This is to say that in many situations, behavior that is reasonable and justifiable for the individual leads to a poorer outcome for all. Such situations are termed *social dilemmas* and underlie many of the most serious social problems we face.[2] One of the most famous models of social dilemmas is the "tragedy of the commons" (Hardin 1968). Hardin described a group of herders having open access to a common parcel of land on which they could let their cows graze. It is in each herders interest to put as many cows as possible onto the land, even if the commons is damaged as a result. The herder receives all the benefits from the additional cows and the damage to the commons is shared by the entire group. Yet if all herders make this individually reasonable decision the commons is destroyed and all will suffer.

A related model of the tension between individual and collective rationality is the challenge of providing

public goods. A public good is a resource from which all may benefit, regardless of whether they have helped create the good (e.g., public television or a community improvement project).3 The temptation is to enjoy a public good without contributing to its production, but if all reach this decision, the good is never created and all suffer.

The tragedy of the commons and the challenge of providing public goods share a common feature:

At the heart of each of these models in the free-rider problem. Whenever one person cannot be excluded from the benefits that others provide, each person is motivated not to contribute to the joint effort, but to free-ride on the efforts of others. If all participants choose to free-ride, the collective benefit will not be produced. The temptation to free-ride, however, may dominate the decision process and thus all will end up where no one wanted to be. (Ostrom 1990: 6)

In the face of the free-rider problem, how is cooperation possible? The pessimistic conclusion of many researchers (e.g., Hardin 1968; 1974) is that coercion by a strong external authority is necessary in order to insure cooperation. But other researchers (e.g., Fox 1985) have argued that an external authority may not be necessary and may even make the situation worse. The question becomes, to what extent can group members regulate themselves, providing collective goods and managing common resources without recourse to external authorities? Given the new possibilities that emerge in computer-mediated interaction, cyberspace provides an important research site to explore this fundamental question of social order.

Thus, the free-rider problem and the ability of a group to overcome it is our focus for this chapter. We apply the logic of social dilemmas to a portion of cyberspace known as the Usenet -- a collection of several thousand discussion groups that is distributed and maintained in a decentralized fashion. In sections 2 and 3 we describe the Usenet and discuss the major social dilemmas that members of the Usenet face. In order to explore how these problems might be solved in the Usenet, in section 4 we make use of the innovative work by Ostrom (1990), who studied a wide variety of communities in order to determine what features of a group contribute to its success or failure in managing collective goods. The set of cases she examined include common forest and grazing grounds in Swiss and Japanese villages, fisheries in Canada and Sri Lanka, and irrigation systems in Spain and the Philippines. She identified a set of design principles that are features of communities which have successfully met the challenge of producing and maintaining collective goods despite the temptation to free-ride and without recourse to an external authority. We discuss each of these principles and ask to what extent they are present in the Usenet and whether their relevance changes when groups interact via computer networks. Thus, our goal is to contribute both to the study of computer-mediated interaction and to research on cooperation and social dilemmas.

Given the space constraints here, we are severely restricted in the amount of detail and number of examples we can present. We are in the process of completing a book-length study in which we will go into much greater depth in our analysis of the issues of social interaction and order in cyberspace (Kollock and Smith, forthcoming).

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2. The USENET

The Usenet is one of the largest computer-mediated communication systems in existence. Developed in 1981 as an alternative to services available through the ARPANET, the Usenet has grown exponentially and currently consists of several thousand discussion groups (termed *newsgroups*). Recent estimates suggest that roughly two million people from all around the world participate in some way, with further increases expected. The Usenet is similar in many ways to *conferencing systems*, often referred to as a *Bulletin Board System* (BBS), and compared to *e-mail distribution lists*. It shares many qualities with these forms of

computer-mediated communication, but differs in significant ways. No central authority manages the Usenet, although considerable cooperation exists around the definition of standards that determine the technical organization of the distribution system. It is distributed in the sense that there is no central repository for Usenet postings, each contribution is passed throughout the system of interconnected *hosts* -- systems that receive and pass along each contribution they receive. The Usenet is not a commercial product, it is distributed through connections that are often informally maintained.

The Usenet is accessed via a variety of tools that alter the way in which groups and messages can be selected and read. However, a theme common to most of the tools used is that one or more *newsgroups* are selected or "subscribed" to, each of which contain one or more *threads*, or series of postings and responses (and the responses to responses) on a common subject. There are roughly 4500 newsgroups in current wide circulation covering a diverse range of topics. The topics of newsgroups are displayed in the name of the group and are designed to advertise the focus of the group. For example, *comp.sys.mac.hardware* focuses on issues concerning the Macintosh computer's hardware. The Usenet has institutionalized eight general thematic categories.[4] and has developed a range of conventions to describe and delineate the kinds of activity and contributions that group considers desirable and appropriate.[5] The names serve not only to identify what is desired in a group, but what is inappropriate as well. Thus, discussion of IBM PC's, foreign affairs, film, or even Macintosh software are not wanted in]*comp.sys.mac.hardware*. Newsgroups provide a forum for individuals with esoteric interests to find one another, thus providing the service of a "Schelling" point.[6]

A number of newsgroups are centered around technical subjects, such as programming languages, operating systems, and kinds of computer hardware. However, less technical subjects are the basis for many newsgroups as well. For example, *sci.lang.japan* contains discussions about the Japanese language, and a collection of groups starting with the name *alt.current-events* have focused on issues ranging from the World Trade Center bombing to the Los Angeles earthquake. Many newsgroups focus on cultural or recreational activities, such as *soc.culture.bangladesh* and *rec.arts.movies*. There are newsgroups, like *alt.barney.die.die.die* or *alt.swedish.chef.bork.bork.bork*, that are intended to provide a venue for a humorous and whimsical discussion. Other newsgroups cover subjects that rarely get candid public discussion in any other forum, such as the *alt.sex* groups. There are also newsgroups, like *alt.sexual.abuse.recovery*, that are specifically created to provide support for its members.

Newsgroups often contain requests for information, replies to requests, discussions of the validity and accuracy of replies, and further questions prompted by the discussion. Newsgroups can and often do have dozens of threads running simultaneously, some referring to one another, some cross-posted to other newsgroups.[7]

Figure 1 illustrates how a collection of threads is displayed in the newsgroup *comp.org.eff.talk*, a newsgroup sponsored by the Electronic Frontier Foundation (EFF), which is dedicated to the discussion of the legal, political and economic issues and problems raised by new information technologies. The first column provides a menu letter for each thread (typing this letter selects the thread listed next to it), the next column lists the authors' names (or usernames)[8] for each response in that thread. The third column indicates the number of messages in each thread (which can be as many as hundreds of messages), and the final column displays the thread's subject. The ">" character indicates that this is a reply to a message with the same subject.

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comp.org.eff.talk 117 articles

a Tom Miller 1 >NET system

b Joe Cipale 4 >A chance to repeal the DAT tax

John Henders
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Don Reid

John A Sigmon 1 >Where can I find HI FI World in S.Bay

d J Heitkoetter 1 Big Dummy's Guide in Texinfo, etc....

e Bob Smart 1 *FLASH* Moby SUBPOENA served

f Stephen Savitzky 1 NSA, meet NRA -- If s/w is a munition...

(Mail) -- Select threads -- 47% [>Z] --
```

Figure 1. Display of threads in a sample Usenet newsgroup

This newsgroup, like many others, is a forum used to provide information and news about issues of relevance to the EFF and hosts extended discussions and debates. Selecting a thread causes the messages stored within it to be displayed.

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comp.org.eff.talk #16743 (52 + 61 more) +-( )+-( )+-(1)--(2)

Newsgroups: comp.org.eff.talk,sci.crypt,alt. | | \-[1]+-[1]

+ security.pgp,talk.politics.crypto | | \-[1]

[1] Re: *FLASH* Moby SUBPOENA served | \-( )--[1]

From: bsmart@bsmart.TTI.COM (Bob Smart) |-( )--[1]

Date: Mon Sep 20 8:00:08 PDT 1993 \-[1]+-[1]

Distribution: inet

Organization: Citicorp+TTI

Nntp-Posting-Host: bsmart.tti.com

Lines: 30

In article <TED.93Sep18104722@lole.crl.nmsu.edu>, ted@crl.nmsu.edu (TedDunning) writes:

> no. ecpa-86 only prohibits recordings made without the permission

> of either party. if one party to the conversation consents, then

> the tap is legal. thus you can record your own conversations.

That's not necessarily the whole story, though: some states require that ALL parties to a
conversation must consent to any recording. At a minimum, you need to know whether you're
in a two-party or a one-party state before you proceed.

[...]

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A fanatic is someone who does what he knows that God would do if God knew the facts of the
case.

Some mailers apparently munge my address; you might have to use bsmart@bsmart.tti.com --
or if that fails, fall back to 72027.3210@compuserve.com. Ain't UNIX grand?
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Figure 2. A sample posting to a Usenet newsgroup

Figure 2 illustrates an excerpt from one of the postings listed in Figure 1. This post is typical of many found in the Usenet. First, the top block of lines contains header information, such as the names of the newsgroups to which the message should be added, the subject line (which is used to construct threads), the date and author of the post, and information concerning each of the machines that passed along the message. Opposite the header is a *thread tree*, generated by some newsreaders, that provides a graphical representation of where in the numerous turns in a thread this message is located. Messages that copy the subject line from this message are represented as branches below this message. Below both the header and thread tree is the body of the message. The body of this message is typical of many Usenet messages in that it contains "quoted" material, often from a message posted earlier in the thread. Here, for example, the quoted text is preceded by ">" characters with a line attributing the source of the quote above it. This cycle of quoting and then commenting can go on for many rounds and sometimes results in postings that are several pages long, but contain very little new text. Finally, the last few lines are a signature, often referred to as a *sig*. *Sigs* frequently serve a combination of the functions of bumper stickers and business cards; quotes and jokes are common, along with return addresses and phone numbers.

Contributing to a Usenet newsgroup is a simple matter. A post can be written immediately after reading another post, and the contents of any post can be copied into the reply. Sending the post is similar to sending e-mail, however, the message sent is copied to the newsgroup(s) specified by the sender, and so will be read by all participants of the newsgroup rather than by just a single person.

Having described the Usenet, we turn in the next two sections to a discussion of the free-rider problem in this part of cyberspace and the design principles of successful communities. We base the analysis that follows on extended observations of the daily workings of the Usenet. It is important to note that Usenet postings, like audio recordings of telephone conversations, have the advantage of capturing everything that was publicly available to the participants in that setting. The copies of postings we drew from the Usenet are exact copies of what others who read them saw. Usenet postings also have the advantage that one can observe patterns of interactions without affecting those patterns. But as with telephone conversations, there is much that is beyond the spoken word or string of ASCII; Usenet postings cannot capture the private meanings people may intend or take from messages. Further, even more than records of spoken interaction, postings have an ambiguous tone. While a variety of textual practices have been developed to convey the subtleties of communication that are normally carried by tone, posture, gesture, and a host of other indicators of nuance, this medium remains particularly open to multiple interpretations. In addition, members of the Usenet have a multitude of back-channels of communication that often escape our examination. Participants in the Usenet may e-mail each other directly, avoiding the public arena of a newsgroup, or may even telephone, write or meet each other without evidence of this appearing in a newsgroup. While these limitations should caution against over-ambitious claims, similar constraints exist for all forms of observation. The fact that the postings we use to ground our claims are available for examination by others provides a useful check on distorted interpretations.

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3. Social Dilemmas in Cyberspace

There is a layer of cooperation and coordination in the details of communication, conversation, and interaction that is unacknowledged by most researchers. An important exception is work by ethnomethodologists and conversational analysts, who have shown how orderly processes of interaction are founded upon an immense amount of collaborative work which is ordinarily taken for granted. The tension

between individual and group outcomes can be seen here as well. There is a sense, for example, in which the conversational "floor" constitutes a commons: if access to the floor is allocated in an ordered way by speakers exchanging "turns", each has the opportunity to accomplish his or her interactional goals, but if all crowd in, the communication breaks down. Similarly, the interactional work that is necessary to keep a conversation going is a kind of public good in the sense that it is possible to free-ride on others' efforts, using and abusing the conversation without contributing to its maintenance. While there are many important ways in which spoken conversation differs from interaction on the Usenet, similar challenges exist there as well.

Despite the great potential of the Usenet to provide collective goods, it is often the case that this potential is not realized. The endemic tension between individual and collective rationality is as present in Usenet newsgroups as it is in shared pasture lands. In the Usenet, the key common resource is not an open pasture, but *bandwidth*. The term refers to "the volume of information per unit time that a computer, person, or transmission medium can handle." (Raymond 1993) Thus, bandwidth refers to both the limited capacity of the Usenet in terms of its technical capacity to carry and store information, and the capacity of its members to attend to and consume that information. A great concern on the Usenet is using the available bandwidth wisely, which is to say, refraining from posting unnecessary information. Among the actions that are usually considered an inappropriate use of bandwidth are: posting extremely long articles; reproducing long sections of text from a previous post rather than summarizing or excerpting only the relevant passages; including long signatures full of comments and diagrams at the end of a post; and posting the same message to many newsgroups instead of one or a small, well-chosen set.

If members exhibit restraint in their use of bandwidth, the Usenet benefits everyone by being an effective and efficient means of exchanging information and carrying on discussions. Unfortunately, an individual member looking out on the huge capacity of the Usenet can reason (with some justification) that his or her individual use of bandwidth does not appreciably affect what is available for others, and so use this common resource without restraint. The collective outcome of too many people reaching this individually rational decision is, of course, disaster. Here then is a crucial way in which a participant of the Usenet might free-ride on the efforts of other members: using the available bandwidth without restraint while others regulate their own behavior.

Overusing bandwidth is not the only social dilemma members of the Usenet face. Whatever the goal of the newsgroup, it's success depends on the active and ongoing contributions of those who choose to participate in it. If the goal of the newsgroup is to exchange information and answer questions about a particular topic (e.g., *alt.comp.sys.gateway-2000*), participants must be willing to answer questions raised by others, summarize and post replies to queries they have made themselves, and pass along information that is relevant to the group. If the goal of the newsgroup is to discuss a current event or social issue (e.g., *soc.veterans*), participants need to contribute to the discussion and to encourage its development. Once again there is the temptation to free-ride: asking question but not answering them; gathering information but not distributing it; or reading ongoing discussions without contributing to them (termed *lurking*). Some newsgroups successfully meet these challenges, others start well and then degrade, and still other newsgroups fail at the beginning of their existence, never managing to attract a critical mass of participants.

Wise use of bandwidth and the active participation of its members is not enough to ensure the success of a newsgroup. One of the most important collective goods that the Usenet provides is a system for coordinating the exchange of information. By providing the means for maintaining a set of several thousand topics, as well as more specific threads within each topic, the Usenet allows individuals with common interests to find and interact with each other. Given the huge amount of information that is transferred through the Usenet, it is critical that members respect the focus of a newsgroup and of the various threads within a newsgroup by sticking to the topic that is being discussed. Being off-topic threatens the coordination of discussion that the Usenet rests on. The logic of social dilemmas is present here as well. If no one worried about being on-topic, meaningful interaction would be impossible on the Usenet, but as long as most people are careful to make comments that are relevant to the newsgroup and thread, others can free-ride on this restraint by posting their

opinions widely and indiscriminately to many groups, without concern for their relevance. Users who do post to many newsgroups without regard to the topic are said to be *grandstanding*, a violation that highlights both the erosion of the organizational boundaries that enable the Usenet to remain a coherent place and the moral and practical limits on the use of another's attention.

Finally, a successful newsgroup depends on its members following rules of decorum. What counts as acceptable behavior can, of course, vary tremendously from newsgroup to newsgroup: a hostile, provocative post (termed *flaming*) is an etiquette breach in most newsgroups, but not in *alt.flaming*, where violating decorum would mean engaging in a sober, restrained discussion. Often the cultural rules that define what is and is not appropriate are implicit or poorly understood and articulated, which can itself lead to conflict as participants with different expectations attempt to interact. Whatever the local rules of decorum, it is important that most participants follow them. However, there is the temptation to free-ride on others' efforts to maintain norms of civility while violating those norms oneself, saying whatever one wants to without any self-regulation.

Ideally, members of the Usenet would make efficient use of bandwidth, participate actively in newsgroups, insure that their comments are posted only to relevant newsgroups, and abide by the local norms and culture that govern decorum. Everyone is better off if all behave in such a manner, but there is the temptation to free-ride on the efforts of others. Thus, some participants post articles that are unnecessarily long, or lurk rather than contributing to the give and take that is the essential feature of any newsgroup, or post articles that are off-topic, or violate the local rules of decorum. The more people free-ride, the more difficult it is to produce useful information and interaction. In the language of the Usenet, the *signal-to-noise ratio* deteriorates. The challenge becomes how a group of individuals can "organize and govern themselves to obtain collective benefits in situations where the temptations to free-ride and to break commitments are substantial" (Ostrom 1990: 27).

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4. Managing the Virtual Commons

To address this issue, Ostrom (1990) studied a wide range of communities which had a long history of successfully producing and maintaining collective goods. She also studied a number of communities which had failed partially or completely in meeting this challenge. In comparing the communities, Ostrom found that groups which are able to organize and govern themselves are marked by the following design principles:

1. Group boundaries are clearly defined
2. Rules governing the use of collective goods are well matched to local needs and conditions
3. Most individuals affected by these rules can participate in modifying the rules
4. The rights of community members to devise their own rules is respected by external authorities
5. A system for monitoring member's behavior exists; this monitoring is undertaken by the community members themselves
6. A graduated system of sanctions is used
7. Community members have access to low-cost conflict resolution mechanisms[9]

We use these design principles as a way of organizing our discussion of the Usenet. Our analysis extends Ostrom's original points and applies them to the kinds of organization found in the Usenet. We have grouped the various design principles under three general headings: group size and boundaries (in which we discuss the first principle and the related issue of group size); rules and institutions (in which we discuss the second, third and fourth principles); and monitoring and sanctioning (in which the last three principles are discussed). In each case we ask to what extent these design principles can be found in the Usenet and whether the relevance and costs and benefits of these design principles change in this new form of social interaction.

4.1. Group Size and Boundaries

One of the most common and accepted tenets in the literature on cooperation is that "the larger the group, the less it will further its common interests" (Olson 1965: 36). Researchers have identified a number of reasons why cooperation may be more difficult as group size increases. First, as the group becomes larger, the costs of an individual's decision to free-ride are spread over a greater number of people (Dawes 1980). If an individual's action does not appreciably affect others, the temptation to free-ride increases. More generally, the larger the group, the more difficult it may be to affect others' outcomes by one's own actions. Thus, an individual may be discouraged from cooperating if his or her actions do not affect others in a noticeable way. Second, it is often the case that as group size increases, anonymity becomes increasingly possible and an individual can free-ride without others noticing his or her actions (Dawes 1980). Third, the costs of organizing are likely to increase (Olson 1965), i.e., it becomes more difficult to communicate with others and coordinate the activities of members in order to provide collective goods and discourage free-riding.

Does this logic hold in the Usenet? In many ways it does not because the costs and effectiveness of defection, social control and coordination in the Usenet are very different than groups that interact without computer-mediated communication. A key difference is that one's behavior in a newsgroup is visible to every other participant of the newsgroup, whether there are 10 participants or 10,000. Thus, the costs of free-riding by, for example, being off-topic, posting huge articles, or violating decorum, are not diffused as the number of participants in the newsgroup increases. Indeed, one could argue that the effects of free-riding *increase* as newsgroup membership increases because there are a greater number of participants to be inconvenienced or angered by such actions. This characteristic of the Usenet creates new challenges for those wishing to establish cooperative communities, but also new possibilities. The fact that every individual's behavior is visible and identifiable discourages free-riding among those who only free-ride when they can do so anonymously. This same visibility can make monitoring people's actions easier.

Another important difference is that the Usenet can reduce the costs of communication and coordination, in some cases allowing groups to produce and maintain collective goods that would otherwise be too expensive. In particular: the challenge of finding people with similar interests is greatly reduced; the usual problems of meeting in a common time and place are eliminated; communicating with a thousand people involves essentially the same personal costs as sending a message to a single individual; a great number of members can participate in discussions involving numerous topics without overloading participants; and an historical record of member's interactions is automatically produced. Thus, there may be the potential to sustain cooperation in much larger groups than is possible without computer-mediated communication. For example, the *comp.sys.ibm.pc.games.action* newsgroup provides several thousand people scattered around the planet with access to each other, detailed information about where to find games for the IBM PC, strategies for playing those games, and reports of problems and patches for fixing bugs. While this group could exist by meeting face-to-face, or could publish a paper newsletter, by interacting via the Usenet, participants can interact more frequently, at less cost, and among a larger and more wide-spread group than could be sustained otherwise.

However, these features of the Usenet do not by themselves guarantee a cooperative community, as is readily apparent to any participant in the Usenet. There are other design principles that also seem to be necessary if a community is to work well.

Ostrom found that one of the most important features of successful communities is that they have clearly defined boundaries: "Without defining the boundaries of the [collective good] and closing it to 'outsiders,' local appropriators face the risk that any benefits they produce by their efforts will be reaped by others who have not contributed to those efforts. At the least, those who invest in the [collective good] may not receive

as high a return as they expected. At the worst, the actions of others could destroy the resource itself" (Ostrom 1990: 91). Boundaries are also important in that they encourage frequent, ongoing interaction among group members. This is critical because repeated interaction is perhaps the single most important factor in encouraging cooperation (Axelrod 1984). If individuals are not likely to interact in the future, there is a huge temptation to behave selfishly and free-ride. On the other hand, knowing that one will be interacting with others on a continual basis can lead to the creation of reputations and serve as a powerful deterrent to short-run, selfish behavior.

One of the greatest challenges to cooperation in the Usenet is that its boundaries are often both undefendable and undefined and cannot sufficiently ward off those who would exploit the collective goods produced by others. While there are many resources to construct boundaries in the Usenet, many of these boundaries exist only by voluntary compliance and are easily violated.[10]

In many ways, a newsgroup's name is one of its most effective means of defining a boundary: by announcing its contents it attracts the interested and repels the disinterested. But within this boundary a newsgroup's membership can be extremely fluid. Some newsgroups do attract and hold a fairly stable group, but many do not. To the extent membership in a newsgroup isn't stable and its boundaries are not clearly defined, cooperation will be more difficult.

One way of increasing the stability of a group is by actively restricting its membership. The overwhelming majority of newsgroups in the Usenet are potentially open to anyone.11 However, there is no technological reason why restricted newsgroups cannot be created, just as there are e-mail distribution lists that one must ask to join or private conferences on bulletin board systems.12 In the Usenet, there are two broad types of boundaries that are relevant: barriers to access to the content of the newsgroup and barriers to posting to the newsgroup. Thus, one possible type of restricted newsgroup might allow anyone to read a discussion but permit only admitted members to contribute to it. Alternatively, both reading and posting could be limited to group members.

There is, however, a technical device called the *kill file* or *bozo filter* that an individual can use to create a kind of customized personal boundary. If someone's actions in the Usenet are considered objectionable, an individual can put this person in his or her kill file, which filters out any future posting by this person. In some ways a kill file reduces a member's reliance on the larger group's ability to define and defend a boundary. This offers both individuals and groups greater flexibility -- the effects of some sorts of violations of the commons can be minimized without the costs of restraining the offending activity. It also illustrates the kinds of powerful interaction tools that can be built in cyberspace -- imagine a conversation in which one could make invisible any objectionable person. While this capacity might be longed for in many situations, it has some practical problems: even though the person using the filter won't see the offending party's postings, other participants in the newsgroup will see future postings and comment on them. Thus, one must continue to deal with the reactions to the posting even if the original postings are kept from one's eyes.

Although it does not yet exist in the Usenet, one way of addressing this limitation would be to create a community kill file. In other words, members of a newsgroup could decide (via majority voting, consensus, etc.) to place an offending individual in a shared, newsgroup-specific kill file such that the individual would be prevented from posting to the newsgroup in the future. Note that this is a different approach to group boundaries than the idea of a private, restricted newsgroup discussed above. A community kill file allows anyone to join a newsgroup but provides a mechanism for banishing people. In contrast, the emphasis in a private newsgroup is making it difficult to join in the first place.

4.2. Rules and Institutions

Any successful community will have a set of rules -- whether they are implicit or explicit -- that govern how common resources should be used and who is responsible for producing and maintaining collective goods. However, it is important that the rules are tailored to the specific needs and circumstances of the group. Ostrom identifies this as another design principle that is a feature of cooperative communities: there is a good match between the goals and local conditions of a group and the rules that govern the actions of the group's members. Her research indicates that there is often great variation from community to community in the details of the rules for managing collective goods. One lesson is that it is dangerous to take the specific rules of a successful group and apply them blindly to other groups.

Ostrom also found that an additional characteristic of successful communities is that most of the individuals affected by the rules governing the use of common resources can participate in modifying those rules. She argued that this feature results in better designed rules because the individuals with the knowledge of the day to day workings of the group and the challenges the group faces could modify the rules over time to better fit local conditions. In contrast, rules that were created and forced upon a community by outside authorities often failed miserably because the rules did not take into account knowledge of local conditions or because the same set of rules were applied in a procrustean fashion to many communities despite important differences between them. Indeed, another design principle that marked successful communities was that external government authorities recognized (at least to some extent) the rights of communities to devise their own rules and respected those rules as legitimate.

Are these features present, and are the issues underlying them relevant in the Usenet? A well-crafted set of rules for managing collective resources is certainly important for newsgroups, and some progress has been made in defining those rules. Rules and institutions exist on a global and local level throughout the Usenet. At the global level, there are some concerns that are common to all newsgroups, and a set of documents exist which chart out rules that should govern participation. Six key documents have been grouped together in what is described as a "mandatory course" for new users.[13] These documents discuss rules of etiquette, suggestions for using the Usenet efficiently, cautions against wasting bandwidth or being off-topic, and many other issues.

On the local level, and consistent with the principle that rules should be tailored to local conditions, many newsgroups have also established a body of information about the newsgroup, complete with prescriptions and proscriptions, that is know as a *Frequently-Asked Questions* file, or *FAQ*. However, there are problems: not every newsgroup has a FAQ (indeed, the creation of a FAQ is often the first sign that a group has resolved some of the hurdles of collective organization); some FAQ's do not addresses critical issues or do so ambiguously; some newsgroups do not have a clear sense of their goals or the challenges they face; and many participants in the Usenet (especially new members) do not bother reading FAQ's and other related documents. Finally, these documents contain no specific recommendations for dealing with violations of their rules; all enforcement in the Usenet remains an informal process (this is discussed in the following section).

These points raise the issue of socialization. Even if a community has developed a good set of rules, there is the task of teaching new members about those rules. The logic of social dilemmas exists here as well. All benefit if all members have learned the information and rules necessary to carry on interaction in a newsgroup, but long-time members are tempted to ignore questions from neophytes (termed *newbies*) and to not contribute to the creation or maintenance of FAQ files. New members are tempted to wade into a newsgroup without first learning the local culture by reading the documents that have been prepared by other members and by observing the group for a period of time before attempting to participate.

The production of FAQ's illustrates the ways in which local rules are produced and modified endogenously, by the members themselves. However, participation in creating and modifying the rules that govern a community does not necessarily mean that every member is involved in every decision. A FAQ may be produced by a single entrepreneurial member of a newsgroup or may be the product of many individual contributions.[14]

Even in newsgroups that have produced a FAQ, many of the rules and institutions that are present remain informal, undocumented and difficult to enforce.15 As a result, there are certain chronic problems that are difficult to resolve through these informal means. In some of these cases, groups have decided to deal with a social dilemma by turning over authority for the management of a collective good to a particular member or group of members, trusting these leaders to manage the resource well. This is, in a broad sense, Hobbes' classic solution of Leviathan: people give up part of their personal freedom to an authority in exchange for some measure of social order. While Leviathan conjures up visions of a fascist, totalitarian state, a milder version of this solution can be found in the Usenet in the form of *moderated groups*. "These are groups which usually have one or more individuals ... who must approve articles before they are published to the net. ... [Moderated groups are often] derived from regular groups with such a high volume that it is hard for the average reader to keep up, ... [or] from regular groups that have often been abused" (Spafford et al. 1993b). Since each contribution is evaluated for its appropriateness to the newsgroup, a moderated group avoids many of the problems of unrestrained participation. But it resolves the problem of collective organization by depending on the willingness of a moderator to invest significant time and effort in managing the newsgroup. And for the majority of newsgroups that cannot find someone to make such a contribution or oppose ceding control to a central authority, the problem of self-organization remains. Moderated groups are one of the rare examples of a formal and enforceable institution in the Usenet.

Finally, in it's present state, the Usenet is not subject to much interference from external authorities. This has the advantage of allowing newsgroups to fashion their own rules and institutions. However, increased government regulation is a possibility in the future. There are political pressures to regulate cyberspace, and external interference, despite its dangers and limitations, is sometimes necessary if communities are unable to solve their own social dilemmas. To the extent the Usenet successfully manages its collective resources, and retains its distributed, decentralized structure, it can avoid the need for external regulation and resist outside pressures encouraging external regulation.

4.3. Monitoring and Sanctioning

Each of the successful communities studied by Ostrom were marked by clearly defined group boundaries and a set of well-designed rules. Because community members participated in refining the rules and the rules were well-matched to local conditions, most members believed in the rules and were committed to following them. However, this does not seem to be enough to insure cooperative relations. Some type of system to monitor and sanction member's actions was a feature of every successful community.

Monitoring and sanctioning is important not simply as a way of punishing rule-breakers, but also as a way of assuring members that others are doing their part in using common resources wisely. Ostrom and other researchers (Levi 1988) have argued that many individuals are willing to comply with a set of rules governing collective goods if they believe the rules are efficacious and if they believe most others are complying with the rules. That is, many people are contingent cooperators, willing to cooperate as long as most others do. Thus, monitoring and sanctioning serves the important function of providing information about other persons' actions.

In every successful community studied, the monitoring and sanctioning of people's behavior was undertaken by the community member's themselves rather than by external authorities. Another common pattern was that cooperative communities employed a graduated system of sanctions. While sanctions could be as severe as banishment from the group, the initial sanction for breaking a rule was often very low. Community members realized that even a well-intentioned person might break the rules when facing an unusual situation or extreme hardship. Severely punishing such a person might alienate him or her from the community, causing greater problems:

A large monetary fine imposed on a person facing an unusual problem may produce resentment and unwillingness to conform to the rules in the future. Graduated punishments ranging from insignificant fines all the way to banishment, applied in settings in which the sanctioners know a great deal about the personal circumstances of the other appropriators and the potential harm that could be created by excessive sanctions, may be far more effective than a major fine imposed on a first offender. (Ostrom 1990, p. 98)

Interaction in the Usenet makes monitoring much easier, but poses special problems for sanctioning others. Because of the nature of computer-mediated communication, it becomes possible to monitor others more thoroughly and more cheaply than has heretofore been possible in groups. Most forms of free-riding in the Usenet, such as using the bandwidth unwisely, being off-topic, or violating norms of decorum, are seen by all other participants of the newsgroup, and one's actions are usually identifiable because each posting is accompanied by the person's e-mail address.[16] Further, because an exact record of every participants' actions is kept (at least for a few weeks), it is possible to "go back into history" and recover a sequence of interaction. On the Usenet, unlike most interactional settings, the claim "I didn't say that" had better be truthful, because anyone can call up the exact words.

While monitoring can be accomplished at a very low cost (almost as a side effect of regular interaction), sanctioning participant's behavior in the Usenet is more of a challenge. There are some types of sanctions that are simply impossible: threats of physical violence are necessarily empty threats[17], and no system exists to levy and collect monetary fines (though such a system is technically possible). Indeed, it is very difficult to force anyone to do anything -- this is both the charm and frustration of the Usenet.

What participants can do is use a variety of informal sanctions to try to shape behavior. Free-riders might be insulted, parodied, or simply informed that their actions are undesirable. Often the response is both intense and voluminous, in part because of the effortlessness with which one can comment on other's actions. [18] In this sense, informal sanctions are easier to carry out in the Usenet than in many other settings. However, enforcing social order is made more difficult by the fact that many newsgroups have no clear common understanding of what should and should not occur in their interactions.

Nonetheless, some actions step clearly out of the bounds of acceptability. For example, recent discussions of cruel acts to cats in the *rec.pets.cats* newsgroup were recognized as a clear violation of decorum. A post with the subject "**** MAKE MONEY FAST ****" containing an invitation to participate in a classic pyramid scheme was recently widely cross-posted throughout the Usenet and also drew widespread sanctions.[19] Responses ranged from cautions against participating to expressions of extreme irritation and personal insults directed to the poster. In addition, there were some calls for a coordinated collective response: "Remember people -- Just ignore it and it will go away. If you have to write something, do it via e-mail. ... Behavior modification in action: Don't bother flaming them -- attention is their reward. Just ignore them. They'll get bored and go away."[20] These kinds of informal social control mechanisms depend upon moral suasion to have an effect -- they lack any capacity to actually restrict deviant behavior, they can only discourage it. Nevertheless, many people report that informal sanctions do have a significant effect on their behavior.

More severe sanctions are possible but rarely carried out. In extreme situations a participant might have his or her computer account revoked by the institution that controls the physical hardware. This occurs rarely, can provoke widespread outrage, and is ultimately not a fool-proof way of banishing someone from the Usenet because of the many alternate routes of getting access.

No set of rules is perfectly designed, and there will always be ambiguity in applying a particular rule. Consequently, it is important to have some method to resolve the conflicts that will inevitably arise. This is the final design principle Ostrom identifies as common to successful communities: access to low-cost conflict resolution mechanisms. The need for these mechanisms in the Usenet is clear: for the reasons already discussed, conflicts in newsgroups are fairly common. In fact, some newsgroups seem to be dedicated entirely to on-going conflicts. However, formal methods for dealing with these conflicts have yet to develop

-- there is no Usenet court system or even a place to engage in arbitration. While the Usenet has survived without these institutions for many years, as the size and diversity of the Usenet population increases, these institutions may become increasingly necessary. Other forms of social organization in cyberspace have already developed such institutions. For example, some MOO's and MUD's have developed councils and judiciary systems to resolve conflicts.[21] In contrast, the Usenet relies on the principle that most conflicts die out after a period of time, if for no other reason than the combatants become exhausted.

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5. Conclusions

As computer-mediated communication increasingly becomes the media through which public discourse takes place, the ways in which that discourse is socially organized becomes more consequential. While systems like the Usenet are continuously changing, their present form has implications for the future nature of a society increasingly woven together by these technologies. Computers are being used, in effect, to manage networks of relationships between people, changing the costs and benefits of cooperation.

Cooperation is an accomplishment, and in the Usenet cooperation must occur without recourse to external authorities. That it occurs at all is somewhat amazing. As Olson (1965: 1) observed in his classic work on collective action, "if the members of some group have a common interest or objective, and if they would all be better off if that objective were achieved, it [does not necessarily follow] that the individuals in that group would ... act to achieve that objective." For all its declared faults, the Usenet has developed into a remarkably robust institution: it has endured more than a decade while it has grown exponentially to include millions of participants.

For all of this cooperation, however, there remain significant shortcomings. Many newsgroups remain relatively uncooperative places, filled with noise and argument. The Usenet may not need to resolve these problems, it may simply become the public space in cyberspace where the balance between order and autonomy is decided in favor of the latter. Other institutions in cyberspace may, however, learn the lessons the Usenet can teach and provide alternatives that satisfy a wide range of desires.

One of the broad lessons that we draw from the social organization of the Usenet is that cyberspace has a double edge: monitoring the behavior of others becomes easier while sanctioning undesirable behavior becomes more difficult; the costs of communication between members of a large group are decreased while the effects of defecting are often amplified; and the existence of several thousand newsgroups makes it easy for individuals to find others who share specific interests and goals but also makes those who want to disrupt those groups able to find them. Thus, there is no simple conclusion to this story, and one-note predictions of either a utopian or dystopian future must be considered suspect.

To deepen our knowledge of the ways in which computer-mediated communications technologies alter the economies of cooperation, we propose to engage in an extended ethnographic exploration of newsgroups, charting their development and interviewing their participants to uncover the emergence of norms and expectations concerning acceptable use and appropriate behavior. To supplement this research we are preparing a network-based survey instrument to gather basic but as yet unavailable information about the demographics and common experiences and practices of members of the Usenet.

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Footnotes:

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1. Direct correspondence to Peter Kollock, Department of Sociology, University of California, Los Angeles, CA 90024-1551 (kollock@ucla.edu). Order of authorship is alphabetical to indicate equal contributions. We wish to thank Ronald Obvious for comments on an earlier draft of this paper.

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2. For general reviews of the research on social dilemmas, see Messick and Brewer (1983); Dawes (1980).

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3. *Public good* is sometimes defined in a more restricted sense (see Taylor 1987: 5-8). Here we use term public good (or collective good) simply to refer to resources that are in some degree non-excludable.

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4. Usenet newsgroups are named according to a loose convention. Groups are to start with one of eight main hierarchy names and then add words separated by periods that increasingly narrow the scope of the group. There are seven broad official classifications of Usenet newsgroups: "news", "soc", "talk", "misc", "sci", "comp" and "rec". As Spafford et al. (1993a) describe them: "Each of these classifications is organized into groups and subgroups according to topic: 'comp' [contains] topics of interest to both computer professionals and hobbyists, including topics in computer science, software source, and information on hardware and software systems; 'sci' [contains] discussions marked by special and usually practical knowledge, relating to research in or application of the established sciences; 'misc' [contains] groups addressing themes not easily classified under any of the other headings or which incorporate themes from multiple categories; 'soc' [contains] groups primarily addressing social issues and socializing; 'talk' [contains] groups largely debate-oriented and tending to feature long discussions without resolution and without appreciable amounts of generally useful information; 'news' [contains] groups concerned with the news network and software themselves; 'rec' [contains] groups oriented towards the arts, hobbies and recreational activities." Finally, the "alt" hierarchy contains "alternative" newsgroups that are less regulated.

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5. For example, newsgroups with suffixes of ".d" are intended as places for meta-commentary on the antecedent newsgroup.

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6. In *The Strategy of Conflict,* Schelling (1960) wrote of features on a landscape that permit tacit coordination. For example, there are points in a city that provide natural spaces for finding others, such as the clock in Grand Central Station.

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7. *Cross-posting* is the practice of posting the same message to multiple newsgroups. This is intended to allow items of interest to be easily shared by more than one group. In practice, it is often the source of annoyance and conflict as items of limited relevance are cross-posted to a number of groups.

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8. *Usernames* are labels that identify the machine and user a message originates from. "Real" identity is sometimes difficult to determine from usernames. This is due in part to usernames like IZZY3046. But even a username like SMITHM@NICCO.SSCNET. UCLA.EDU conveys a minimum amount of information about its owner.

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9. Ostrom identified an eighth design principle that is relevant in complex social systems: monitoring, sanctioning, and other governance activities are organized in multiple layers of nested enterprises. Note also that Ostrom considers this list to be a first, speculative attempt to isolate what is required to successfully manage a common resource. She and her colleagues are currently involved in a large research project to further develop and refine this list.

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10. Social boundaries are never hermetic; their value to a group is often based on what they let in and let out as much as they keep in and keep out. Further, it is a mistake to conceive of boundaries as singular forces.

Instead, boundaries are erected and maintained by a variety of practices and tools, some of which have conflicting effects.

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11. Note, however, that there are *de facto* barriers that can keep people out of the Usenet in general. Some people do not have access to or cannot afford the hardware necessary to connect to Usenet. Others may have access to the hardware but do not have the necessary knowledge in order to participate -- they may not know how to use newsreading software or may not even be aware of Usenet's existence. These barriers are likely to decrease in the future as access becomes both simpler and cheaper.

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12. There has been limited experimentation with restricted newsgroups through the use of coded messages that can only be decoded by members who have been provided with a key. Another example is the Clarinet newsgroups, which provide information from commercial news providers to paying subscribers only. Legal recourse provides Clarinet with a major element of its boundary.

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13. The course consists of: "A Primer on How to Work With the Usenet Community" (Von Rospach et al. 1993), "Answers to Frequently Asked Questions about Usenet" (Schwarz et al. 1993), "Emily Postnews Answers Your Questions on Netiquette" (Templeton 1991), "Hints on writing style for Usenet" (Offutt et al. 1992), "Rules for posting to Usenet" (Horton et al. 1993), and "What is Usenet?" (Salzenberg et al. 1992).

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14. Note that boundaries and rules are interrelated: Having members of a group participate in the design of rules to govern the group makes sense if the members all have experience in the group, knowledge about the challenges the group faces, and an investment in the group (i.e., they intend to stay in the group and value their membership in the group). But if the boundaries of a group are not well defined so that there are many participants who have little knowledge about the group or little investment in it, involving all affected participants in the modification of rules can result in poorly designed institutions.

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15. By "institutions" we mean "...the sets of working rules that are used to determine who is eligible to make decisions in some arena [and] what actions are allowed or constrained...." (Ostrom 1990: 51)

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16. However, there has been increasing use of services that provide a form of anonymity or pseudo-anonymity for users of e-mail and the Usenet. "Anonymous name servers" accept e-mail or Usenet postings, strip all identifying information from them, assign a pseudonym (such as an3209@anon.penet.fi), and redirect them to the person or newsgroup to which they are addressed. The effects anonymity has on the social organization of groups based on computer-mediated communication bears close investigation but goes beyond the scope of this chapter.

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17. Although the very real instances of stalking that have been accomplished through the use of networks highlights the fact that the Usenet can become a means by which real violence is carried out.

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18. Ironically, the sanction itself can consume more bandwidth than the original violation, but the sanction may still make sense if it encourages wiser use of this common resource in the future. A similar logic can be seen in the action of the agents of the I.R.S., who sometimes spend more finding and prosecuting a tax offender than they collect in back taxes and fines.

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19. This post was sent to a set of unrelated groups including: *comp.sys.powerpc, rec.motorcycles, cmu.misc.market, alt.astrology, alt.bbs.internet, alt.bbs, alt.best.of.internet, rec.games.video.arcade, alt.asian-movies.*

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20. From: *alt.best.of.internet*, message id# 3211, 23 January 1994.

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21. MUD's and MOO's are real-time text-based social worlds. For a detailed description of MUD's and MOO's see Curtis (1991).