

**PUBLIC GOODS OR VIRTUAL COMMONS?
APPLYING THEORIES OF PUBLIC GOODS, SOCIAL
DILEMMAS, AND COLLECTIVE ACTION TO ELECTRONIC
NETWORKS OF PRACTICE**

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Abstract

Electronic networks of practice are self-organizing, open activity systems focused on a shared practice that exist primarily through computer-mediated communication. These networks create a public good of knowledge that is available to anyone in the network, making it easy for individuals to free-ride on the efforts of others. Theories of collective action are reviewed to explain why individuals choose to actively participate in collective activities when the rational individual decision would be to free-ride on the efforts of others. These theories are applied to examine participation in electronic networks of practice, suggesting that participation in these networks is dependent upon 1) the attributes of the individuals in the collective, 2) the relational structure of social ties between individuals in the collective, 3) the norms of behavior of the collective, 4) the affective factors of the collective, and 5) the development of sanctions for noncompliance with network norms. This paper discusses how the ability of a network to leverage these factors to promote collective action is dependent upon the openness of the network, the extent to which the relationships in the collective are based on computer-mediated communication, and the extent to which the critical resources in the network are characterized by public or private goods.

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This paper advances information systems and virtual organization research by integrating public goods, social dilemmas and collective action theories with the study of online social structures. The paper illustrates how the specific characteristics of electronic social networks influence knowledge contribution and the sustainability of the network, using an electronic network of practice as a baseline case. Its contribution is important for the organization and comparison of prior research as well as essential for advancing the current state of the field. Another contribution is the summary of existing research on collective action from the fields of sociology and economics and how these theories are relevant for IS research. The paper can help new entrants to the field of virtual organizing gain a basic understanding of the dynamics underlying online social networks. This research is also significant for researchers in the fields of electronic communities and virtual organizing, both theoretically and practically in terms of future study design.

INTRODUCTION

Recent advances in information and communication technologies have led to the emergence of online social structures where the primary purpose is knowledge exchange. The study of these online social structures is critical because they have fundamentally altered our understanding of how and why people share knowledge, by removing the barriers of same place and same time communication. Using computer-mediated communication technologies, such as newsgroups, listservers and bulletin boards, an unlimited number of geographically dispersed individuals with diverse organizational, national, and demographic backgrounds share knowledge by helping each other solve problems, telling stories of personal experiences, and debating issues based on shared interest (Sproull and Faraj 1995; Wasko and Faraj 2000). Electronic networks enable individuals to interact around a specific practice, regardless of physical proximity or prior personal acquaintance, eliminating the need for people to know one another in order to communicate. This increases an individual's access to knowledge resources by amassing greater numbers of like-minded individuals through electronic links than previously available in a local community. This increased access improves the likelihood of connecting to others who are able and willing to help. Electronic networks also support new combinations of existing knowledge and the creation of new knowledge (Teigland 2003; Teigland and Wasko 2003).

Since electronic message postings are openly available, individuals do not have to anticipate the specific information needs of others nor do they have to identify the synergistic possibilities that arise from the potential combinations of information from multiple sources (Fulk et al. 1996).

While interest in the organizing processes underlying online social structures focused on knowledge continues to grow, we know, however, surprisingly little about how or why these structures support knowledge exchange (Desanctis and Monge 1999; Lin 2001). For instance, an enduring characteristic of these structures is the propensity of individuals to provide their valuable knowledge and insights to strangers (Kollock and Smith 1996; Rheingold 1993; Wasko and Faraj 2000), yet why individuals participate in this activity when there is no obvious benefit to them remains not well understood. Furthermore, the availability of technology to support communication does not necessarily translate into the creation of open discussion forums focused on knowledge exchange. As management in many organizations has discovered, the creation of an online social space is no guarantee that knowledge sharing will actually take place (Alavi and Leidner 1999; Orlikowski 1996). While researchers have examined why individuals share knowledge online with strangers using theories such as weak ties (Constant et al. 1996), the resource-based view of resource availability and benefit provision (Butler 2001), generalized gift exchange (Kollock 1999), and public goods (Fulk et al. 1996; Kollock 1998;

Kollock and Smith 1996; Rafaeli and LaRose 1993), these studies focused on different types of online social structures. Without clearly defining the phenomenon of interest or the key characteristics describing that phenomenon, researchers are unable to apply specific overarching theories that are appropriate and generalizable across studies, which further impedes our ability to build upon prior research and advance the field.

In order to better understand online social structures, we must be clear on what it is that we are discussing. The purpose of this paper is to advance the current state of the field by providing a model of one type of online social structure in order to make a baseline for research and improve the ability to compare across settings. While recognizing that there are many forms of online social structures, we begin by defining and describing the key characteristics of one, an electronic network of practice, in order to build a theoretical framework around a baseline case. We propose that theories of public goods, social dilemmas and collective action are informative for understanding the organizing principles and dynamics of knowledge exchange in these networks. We conclude by discussing the theoretical implications for changing some of the underlying characteristics of our definition, noting how alterations to the definition change the parameters of the network and the theories that may be applied. By doing so, we hope that this paper will be useful to researchers interested in the organizing processes of online social structures by providing insights into how to apply collective action theories within specific contexts.

DEFINING AN ELECTRONIC NETWORK OF PRACTICE

We refer to online social structures focused on knowledge exchange as “electronic networks of practice”. Although prior researchers have used the term “community” to describe these structures (i.e., electronic community of practice, electronic community, or virtual community), following Brown and Duguid (2000) we use the term “network of practice” to distinguish these social structures from “communities of practice”. According to

Brown and Duguid (2000), both terms describe work-related networks where the common denominator is a shared practice and both are critical for understanding learning and the sharing of knowledge. They describe communities of practice as a subsection of larger networks of practice, but that consist of a relatively tight-knit group of members who know each other and work together, who typically communicate face-to-face, and who continually negotiate, communicate and coordinate with each other directly. These demands of direct communication and coordination limit the size of the community, enhance the formation of strong interpersonal ties, and create strong norms of direct reciprocity between members (Brown and Duguid 2000).

Networks of practice refer to social structures that link similar individuals engaged in a shared practice, but who may never get to know one another or meet face-to-face. These networks typically consist of weak ties where individuals coordinate through third parties such as professional associations or indirect ties such as newsletters, websites, bulletin boards and listservers (Brown and Duguid 2000). We adopt the term network rather than community to distinguish between collectives characterized by sparsely connected weak, indirect ties and collectives where members are connected through frequent face-to-face interactions and direct personal ties. We add the term “electronic” to highlight that communication and coordination within this type of network of practice occurs through asynchronous computer-mediated communication and that the focal network structure exists solely in electronic space. The purpose of the network is to engage in knowledge exchange around a specific practice, and the network structure consists of the aggregation of ties between individuals that are created when individuals post and respond to messages. More precisely, *we define an electronic network of practice as a self-organizing, open activity system focused on a shared practice that exists through computer-mediated communication.* These four defining characteristics are essential for understanding how individuals communicate, coordinate and interact in these networks.

First, participation in an electronic network of practice is self-organizing and voluntary. Individuals choose whether or not they want to participate as well as how often they participate, ranging from simple observation (lurking) to active participation. Individuals voluntarily choose the manner in which they participate, such as posting questions, replies, general comments, or a mixture of these. Individuals also decide what they want to contribute, such as the specific knowledge they are willing to disclose and how much effort they are willing to expend. Because participation is self-organizing and voluntary, knowledge seekers have no control over who responds to their questions or the quality of the responses. Knowledge contributors have no assurances that the seekers being helped will ever reciprocate the favor, and lurkers may draw upon the knowledge of others without contributing. This feature of self-organizing, voluntary participation distinguishes electronic networks of practice from virtual project teams, workgroups or other collectives in which individuals are assigned tasks, required to participate and expected to coordinate their efforts to fulfill a specific obligation or goal.

Second, participation is open to anyone with an interest in the shared practice. As long as an individual has access to the technology, participation is freely available regardless of physical location, demographics, organizational affiliation, social position or personal expertise. Access to the network is open to individuals even if they do not actively post or contribute to others. Any individual with an interest in the practice may simply lurk on the network or may draw upon the knowledge of others by posting a question without contributing anything in return. This characteristic of open participation differentiates an electronic network of practice from other networks or collectives where individuals are designated and assigned or where there are limits on membership.

Third, an electronic network of practice is an activity system focused on a shared practice. Knowledge exchange occurs through the mutual engagement revolving around a shared practice, creating an activity system in which individuals help each other solve problems by interacting with one another.

Individuals requiring help post a question, reaching out to others who may provide knowledge and insight in response. This posting and responding to messages is similar to what occurs in face-to-face collaborations, representing the active mutual engagement in problem solving. While the purpose of the network is to exchange knowledge around a shared practice, such as programming languages, dieting, sports, or religion, the actual topic of the shared practice is not relevant to our definition. What is relevant is that the mutual engagement focuses on the sharing of practice-related knowledge. This feature of mutual engagement in a shared practice distinguishes electronic networks of practice from static forms of written communication such as user manuals, content delivering websites, document repositories, or other types of databases.

Fourth, an electronic network of practice exists solely through computer-mediated communication. This characteristic indicates that the focal network of interest is the one that is created through message postings that are asynchronous and text-based, which has a profound influence on how knowledge is actually shared and exchanged (Daft and Lengel 1986). Unlike knowledge exchange through verbal communication, the knowledge contained in message postings is codified. This codified knowledge may be made available to anyone with an interest in the shared practice and archived for future reference, regardless of an individual's participation in the original exchange. The technology replaces the need for same-time interactions (typical of synchronous communications) or same-place interactions, enabling individuals to participate at their own convenience. The technology removes physical restrictions based on the size of the network in terms of the number of participants, the quantity of messages, or even the size of the messages exchanged. Participation and interaction occur between people regardless of personal acquaintance, familiarity, or location. This sharply contrasts with other networks or collectives such as communities of practice, project teams, or workgroups, in which people typically know one another and interact over time, thereby creating expectations of obligation and direct reciprocity that are

enforceable through social sanctions. However, this feature of existing solely in electronic space does not mean that an electronic network of practice may not also support a physical entity, such as a professional association, nor does it mean members cannot engage in private communication outside of the electronic network of practice. Rather an electronic network of practice may exist within a wider network of practice.

For the purposes of this paper, we focus on the case of a “pure” electronic network of practice where participation is completely self-organizing and all participation is voluntary, the network is open to anyone with a connection to the Internet, the interactions reflect mutual engagement in a shared practice, and the focal network exists solely in electronic space without a comparable physical entity. We also limit our focus to electronic networks of practice that publish all message postings and make these messages available in an archive. This type of electronic network of practice is of particular interest as a baseline case because the basic tenets of what we theoretically know about knowledge exchange do not hold true in this context. For example, prior studies on knowledge exchange have consistently found that knowledge sharing is positively related to factors such as strong ties (Wellman and Wortley 1990), co-location (Allen 1977; Kraut et al. 1990), demographic similarity (Pelled 1996), status similarity (Cohen and Zhou 1991), and a history of prior relationship (Krackhardt 1992).

Although this “pure” case of an electronic network of practice may seem restrictive, there are tens of thousands of these electronic networks of practice currently thriving on the Internet, such as Usenet newsgroups. The Usenet was created in 1981 and is a key element of the Internet that has grown to include over twenty-five thousand different interest newsgroups with more than half a million postings per day by 1999 (Dern 1999). In addition to Usenet, there are thousands of other electronic networks of practice openly available through major portals such as Yahoo, AOL and Google. We limit our focus to the baseline case in order to develop a theoretical framework that is specific to this context. After articulating the

theoretical framework for the baseline case, we conclude by discussing the implications for changing our definition, thereby enabling researchers to adapt the theoretical framework presented here to fit the specific context of interest.

INTRODUCING THEORIES OF PUBLIC GOODS, SOCIAL DILEMMAS, AND COLLECTIVE ACTION

Having defined electronic networks of practice, we now turn to theories of public goods, social dilemmas, and collective action to help us better understand the social and structural dynamics underlying electronic networks of practice. We begin with a discussion of public goods.

Characteristics of Public Goods

Public goods are typically associated with two characteristics: nonrivalry and nonexcludability. The most basic definition of a public good is that it is a good that is nonrival. Nonrival means that a good is not used up or depleted in its consumption (Shmanske 1991). Typical examples of public goods include tangible goods such as public parks and lighthouses, as well as intangible or information goods such as public television and radio. Paul Samuelson (1954) first examined the nonrival characteristic of a public good and claimed that although perfectly competitive markets could bring about the optimal solution for private goods, no such market mechanisms existed for public goods. He concluded that public sector intervention would be necessary to avoid the underproduction of public goods.

The second characteristic associated with public goods is nonexcludability (Head 1962). Nonexcludability occurs when noncontributors cannot be excluded from consuming the good. In other words, nonexcludable goods are goods that all individuals in a collective may use and benefit from regardless of their contribution to its production or maintenance. Public goods are generally considered to evidence both nonrival and nonexcludable characteristics. Because public goods are not depleted in their consumption due to nonrivalry, there is no incentive to add costs by controlling access to

the public good through exclusion (Musgrave 1959). However, a connection between the two characteristics of nonrivalry and nonexcludability does not necessarily exist: a nonrival good can be excludable while a nonexcludable good can be either rival or non-rival (Shmanske 1991).

Social Dilemmas

Since Samuelson's seminal article, literally hundreds of articles have been published supporting, critiquing, and expanding on the issues of public goods, and much of this research has concluded that public goods are subject to underproduction by a collective (Shmanske 1991). The nonrival nature of a public good allows the good and its benefit to be offered to everyone in the collective, and nonexcludability influences individual decision-making about participation in the production, maintenance, or consumption of the public good. In particular, the issue of nonexcludability results in the tendency to free-ride, i.e., to consume the public good without contributing to its production or maintenance. In fact, the optimal individual decision is to free-ride and consume the public good without contributing anything in return. However, if everyone decided not to contribute, the public good would not be created and everyone in the collective would be worse off.

This paradox has been conceptualized as the well-known "Prisoner's Dilemma". In the Prisoner's Dilemma, two prisoners are taken into custody and immediately separated. These prisoners have two choices: to confess or not to confess. If both choose not to confess, then they receive a light sentence (one year). If both confess, they will both serve time, but will serve the minimum sentence (five years). If one confesses and the other does not, then the confessor will receive a very light sentence (6 months) and the nonconfessor receives the maximum (10 years). In this scenario, the dominant strategy is always to confess (defect) regardless of what the other prisoner chooses. However, this dominant strategy would lead to a defect-defect result even though both prisoners would prefer the cooperate-cooperate strategy (neither confesses). Thus, the equilibrium resulting from each individual choosing the best

individual strategy is not a Pareto-optimal outcome, i.e., where there is no other outcome that is strictly preferred by at least one individual that is at least as good for the others. The Prisoner's Dilemma game has been expanded to the N-person Prisoner's Dilemma to examine the rational behaviors of more than two individuals, where universal cooperation is preferred to universal defection yet the preferred outcome is individual defection (Heckathorn 1996). The paradox that rational individual decisions lead to collectively irrational outcomes suggests that it is impossible for rational individuals to cooperate.

Mancur Olson (1965) examined this difficulty of getting individuals to pursue collective interests to produce a public good in the *Logic of Collective Action*. Olson proposed that when the nature of the organization and services are such that no individual can be excluded from their benefits, self-interest dictates that an individual should allow the others in the collective to provide the good and then free-ride on these efforts. Basing his arguments on the premise of free-riding, Olson specifically set out to challenge the optimism of group theory that collective interests would lead to voluntary collective action (Ostrom 1990). Olson suggested that individuals seek to reap the benefits of others' participation while evading the costs to themselves because individuals who cannot be excluded from the benefits of a public good have little incentive to voluntarily contribute once the good is produced. He concludes that in a large group, individuals perceive that their individual efforts have no noticeable effect so that even in the case where there is universal consensus and a desire from the collective to produce the public good, self-interest rather than collective action is more likely to occur (Olson 1965).

These pessimistic conclusions predicting the underproduction of public goods have been termed social dilemmas. Social dilemmas arise when a set of individuals act rationally in their own self-interest, yet the sum of their actions leads to collective irrationality (Kollock 1998). There are two types of social dilemmas: the social fence and the tragedy of the commons. The social fence refers to the production of public goods, where

the social dilemma arises because the optimal individual decision is to free-ride or enjoy the public good without contributing anything to its creation or maintenance. The tragedy of the commons dilemma focuses on the consumption of a semi-public good, i.e., a good that is nonexcludable yet rival rather than nonrival. Examples of such goods include common-pool resources, such as common grazing fields, fishing grounds or water supplies. In the tragedy of the commons, the social dilemma arises because the optimal individual decision to free-ride destroys the common-pool resource, resulting in “the tragedy of the commons”.

Although public goods are subject to social dilemmas, public goods are often created and maintained through collective action, even in the face of self-interest and the ability to free-ride. In contrast to theories of social dilemmas, theories of collective action focus on how social dilemmas are avoided. Rather than focusing on free-riding behavior, collective action theories attempt to explain why individuals forego the tendency to free-ride and contribute to collective benefits. In the following section, we review collective action theories to highlight how collectives are able to overcome social dilemmas to create and maintain public goods.

Collective Action

Collective action is described as action based solely on the voluntary cooperation of individuals (Marwell and Oliver 1993) and typically involves the production of a public or semi-public good (Heckathorn 1996). Collective action researchers note that the Prisoner’s Dilemma game is confined to a narrow set of assumptions: radical uncertainty and interdependent outcomes. Once the assumption of radical uncertainty is relaxed, methods of cooperation emerge based on expectations of ongoing interactions – referred to as strategic interactions (Heckathorn 1996). Olson suggests that individuals forego the tendency to free-ride when individual efforts are visible to others in the collective, there are incentives for participation, and there exist mechanisms of coercion (Olson 1965). Overall, collective action theories focused on understanding the production of a public good break down into five related areas: 1) the

attributes of the individuals in the collective, 2) the relational structure of social ties between individuals in the collective, 3) the norms of behavior of the collective, 4) the affective factors of the collective, and 5) the sanctions for noncompliance. We examine each area below.

Attributes of Individuals in the Collective

The first stream of collective action research proposes that the population’s heterogeneity of resources and interests affects collective action and the production of public goods (Hardin 1982; Oliver et al. 1985; Olson 1965). Research in this area focuses on the attributes of the individuals within the collective, such as the amount of an individual’s resources and his or her level of interest in seeing the good realized. The heterogeneity of individual resources and interests is particularly relevant in collectives where the costs of providing the good are the same, regardless of the number of individuals contributing towards its provision. In this case, the public good may be created and sustained through the actions of a few interested and resourceful individuals, leading researchers to propose that individuals who have a greater access to resources and a higher interest in seeing the good realized will be able to create and sustain the public good for the benefit of the collective. This results in what Olson refers to as the “exploitation of the great by the small” (Olson 1965). This situation may occur when at least some subset of more interested members has an incentive to see the public good provided, even if they have to bear the full burden of providing it themselves (Olson 1965).

Relational Structure of Social Ties

The second stream of research focuses on the attributes of the aggregate network structure of social ties representing the personal relationships that exist between individuals in the collective as a whole. Initial research proposes that the overall frequency or density of social ties within a collective promotes collective action. When networks are dense, consisting of direct ties between all members, collective action is relatively easier to achieve. This argument goes back to Marx, who reasoned that the more individuals are in regular contact with one another, the more

likely they will develop a “habit of cooperation” and act collectively (Marwell and Oliver 1988).

However, some collectives may be sustained through other patterns of interactions, especially if the collective benefit is achieved through the efforts of only a few individuals. For instance, the pattern of interaction may resemble a reciprocal gift exchange. Reciprocal exchanges occur when there is an exchange between two individuals with the expectation that the gift of help will be reciprocated some time in the future (Kollock 1999). Public goods may also be provided through generalized exchange (Fulk et al. 1996). A generalized exchange occurs when one’s giving is not reciprocated by the recipient, but by a third party (Ekeh 1974). In contrast to dyadic exchange characterized by direct reciprocity and accountability, generalized exchange is based on indirect reciprocation and interest-based contribution. Thus, while it has been established that social ties are important for collective action, it is less well established as to exactly how and why social ties are important (Marwell and Oliver 1988).

Norms of Collective Behavior

Many researchers cite the importance of collective norms for supporting collective action (Coleman 1990; Nahapiet and Ghoshal 1998; Putnam 1995a; Putnam 1995b), and norms are commonly referred to as institutional structures, rules (Ostrom 1990) or conventions (Reisman 1990). Norms are standards of acceptable conduct that guide and regulate the life of a collective and develop through repeated interactions over time (Coleman 1990; Putnam 2000). Norms enable individuals to coordinate actions, provide stability, furnish information on socially acceptable behaviors, and act as a type of insurance that others will act accordingly (Reisman 1990). Norms are a key component of collective action, regardless of the actual content or substance of the norm. As Reisman notes, “It is the rule and not the content, after all, that ensures the requisite coordination of expectations and actions” (Reisman 1990). Coleman (1988) suggests that a norm exists when a socially defined right to control an action is held not by the actor but by others,

representing a degree of consensus around social action. Norms are important in that they allow collectives to function effectively to produce and maintain public goods by providing a structured set of rules for coordination, as well as setting expectations about acceptable behaviors and actions (Ostrom 1990).

Collective Affective Factors

Researchers suggest that a variety of affective factors, such as trust (McAllister 1995; Nahapiet and Ghoshal 1998; Ring and Van de Ven 1994), influence collective action. Affective factors develop from the relationships between the individuals in the collective as well as the relationships between individuals and the collective as a whole. These affective factors have been referred to as social capital (Leana and Van Buren 1999; Putnam 1995b; Putnam 2000) and relational social capital (Nahapiet and Ghoshal 1998). Other affective factors include obligation to the collective and identification with the collective (Nahapiet and Ghoshal 1998), affiliation (Leana and Van Buren 1999), commitment (Mowday et al. 1979), sentiment and ethical legitimation (Reisman 1990), and organizational citizenship (Organ 1988). These affective factors support collective action because individuals are more likely to suppress self-interest when there are strong, positive associations between individuals and the collective (Leana and Van Buren 1999).

Collective Sanctions for Noncompliance

Researchers note that collective action is more likely to occur in collectives that are able to enforce sanctions for noncompliance with collective norms (Olson 1965; Ostrom 1990). In order to enforce these sanctions, individual behavior in the collective must be monitored, which consumes time and resources that could be devoted to other activities (Ostrom 1990). However, Olson contends that in large collectives individuals will prefer to free-ride unless they are restrained and defectors punished for their actions (Olson 1965). This research concludes that the costs associated with monitoring behavior and enforcing sanctions are seen as necessary in order to sustain collective action.

In summary, the results from collective action research suggest that public goods are more likely to be created and sustained and social dilemmas avoided in collectives where there is a heterogeneity of resources and interests, a pattern of social ties that supports exchange, norms to guide collective behavior, strong affective ties between individuals and the collective, and collective sanctions punish self-interested behavior.

APPLYING PUBLIC GOODS, COLLECTIVE ACTION, AND SOCIAL DILEMMAS TO ELECTRONIC NETWORKS OF PRACTICE

In this section, we apply theories of public goods, social dilemmas, and collective action to electronic networks of practice. We focus on the purest form of our definition: networks that are completely self-emergent, open, based on the mutual engagement in a shared practice, and exist solely through computer-mediated communication. These electronic networks of practice consist of a collective of individuals voluntarily engaged in actions that benefit the collective, and their actions create a public good of knowledge in the form of archived messages. In the formal language of collective action theory, we suggest then that the participants in an electronic network of practice form the interest group or the collective. These individuals act collectively to create a continuous stream of knowledge by posting and responding to messages, and the archive of collective knowledge produced by this interaction exhibits the key characteristics of a public good. In terms of nonrivalry, the archive of collective knowledge is nonrival since the use of this knowledge by one individual does not deplete the supply of knowledge or diminish the capacity of other individuals to access and use the knowledge. Because the archive of collective knowledge is purely nonrival, free-riders do not place an extra burden on the network, reducing the need to restrict access through exclusion. Therefore, in terms of nonexcludability, we focus on electronic networks of practice that are open to anyone with an interest in the practice, making the archive of collective knowledge nonexcludable. When one participant responds to a posting, then all members may

benefit even though they did not contribute to the original exchange. Furthermore, the costs of posting a message to the network are the same, regardless of the number of individuals who benefit, indicating that the public good may be created and sustained through the efforts of a few individuals.

In an electronic network of practice, the social dilemma arises since the individual rational decision is to access the knowledge produced by others in the network without contributing anything in return. However, if all individuals were to behave in this manner then there would be no knowledge exchange, leaving everyone worse off. This leads to an interesting area of potential research based on social dilemmas, the N-person Prisoner's Dilemma and Olson's Logic of Collective Action, which assume the calculative rationality of individual self-interest and the temptation to free-ride. These theories may be useful for researchers interested in investigating free-riding and collective irrationality and why electronic networks of practice do not develop into active collectives that create and exchange knowledge.

For example, prior research suggests that in many instances online social spaces created to enhance knowledge exchange simply remain empty spaces where no one contributes and some collectives lose participants and die out over time (Desanctis and Roach 2002). Researchers assuming that rational individuals acting to maximize their own self-interest do not contribute to electronic networks of practice might examine how and when the costs of individual participation outweigh individual benefits. These costs may include individual time and effort, perceptions of self-efficacy, confidence in expressing oneself and submitting ideas to public exposure, barriers to entry such as skills with the technology or access to the technology. In addition, theories of public goods and social dilemmas may provide insights into lurking behaviors, where lurking behavior is viewed as a self-interested act of free-riding.

Additionally, theories of collective action are useful for researchers interested in examining how electronic networks of practice overcome social dilemmas. Research in this

area could focus on the attributes of the individuals in the collective, the relational aggregate network structure created through social ties, the development and role of norms to guide collective behavior, the influence of a variety of affective factors, and the creation and use of collective sanctions for self-interested behavior. We highlight below how these streams of collective action research are applicable to electronic networks of practice.

Attributes of Individuals in the Collective

Researchers have proposed that the more heterogeneous a group is, the more likely that there is a critical mass or subset of members who have a high enough level of resources and/or interests to produce the public good (Oliver et al. 1985). However, heterogeneity can also hinder collective action even when the mean levels of heterogeneity appear sufficient. As such, it has been suggested that the distribution of heterogeneity is important in terms of collective action, i.e., the more positive skew and deviation from the mean, the more likely a critical mass may result (Oliver et al. 1985). Hence, researchers interested in investigating why individuals participate and contribute messages to electronic networks of practice may want to consider the resources and interests of active participants.

In terms of resources, prior research has found that individuals who have higher levels of professional expertise and organizational tenure (Constant et al. 1996) and those who lack access to private alternatives such as co-workers or acquaintances (Wasko and Teigland 2002) are more likely to participate and provide useful advice in electronic networks. Other resources might include time, access to technology or position in the particular practice. In terms of interests, prior research indicates that individual motivations and interests such as reputation, organizational/community affiliation, access to a peer group, access to useful information, enjoyment and learning influence participation in electronic networks (Constant et al. 1996; Lakhani and von Hippel 2000; Wasko and Faraj 2000). Researchers may also consider examining individual traits, such as an individual's general propensity to help. This kind of additional research on individual

resources and interests would shed light on why individuals ask strangers for advice and why individuals help others in electronic networks of practice.

Relational Structure of Social Ties

Another area of potential research is the examination of the structure or the pattern of interactions and social ties within electronic networks of practice. As mentioned, individual participation in electronic networks of practice is reflected in the posting of questions and replies that take the form of a thread. This interaction creates a social tie between two participants, and these dyadic ties can be aggregated to examine the structure of social ties in the network as a whole. Methods such as social network analysis are helpful for this type of examination (Wasserman and Faust 1994). Research indicates that electronic networks of practice may have a network structure like a star, where a critical mass of individuals sustain the network by responding to all others in the network as a whole (Wasko and Teigland 2002). Other electronic networks of practice may be characterized by a core/periphery structure consisting of an active group of core individuals who interact mainly among themselves or by multiple core/periphery structures, also known as cliques.

The examination of the structure of social ties may also focus on the attributes of the social ties within the network. For example, previous research on computer networks has indicated that the social ties in these networks may be of a strong, intermediate, or weak nature (Wellman et al. 1996). A structural examination of an electronic network of practice that includes the attributes as well as the pattern of ties may thus shed light on the factors leading to the creation of the public good. Chances are that electronic networks of practice will exhibit a variety of network structures, but to date we know little about how network structure influences collective action or whether certain network structures are more sustainable or lead to higher outcomes, making this is another area in need of further research.

Norms of Collective Behavior

In electronic networks of practice, prior research suggests that norms develop around appropriate conduct in the network (Wasko and Faraj 2000). For instance, in some electronic networks of practice, new participants are expected to review frequently asked questions before posting their questions. Other electronic networks of practice establish various norms around the tone of the exchange, where breaches of “netiquette” result in flaming. Organizational research suggests that norms of cooperation (Nahapiet and Ghoshal 1998), reciprocity (Putnam 1995b), openness and teamwork (Starbuck 1992), and tolerance of both criticism and failure (Leonard-Barton 1995) are conducive to knowledge sharing. However, we know little about how roles develop, how norms play a role in guiding behavior or whether certain norms are more supportive of collective action in electronic networks. Thus, researchers interested in collective action in electronic networks of practice might consider examining the existence of norms in the collective, the general understanding of those norms across individuals, and the content of the norms that result in collective behaviors.

Collective Affective Factors

Affective factors such as relational social capital should also be relevant to the study of electronic networks of practice. For example, in online settings researchers have found that people with a strong sense of identification and attachment are more likely to participate and assist others (Wellman and Gulia 1997) while individuals posting valuable advice to an intra-organizational electronic network were motivated by a sense of organizational citizenship (Constant et al. 1996). Individuals from computer-focused electronic networks noted that they participated and helped others due to a moral obligation similar to “been there, done that”, to pay back to the network and the profession as a whole (Teigland 2003; Wasko and Faraj 2000), and to a sense of identification with the network and with the network’s goals (Lakhani and von Hippel 2000). Additional research in this area is needed to better understand the relational nature of the relationships in the collective and would shed

additional light on why some collectives succeed over others.

Collective Sanctions for Noncompliance

Lastly, while researchers note that collective action is more likely to occur in collectives that are able to enforce sanctions for noncompliance with collective norms, enforcing sanctions for noncompliance may be difficult or impossible in electronic networks of practice. Although active participation in the network is fully visible and easy to monitor, the open, anonymous, and electronic nature of the network makes it difficult to render and enforce significant sanctions against free-riding or other forms of defection. Attempts at sanctions such as flaming and exclusion can be observed in electronic networks of practice, but their effectiveness is unknown. For example, even when behavior is monitored and some form of sanction is applied, it is relatively simple for an individual to create a new electronic identity. This makes sanctions another area that should be researched because of the unique characteristics of electronic networks of practice as a collective. For example, evidence indicating that sanctions are not a necessary component of collective action in electronic networks would introduce an exciting alternative to current collective action theories.

STUDYING ALTERNATIVE MODELS OF ELECTRONIC NETWORKS OF PRACTICE

Thus far, we have argued that an electronic network of practice is a form of collective action consisting of a self-organizing, open activity system focused on a shared practice that exists through computer-mediated communication. We argued that public goods, social dilemmas, and collective action are useful theoretical lenses for studying electronic networks of practice and highlighted areas of current and potential future research. Each aspect of our definition is important for applying these theories, and changing any part of the definition may alter the way the theories should be applied. That is why a clear definition of the context under study is important for researchers. In fact, we offer this specific definition of a “pure” electronic network of practice to address a baseline

situation in which one would *expect the least amount* of collective action. Although this definition describes many online social structures that create an archive of collective knowledge (such as Usenet newsgroups, electronic bulletin boards, and listservers openly available on the Internet), there are many forms of electronic networks of practice that deviate from this definition and deserve separate study. Here are some examples of what we propose happens when parts of the definition of electronic networks of practice are changed.

Open Participation

While our definition focuses on electronic networks of practice that are completely open, some electronic networks of practice may have restricted access. For example, to belong to a network individuals may have to subscribe or pay membership fees, be members of a specific professional association or organization, or be recommended by other members. Theoretically, when access to a public good is limited, the public good becomes an excludable public good, which also has been referred to as a club good (Buchanan 1965). In public goods research, restricting access is typically only relevant to prevent crowding or to prevent nonpayers from accessing the public good. This would suggest that in the case of electronic networks of practice, there is little motivation to add costs by controlling access to the public good. In electronic networks of practice the public good of archived knowledge is not susceptible to crowding, and nonpayers (free-riders) do not place a burden on the network. Restricting access may have negative effects such as reducing the potential value and benefits of the public good. Mechanisms of exclusion restrict access to knowledge and the potential synergies of new knowledge creation by excluding individuals who may be able to provide additional insights. However, open networks may be more susceptible to free-riding or destructive/subversive behaviors. As mentioned above, prior research proposes that limits to group size and restricted access serve to enhance collective action because individual behavior becomes more visible the higher the density of the network (Olson 1965).

In the case where membership is restricted yet the collective is large enough that individuals are still typically strangers, then the collective action theories proposed above are still relevant. For example, prior research indicates that electronic networks of practice are sustained by a subset of active individuals that develop a recognition of one another, and this subset is surrounded by a larger set of non-recognizable individuals (Wasko and Teigland 2002). Based on collective action theories, we would expect that those individuals who are more connected to others in the network and feel stronger ties to the network are more likely to engage in collective action. In this case, theories of collective action are still applicable, and theoretically we would expect that restricted access enhances collective action but potentially excludes interested individuals from participation.

However, highly restricted access may result in personal acquaintance and recognition, so that individuals in the network are no longer strangers or relatively anonymous. In this scenario, theories of social exchange based on dyadic relationships may be more relevant than collective action theories (Blau 1964). For example, in networks consisting of known and recognized participants, individuals can base their personal interactions on the expected behaviors of other individuals. When dyadic relationships develop, the motivations of reputation and status may become more relevant, the effectiveness of sanctions and control may increase, and expectations of obligations, direct reciprocity and feelings of dyadic trust may also be strengthened (Blau 1964). In the case of tight restriction on membership and recognition between individuals, we would no longer consider the network to be an electronic network of practice, but more akin to a virtual workgroup, team or electronic community of practice.

Computer-Mediated Communication

Our definition limits electronic networks of practice to computer-mediated communication. This limitation is relevant because the phenomenon of interest is the network that is created through message exchange and the public good of knowledge that results from archiving the messages. This

does not mean that individuals participating in an electronic network of practice do not have private alternatives for communication, such as e-mail. However, private exchanges may have an impact on knowledge exchange in the network. For instance, if members prefer to privately ask each other questions without making the exchange openly available, the knowledge also remains private, which may limit the value of the public good. Exchanges that occur outside of the electronic network of practice do not become part of the public good and are considered private actions rather than collective actions, thus they fall outside the scope of the theories presented here.

Also, although we focus on electronic networks of practice that exist solely in electronic space, our definition recognizes that electronic networks of practice may be created to support communications within collectives that have a corresponding physical entity, such as professional associations. In the case of a corresponding physical entity, the collective action theories presented here still apply and may actually lead to higher levels of collective action. For example, supporting a corresponding physical entity may result in more individuals having personal, face-to-face relationships, which in turn might increase the density of the ties in the electronic network. We would also expect that a corresponding physical entity might result in stronger affective relationships characterized by trust, organizational citizenship, commitment and professional affiliation among participants and lead to higher levels of collective action. On the other hand, a physical entity may enable more private alternatives, thereby reducing the level of collective action in the electronic network of practice and limiting the creation of the public good. It is also important to note that electronic networks of practice that support a corresponding physical entity may no longer be completely open. As noted above, the relevance of collective action theories also depends upon the extent of restricted access, which may have both positive and negative consequences. Therefore, another interesting area of future research examines whether collective action in electronic networks of practice is more successful when the practice of interest corresponds to a physical entity such as a

profession, and whether or not this success is attributable to characteristics of the physical entity, restricted access or a combination of both.

Public Good or Virtual Common

We have proposed that the knowledge generated and archived through message postings is a pure public good, nonrival in its consumption and nonexcludable once produced. Because we assume that the knowledge is not depleted in its consumption, anyone with an interest in the practice can access the knowledge without diminishing the availability to others. Under this condition, free-riders or lurkers have no impact on collective benefits. However, not all forms of knowledge exchange produce a public good. For example, some electronic networks have a norm where questions are posted publicly to the network, but responses are sent privately to the individual posting the question rather than to the network as a whole. In this scenario, there is the potential for the same question to be asked multiple times, which creates additional costs every time answers have to be repeated. These networks would still be considered electronic networks of practice and researchers could still apply theories of collective action, but the scenario changes. The mutual engagement in practice is no longer visible to everyone in the network (potentially reducing the motivations of status and reputation, the ability to monitor, and the effectiveness of social sanctions), and the collective action does not result in a public good available to all. Applying collective action theories, in this case we might expect lower levels of collective action and lower levels of collective benefits since the knowledge is not made publicly available as a collective good. This is another area in need of further research.

Finally, although we focus on collective action that results in an archive of messages, which creates a pure public good, there are other resources in electronic networks of practice that may be rival or subtractable (i.e., used up in their consumption). Researchers have suggested that electronic networks of practice may be conceptualized as common-pool resources rather than public goods (Kollock 1999; Kollock and Smith 1996; Lee

2002). A common-pool resource is a resource that is sufficiently large so as to make it costly to exclude beneficiaries, even though it is subtractable rather than nonrival and diminishes with consumption (Ostrom 1990). This leads to the second type of social dilemma, the tragedy of the commons. The tragedy of the commons dilemma involves the *consumption or replenishment* of a common-pool resource where the use of the common-pool resource by one individual diminishes the availability of the resource to another individual, resulting in the “tragedy of the commons” (Kollock and Smith 1996).

Examination of the commons dilemma and the exploitation of rival resources in electronic networks of practice is another area in need of further research. For example, one potentially subtractable resource is the bandwidth made available by the technology. In this case, activities that waste bandwidth, such as spam (mass messages that are off-topic), can lead to the destruction of the resource unless controlled (Lee 2002). Another potential subtractable resource is the pool of collective expertise or individual attention available to the collective. Given a finite amount of expert knowledge and individual attention available to the electronic network of practice, posting questions without responding to others in return may consume the common-pool resource of expert attention. Another set of problems arises when the network becomes so large in terms of the number of available messages, that individuals have a difficult time “separating the wheat from the chaff”. We propose that theories of collective action are still relevant in this context, and this area of research is particularly relevant since acts of self-interest and free-riding actually destroy common-pool resources. Thus, a final area of potential

research is the examination of resources in electronic networks of practice that are rival through applying theories of collective action and the tragedy of the commons dilemma.

CONCLUSION

Although there has been a significant increase in networked communication and growing interest in the topics of virtual organizing, to date researchers have yet to establish consistent terminology describing the context of interest and have paid little attention to how specific characteristics of electronic networks influence social dynamics. In addition, advances in this area have been hampered by the lack of theoretical development and consistent theoretical application. Our purpose was to offer a clear definition of one type of online social structure, an electronic network of practice, and describe its key characteristics. We then proposed that theories of public goods, social dilemmas, and collective action may facilitate our understanding of a variety of issues in electronic networks of practice. We ended the paper by discussing how altering our definition of an electronic network of practice and how changing the focus from a public good of archived messages to a common-pool resource may change the theories that apply. A major conclusion of this paper is that researchers investigating the dynamics of electronic networks of practice should pay careful attention to the actual characteristics of the electronic network since these defining characteristics are important for theory selection and the generalizability of findings. Researchers should also be aware of the characteristics of the collective good, whether public or common, and select the appropriate theories and methods for study.

REFERENCES

- Alavi, M., and D. Leidner, "Knowledge Management Systems: Issues, Challenges and Benefits," *Communication of the Association for Information Systems* (1) 1999, pp 1-28.
- Allen, T.J., *Managing the Flow of Technology* MIT Press, Cambridge, MA, 1977.
- Blau, P.M., *Exchange and Power in Social Life* Wiley, New York, 1964.
- Brown, J.S., and P. Duguid, *The Social Life of Information* Harvard Business School Press, Boston, MA, 2000.
- Buchanan, J.M., "An Economic Theory of Clubs," *Economica* (32:February) 1965, pp 1-14.

- Butler, B.S. "Membership Size, Communication Activity, and Sustainability: A Resource-Based Model of Online Social Structures," *Information Systems Research* (12:4) 2001, pp 346-362.
- Cohen, B.P., and X. Zhou, "Status Processes in Enduring Work Groups," *American Sociological Review* (56:179-188) 1991.
- Coleman, J.S., "Social Capital in the Creation of Human Capital," *American Journal of Sociology* (94) 1988, pp S95-S120.
- Coleman, J.S., *Foundations of Social Theory* Belknap Press of Harvard University Press, Cambridge, MA, 1990.
- Constant, D., L. Sproull, and S. Kiesler, "The Kindness of Strangers: The Usefulness of Electronic Weak Ties for Technical Advice," *Organization Science* (7:2) 1996, pp 119-135.
- Daft, R.L., and R.H. Lengel, "Organizational Information Requirements, Media Richness and Structural Design," *Management Science* (32:5) 1986, pp 355-366.
- Dern, D., "Usenet -- Still Useful after All These Years," in: *BYTE*, 1999.
- Desanctis, G., and P. Monge, "Communication Processes for Virtual Organizations," *Organization Science* (10:6) 1999, pp 693-703.
- Desanctis, G., and M. Roach, "Age, Size, and Contribution Dynamics in Online Learning Communities," Academy of Management Conference, Denver, CO, 2002.
- Ekeh, P.P., *Social Exchange Theory: The Two Traditions* Harvard University Press, Cambridge, MA, 1974.
- Fulk, J., A.J. Flanagin, M.E. Kalman, P.R. Monge, and T. Ryan, "Connective and Communal Public Goods in Interactive Communication Systems," *Communication Theory* (6:1) 1996, pp 60-87.
- Hardin, R., *Collective Action* Johns Hopkins University Press, Baltimore, MD, 1982.
- Head, J.G., "Public Goods and Public Policy," *Public Finance* (17:3) 1962, pp 197-219.
- Heckathorn, D.D., "The Dynamics and Dilemmas of Collective Action," *American Sociological Review* (41:April) 1996, pp 250-277.
- Kollock, P., "Social Dilemmas: The Anatomy of Cooperation," *Annual Review of Sociology* (24) 1998, pp 183-214.
- Kollock, P., "The Economies of Online Cooperation: Gifts, and Public Goods in Cyberspace," in: *Communities in Cyberspace*, M.A. Smith and P. Kollock (eds.), Routledge, London, 1999, pp. 220-239.
- Kollock, P., and M.A. Smith, "Managing the Virtual Commons: Cooperation and Conflict in Computer Communities," in: *Computer-Mediated Communication: Linguistic, Social and Cross Cultural Perspectives*, S. Herring (ed.), John Benjamins, Amsterdam, 1996, pp. 109-128.
- Krackhardt, D., "The Strength of Strong Ties: The Importance of Philos in Organizations," in: *Organizations and Networks: Structure, Form, and Action*, N. Nohria and R. Eccles (eds.), Harvard Business School Press, Boston, 1992, pp. 216-239.
- Kraut, R.E., C. Egidio, and J. Galagher, "Patterns of Contact and Communication in Scientific Research Collaboration," in: *Intellectual Teamwork*, J. Galagher, R.E. Kraut and C. Egidio (eds.), Lawrence Erlbaum Associates, Hillsdale, NJ, 1990.
- Lakhani, K., and E. von Hippel, "How Open Source Software Works: "Free" User-to-User Assistance," The 3rd Intangibles Conference. Knowledge: Management, Measurement and Organization, Stern School of Business, NYU, 2000.
- Leana, C.R., and H.J.I. Van Buren, "Organizational Social Capital and Employment Practices," *The Academy Management Review* (24:3) 1999, pp 538-555.
- Lee, H. "'No Artificial Death, Only Natural Death': The Dynamics of Centralization and Decentralization of Usenet Newsgroups," *The Information Society* (18) 2002, pp 361-370.
- Leonard-Barton, D. *Wellsprings of Knowledge: Building and Sustaining the Sources of Innovation* Harvard Business School Press, Boston, 1995.
- Lin, N. *Social Capital* Cambridge University Press, Cambridge, UK, 2001.
- Marwell, G., and P. Oliver, "Social Networks and Collective Action: A Theory of the Critical Mass Iii," *American Journal of Sociology* (94:3) 1988, pp 502-534.

- Marwell, G., and P. Oliver, *The Critical Mass in Collective Action: A Micro-Social Theory* Cambridge University Press, New York, 1993.
- McAllister, D. "Affect- and Cognition-Based Trust as Foundations for Interpersonal Cooperation in Organizations," *Academy of Management Journal* (38:1) 1995, pp 24-59.
- Mowday, R.T., R.M. Steers, and L. Porter, "The Measurement of Organizational Commitment," *Journal of Vocational Behavior* (14) 1979, pp 224-247.
- Musgrave, R.A. *The Theory of Public Finance* McGraw-Hill, New York, 1959.
- Nahapiet, J., and S. Ghoshal, "Social Capital, Intellectual Capital, and the Organizational Advantage," *Academy of Management Review* (23:2) 1998, pp 242-266.
- Oliver, P.E., G. Marwell, and R. Teixeira, "A Theory of Critical Mass I: Group Heterogeneity, Interdependence and the Production of Collective Goods," *American Journal of Sociology* (91) 1985, pp 522-556.
- Olson, M., *The Logic of Collective Action* Harvard University Press, Cambridge, MA, 1965.
- Organ, D.E., *Organizational Citizenship Behavior* Lexington Publishers, Lexington, MA, 1988.
- Orlikowski, W.J., "Learning from Notes: Organizational Issues in Groupware Implementation," in: *Computerization and Controversy*, R. Kling (ed.), Academic Press, New York, 1996, pp. 173-189.
- Ostrom, E., *Governing the Commons: The Evolution of Institutions for Collective Action* Cambridge University Press, Cambridge, 1990.
- Pelled, L.H., "Demographic Diversity, Conflict, and Work Group Outcomes: An Intervening Process Theory," *Organization Science* (7) 1996, pp 615-631.
- Putnam, R., "Bowling Alone: America's Declining Social Capital," *Journal of Democracy* (6) 1995a, pp 65-78.
- Putnam, R., "Tuning in, Tuning Out: The Strange Disappearance of Social Capital in America," *Political Science and Politics* (December) 1995b, pp 664-683.
- Putnam, R.D. *Bowling Alone* Simon & Schuster, New York, 2000.
- Rafaeli, S., and R.J., LaRose, "Electronic Bulletin Boards and 'Public Goods' Explanations of Collaborative Mass Media," *Communications Research* (20:2) 1993, pp 177-197.
- Reisman, D., *Theories of Collective Action: Downs, Olson and Hirsch* The Macmillan Press Ltd, Hong Kong, 1990.
- Rheingold, H., *The Virtual Community: Homesteading on the Electronic Frontier* Addison Wesley, Reading, MA, 1993.
- Ring, P.S., and A.H., Van de Ven, "Developmental Processes of Cooperative Interorganizational Relationships," *Academy of Management Review* (19) 1994, pp 90-118.
- Samuelson, P.A., "The Pure Theory of Public Expenditure," *Review of Economics and Statistics* (36) 1954, pp 387-390.
- Shmanske, S., *Public Goods, Mixed Goods, and Monopolistic Competition* Texas A&M University Press, College Station, 1991.
- Sproull, L., and S. Faraj, "Atheism, Sex and Databases: The Net as a Social Technology," in: *Public Access to the Internet*, B.K.J. Keller (ed.), MIT Press, Cambridge, MA, 1995, pp. 62-81.
- Starbuck, W.H., "Learning by Knowledge Intensive Firms," *Journal of Management Studies* (29:6) 1992, pp 713-740.
- Teigland, R., *Knowledge Networking: Structure and Performance in Networks of Practice*, Published Doctoral Dissertation, Stockholm School of Economics, Stockholm, 2003.
- Teigland, R., and M. Wasko, "Integrating Knowledge Through Information Trading: Examining the Relationship Between Boundary Spanning Communication and Individual Performance," *Decision Sciences* (34:2) 2003, pp. 261-286.
- Wasko, M., and S. Faraj, "It Is What One Does: Why People Participate and Help Others in Electronic Communities of Practice," *Journal of Strategic Information Systems* (9:2-3) 2000, pp 155-173.

- Wasko, M., and R. Teigland, "The Provision of Online Public Goods: Examining Social Structure in a Network of Practice," *Proceedings of the 23rd Annual International Conference on Information Systems*, Barcelona, Spain, 2002.
- Wasserman, S., and K. Faust, *Social Network Analysis* Cambridge University Press, Cambridge, 1994.
- Wellman, B., and M. Gulia, "Net Surfers Don't Ride Alone," in: *Communities in Cyberspace*, P. Kollock and P. Smith (eds.), University of California Press, Berkeley, 1997.
- Wellman, B., J. Salaff, D. Dimitrova, L. Garton, M. Gulia, and C. Haythornthwaite, "Computer Networks as Social Networks: Collaborative Work, Telework, and Virtual Community," *Annual Review of Sociology* (22) 1996, pp 213-238.
- Wellman, B., and S. Wortley, "Different Strokes for Different Folks: Community Ties and Social Support," *American Journal of Sociology* (96) 1990, pp 558-588.

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