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Abstract

According to public goods theory, there should be a deficiency of knowledge shared in electronic discussion groups (EDG) because self-interested individuals would be motivated to receive others' knowledge but not to share their own. A number of motivators (such as generalized reciprocity, altruism, and normative obligations) have been proposed to explain why people actually do share their knowledge in such settings, and empirical research has confirmed that people do express these motivations for sharing their knowledge. However, the simple picture of individuals sharing knowledge that is known to be true limits our ability to understand what actually is going on in EDG. This paper develops a typology of interactions that may arise in electronic discussion groups and argues that several of these types of interactions confer benefits onto participants that may well motivate them to contribute their knowledge, even in settings where traditional motivators may be weak or absent. In particular, the process whereby anomalies are reconciled and the provision of knowledge to conduct remote-controlled experiments both stand to generate returns to those who contribute that are not available to those who "lurk."

Keywords: Knowledge management, knowledge sharing, knowledge creation, electronic discussion groups, electronic communities.

> "The most exciting phrase to hear in science, the one that heralds new discoveries, is not 'Eureka!' (I've found it!), but 'That's funny...' "
> (generally attributed to Isaac Asimov)

INTRODUCTION

There has been considerable growth over the past two decades in the use of electronic discussion groups (EDG), also known as bulletin boards, list-serves, collaborative media, and discussion forums. Spurred by the widespread availability of computing and communication facilities and the Internet boom, EDG have become common within organizations and external to them. By one estimate (Dern 1999), the public discussion groups known as Usenet receive in excess of 500,000 new messages per day, which does not include traffic on list-serves and limited-access discussion groups.

A considerable body of research in the information systems literature examines the impact of such discussion groups on individuals, organizations, and communities. For example, Karsten (1999) reviewed 18 case studies of the implementation of commercial EDG software (Lotus Notes) for inducing collaboration. More recently, Alavi and Leidner (2001) cast EDG as a type of knowledge management system that enables knowledge sharing. Research also exists that seeks to understand why people share their knowledge via EDG (e.g., Constant et al. 1996; Lakhani and von Hippel 2000; McLure Wasko and Faraj 2000). This is a particularly interesting question, as the EDG setting (especially in settings where participants share no social bonds) weakens the explanatory power of many traditional theories that explain cooperation among strangers.

A situation where members of a collective could benefit from accessing others' knowledge but have no incentives to share their knowledge with others is an example of a social dilemma (Dawes 1980) that would result in a deficiency in knowledge sharing behavior. Economic theories have addressed such problems of collective action among self-interested individuals through the concept of a *public good* (e.g., Samuelson 1954). A public good provides a potential benefit to all members of a community regardless of whether they contributed toward its creation (e.g., parks, lighthouses, national defense). Information and knowledge can be seen as public goods (e.g., Connolly and Thorn 1990). In their thorough integration and extension of public goods theory and information/communication technologies, Fulk et al. (1996) proposed a variety of benefits available to participants in what they termed *communal public goods*, which includes EDG. Beyond directly benefitting from others' contributions, Fulk et al. argued that assembling disparate information can in and of itself create value for participants and point to census records as an example of a type of information that, when assembled, holds greater value to the collective than does each individual piece of census information to each individual.

Fulk et al. also draw on public goods theory in their description of situations where individuals may be motivated to draw on a jointly held body of information but shirk their responsibility of contributing to it. Public goods are characterized by (1) *jointness of supply*, where one individual's consumption of the good does not reduce the amount available to anyone else (Hardin 1982), and (2) *impossibility of exclusion*, where it is impossible to prevent others from consuming the good (Barry and Hardin 1982). Together, these two conditions create a situation where individuals can benefit from a public good without having to contribute toward its creation or maintenance. Olson (1965) provided the most extreme form of this argument in the form of the "zero-contribution thesis," namely that rational, self-interested individuals would not contribute toward the production of a public good without some form of external incentive. While this position has softened over the years, it is still accepted that there is likely to be an under-supply of public goods in such situations because of "free riding" (Sweeney 1973). Thus, public goods theory would suggest that individuals would be unlikely to contribute their knowledge in EDG, despite their desire to benefit by receiving others' knowledge.

In spite of this apparent social dilemma, research (e.g., Constant et al. 1996) has shown that some individuals do in fact share their knowledge in such situations. This paper reviews explanations for this behavior that have been corroborated through empirical research, and argues that existing explanations consider only a simple form of knowledge-sharing in response to a request for assistance. A more detailed typology of ideal-type responses to requests for assistance is developed, including types of responses that have not previously been discussed in the literature. Without rejecting existing motivations, this paper argues that these types of exchanges have direct benefits for participants, which suggests that they are likely to occur even in environments devoid of traditional motivators. A better understanding of these forms of exchange may also improve our ability to explain knowledge-sharing behavior in EDG even when traditional motivations are also present.

MOTIVATION TO SHARE KNOWLEDGE

There are a variety of explanations for why individuals share their knowledge with distant strangers, many of which are not mutually exclusive. Although a complete review of explanations for what motivates individuals to perform social acts that provide them with no apparent benefit is beyond the scope of this paper, key arguments will be summarized in this section.

Connolly and Thorn (1990) used public good theory to theorize about individuals' contributions of information to what they term a *discretionary database*, described as "a shared pool of data to which several participants…may, if they choose, separately contribute information." Electronic discussion groups are a type of discretionary database. Connolly and Thorn argued that individuals contribute to discretionary databases because of the expectation that they will benefit from others' contributions in the future. This is termed *generalized reciprocity*: individuals are motivated to help others when they can reasonably expect that some other member of the group (not necessarily the one helped) will reciprocate in the future (e.g., Ekeh 1974). When individuals collectively believe that such future benefits are worth the cost of contributing advice in the present, they may be motivated to do so.

Another economic explanation rests on the *reputation-enhancing* effect of providing advice that generates increased future returns for the advice-giver (e.g., Rheingold 1993). Such an explanation is clearly only valid where an improved reputation can generate some tangible benefits, such as enhanced career prospects. Lerner and Tirole (2000) argued along these lines when they described how open-source software developers held career interests and reputation as strong motivators for their time contribution to the development of a public good.

A related explanation is provided in *social exchange theory* (e.g., Blau 1964), which posits that individuals naturally engage in long-term patterns of monetary and non-monetary exchanges with others. Social exchange theory builds on the norm of reciprocity (Gouldner 1960), which motivates individuals to repay others who have helped them in some way. For example, employees may help others because they view such behavior as repayment for (or in anticipation of) benefits such as status, support, or promotions received from their organization. Other phenomena described by social exchange theory include advice-sharing in communities of practice (e.g., Orr 1990), a more specific form of reciprocity among peers where sharing knowledge may result in improved reputation, respect, and the right to call on others for return favors in the future.

Another explanation for contributions is an individual's sense of *public duty* (e.g., Schwartz 1970). In this vein, Brown and Duguid (1998) argued that community members support each because they share common bonds. Similarly, Constant et al. (1994) proposed a theory of information sharing built in part around the idea that individuals perceive normative obligations that motivate them to share information with other organizational members. Normative beliefs may be important motivators of knowledge sharing behaviors.

There are a host of other psychological explanations for helping others in this way. Advice-providers may experience a positive impact on their self-esteem (Constant et al. 1996), feelings of technical competency (Goodman and Darr 1996) or ego gratification (Lerner and Tirole 2000) by contributing advice to others. The literature on pro-social and organizational citizenship behaviors (e.g., Brief and Motowidlo 1986; Organ 1990) suggests that such extra-role behavior may also result in improved self-esteem or self-image. Further, Kollock (1999) argued that the act of helping others improves individuals' beliefs that they can positively affect their environment, improving their self-efficacy (e.g., Bandura 1995). Finally, individuals may simply enjoy seeing the positive results that come about because of their altruistic acts (Rioux 2000). The important common denominator here is that the act of sharing knowledge (absent of any reciprocating effects) produces psychological benefits that are inherently motivating.

There may also be *manipulative* benefits to sharing knowledge, either to mislead someone by providing inaccurate knowledge, or to provide accurate knowledge to elicit behavior that furthers certain values and goals rather than to purely solve the problem at hand. The manipulative benefits of providing advice are well-documented elsewhere (e.g., Cialdini 1993; Machiavelli 1532/1950). Particularly in situations characterized by high causal ambiguity, an individual may provide advice that is entirely false in its justifications in order to reap some benefit. However, the very real possibility that other group participants will blow the whistle on such deception may bound its likelihood of occurring.

In summary, many explanations may describe why individuals share their knowledge in situations without apparent direct benefits. Without challenging the validity of these explanations, the following section proposes two types of knowledge exchange not previously discussed in the literature and argues that they can create direct economic benefits to participants. They can thus be explained from a simple perspective of self-interest, which remains robust even under conditions where many of the explanations offered in this section are likely to be significantly weakened.

KNOWLEDGE SHARING IN EDG

The explanatory power associated with the motivations described in the previous section is likely to weaken in an EDG context, where participants have fewer social ties or common bonds (Krackhardt 1992), and most particularly when they share no organizational affiliation. There are at least four reasons to expect that individuals would be less inclined to share knowledge in such settings:

1. Monitoring for compliance with group norms (Ostrom 2000) is difficult in an EDG because of the impossibility of differentiating between silence and knowledge-withholding (e.g., Durnell Cramton 2001), particularly when groups are large and overall patterns of communication are irregular (Fulk et al. 1996). It is thus difficult to enforce sanctions against free-riders who consume advice but refuse to provide it.

2. Individuals must expend effort not only in formulating a response to a request for advice, but in a large EDG, a potential advice-provider may have to read through many requests before finding one to which they can respond (Lakhani and von Hippel 2000). The costs so imposed on individuals may dissuade them from participating at all.

3. Information and knowledge are unlike most public goods in that their contribution has potential benefit to everyone except the individual who contributes it (Connolly and Thorn 1990). When by definition the content of one's own advice cannot benefit oneself, the incentive to contribute is lower.

4. Individuals who lack shared goals may be competing in some way, which makes the provision of advice even less likely. Consider an EDG where exchanges are made in public, without detailed knowledge about who is listening and their motivation. The risks associated with possibly rivalrous consumption of advice grow significantly, as every "lurker" might benefit from reading a contribution. The use of advice in this way is, therefore, closer to a common-pool resource (e.g., Hardin 1968) than a public good, as others' use of one's advice may actually reduce its value to the original provider (Fulk et al. 1996).

Despite these costs, people do respond to messages posted on public EDG. Several empirical attempts to explore why this happens have been published. The first major study of this nature in the information systems literature was performed by Constant et al. (1996), who surveyed employees contributing advice in an discussion group intended as a computer help line. They found support for psychological gratification, fairness, organizational rewards, and a sense of duty as motivators for providing technical advice to strangers within a firm. However, Constant *et al.* also reported that individuals who provided advice were willing to spend an average of only nine minutes per response; while it is possible that the kind of advice exchanged required only such brief efforts, it is also possible that these motivators were insufficient to encourage more extensive knowledge sharing.

Research by Lakhani and von Hippel (2000) extended the Constant et al. (1996) study to an EDG setting where individuals posted questions and answers about Apache Web Server, a piece of open source software developed and supported by users. Most participants in this discussion group had no direct interaction and did not share employment ties through a common organization. In this study, respondents reported being motivated to answer questions because of benefits associated with reciprocity, reputation, intrinsic rewards, and identification with a common "cause" (namely, the provision of open source software). Lakhani and von Hippel also found that individuals who provided technical advice to strangers were willing to do so only when it took no more than a few minutes of their time and involved virtually no problem-solving effort. Further, in describing their research into open-source software development, Markus et al. confirmed the need to examine the cost of participation in their assertion that "professionals cannot afford to be indifferent to economic issues" (2000, p.18). The effect of these motivations seems clearly bounded by the costs they impose.

Most recently, McLure Wasko and Faraj (2000) collected open-ended responses from individuals who had posted messages to one of three technical Usenet newsgroups. Because this respondent pool included both those who posted questions and those who posted answers, the motivations they described did not purely apply to those who shared their knowledge with someone who needed help. However, McLure Wasko and Faraj found support for personal gain, satisfaction, exposure to new knowledge, duty, reciprocity, and support of a cause as motivators for participation. Their results also identified a set of barriers to participation, including the number of postings and the possibility of getting into a destructive argument with another member.

Together, these three studies present a complex picture of motivation for contributing knowledge in an EDG. While it can be argued that such motivators weaken as participants to an EDG share fewer common bonds (social, organizational, or ideological), the extent to which this occurs remains an empirical question for future research.

A common limitation to these studies is the assumption that the information or knowledge content transmitted via EDG confers benefits onto participants because it is true; individuals are thus thought to share advice that accurately reflects reality (or is at least believed to be true) and can be acted on by a recipient to solve some problem. Yet, much more goes on in EDG than the transmission of justified true beliefs. The following section will decompose the simple provision of such knowledge in response to a question into a more detailed typology of exchanges that may increase our understanding of why individuals participate in EDG.

OBSERVATIONS, EXPLANATIONS, AND ANOMALIES

Some basic distinctions between several types of knowledge serve to improve our understanding of the motivations for participation in EDG. Many taxonomies of knowledge (e.g., Machlup 1980) differentiate between observations and explanations. *Observations* are descriptions of phenomena that do not contain any assertions of causality. Observations are also termed "know-that," as in "I know that the car is red." *Explanations* are the cause-and-effect relationships that enable prediction, described by Duncan and Weiss as "knowledge about action-outcome relationships and the effect of the environment on these relationships" (1979, p. 84). Explanations fall into categories of knowledge termed "know-how" or "know-why," as in "The car will not function properly when the battery is dead."

Observations are made sensible through the use of explanations. Observations that cannot be explained are *anomalies*. Anomalies may be reconciled individually (e.g., through experimentation) or collectively (by soliciting similar observations and explanations from others); once they have been explained, they are no longer anomalies. To explain an anomaly, therefore, requires the development of cause-and-effect relationships that reconstruct the anomalous observations to be the result of some known source(s) of causality. For example, if my car is not functioning properly, I can conjecture that the battery may be dead and test this explanation using booster cables.

The accuracy of conclusions an individual can reach about some phenomenon is limited by the observations and explanations that he or she knows. Perfect knowledge of cause-and-effect relationships does not imply that one can draw correct conclusions from an incomplete observation. The reverse is also true: perfectly complete observations do not compensate fully for incomplete causal knowledge. Although the mix will vary from situation to situation, some combination of observations and explanations is necessary to reach an accurate conclusion.

Perhaps the most interesting anomalies are those that defy explanation by a group of individuals who have extensive knowledge of the domain in which the anomaly exists. Such anomalies represent an opportunity to extend knowledge beyond what is known. On a more mundane level, the presence of an anomaly to a single individual may indicate that the limit of that individual's knowledge has been reached, which can motivate that individual to seek explanations from others. EDG provide a context for individuals to extend their knowledge in both of these ways, which will be examined in more detail in the following section.

ANOMALY RECONCILIATION

This section develops a simple flowchart that can be used to decompose what is traditionally considered to be knowledge-sharing into a variety of different phenomena. This discussion is framed in the language of anomalies and explanations developed in the previous section, which provides us with a greater fidelity than does the term "knowledge sharing" in differentiating between different kinds of knowledge sharing interactions.

The proposed model shows different types of interactions between a *Requester*, who describes an observation that to him/her is an anomaly and asks for help, and a *Responder*, who hears the request and may or may not be capable of providing assistance. Figure 1 depicts a set of possible responses to a request, assuming that the Responder is suitably motivated to assist the Requester. The question of motivation is, of course, the central issue in this paper; the assumption that motivation exists is made here purely to illustrate ideal-type responses that would bring maximum benefit to the Requester.

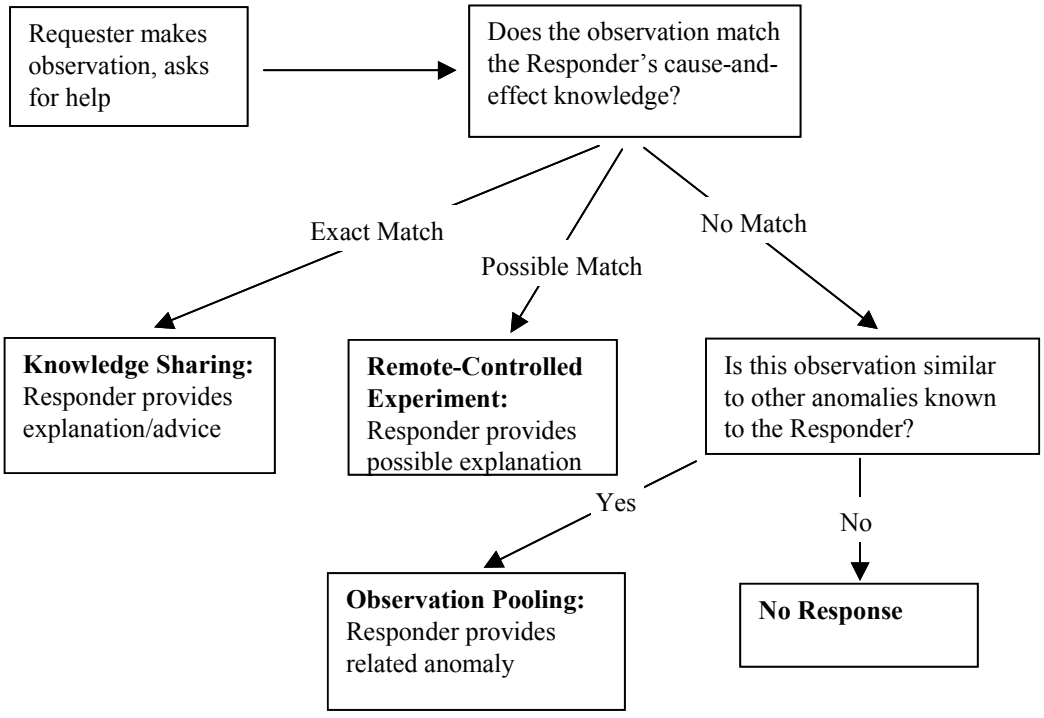

Figure 1. Possible Responses to a Request for Assistance

Knowledge Sharing

Part of Figure 1 depicts a simple advice-giving path that parallels much of what has been described as "knowledge sharing." Following the posting of an observation, a Responder reads it and notices that the observation corresponds exactly to some phenomenon that is explained by the Responder's own knowledge about cause-and-effect relationships. If the Responder understands enough about the Requester's problem context, he/she can provide an explanation and/or prescribe a course of action that solves the problem. Although explanations are not necessarily required to justify recommending some action to the Requester, the presence of an explanation (i.e., describing the key parts of the observation and relevant cause-and-effect explanations) may help the Requester better understand the problem and course of action prescribed. Such advice has value as it improves the Requester's ability to both explain his or her observation and take effective action. Over time, the transmission of questions and advice in this way forms the raw material that can be combined to produce additional benefits (as described by Fulk *et al.,*1996); for instance, all responses on a particular topic are sometimes collected and synthesized into an F.A.Q. (Frequently Asked Questions) file.

Remote-Controlled Experiment

An interesting possibility arises when a Responder is not entirely sure that his/her knowledge applies to the problem at hand, but provides it to the Requester as a form of remote-controlled experiment. In such a situation the Responder provides cause-and-effect hypotheses, prescribes a course of action for the Requester to take, and asks the Requester to report back with the outcome. This is an interesting example of a low-risk, low-cost mechanism by which the Responder can expand his/her knowledge, as the effort required to act on the advice and the risk of negative outcomes are borne by the Requester. Indeed, the Responder's knowledge is improved regardless of whether the advice solves the problem. If the Requester reports back that the problem has been solved, then the Responder has a broadened understanding of the applicability of that cause-and-effect knowledge. If the problem is not solved, the Responder is now aware of a new boundary condition on his/her knowledge. The Responder has used the Requester as a form of extended hypothesis testing system, and the resulting improvements in his/her own knowledge represents a rational motivator for individuals to respond to requests for assistance.

Observation Pooling

The question-and-advice perspective on group interaction describes an interesting subset of the body of knowledge-transferring interactions occurring between individuals. However, it assumes that the Responder knows enough to provide advice; clearly, this is not always true. A second path, therefore, addresses possible responses in a situation where the Responder has insufficient cause-and-effect knowledge to guide the Requester, but has observed a similar anomaly and describes it to the Requester. This may take the form of observations describing similar or related anomalies, possibly accompanied by candidate (tentative) explanations. Such non-conforming observations could be erroneous (a "blip"), could be misinformed (the individual is merely unaware that an explanation exists), could represent a previously overlooked relationship (a "discovery"), or could be indicative of a novel class of phenomena that has only recently emerged (a "trend").

By itself, the value of an anomaly is uncertain. Although greater certainty can be achieved in ways that do not require communication with others (e.g., experimentation, further observation, etc.), it can also be achieved by sharing anomalous observations with a peer group in order to elicit other related observations and/or candidate explanations. If no explanations exist, such a process may result in a pool of anomalous observations. By pooling observations, the group expands the available data upon which conclusions of cause-and-effect can be based. This process may generate knowledge that has never existed before in the group.

Interestingly, the creation of such a pool of observations can be the result of individually self-interested behavior alone. This is important because it means that this behavior will exist under a robust set of conditions. The presence of (potentially valuable) observations implies a solid rationale for participation in EDG by individuals who have neither an anomaly for which they are seeking assistance, nor even the belief that they might benefit from others' advice. Quite simply, individuals may view such a discussion group as a form of risk sharing. Particularly when there is a relatively low possibility that any given member may discover a valuable anomaly, individuals can benefit by paying attention to anomalous observations as potential triggers for knowledge creation. The extent to which individuals may benefit from observation pooling is dependent on their domain knowledge: those with high domain knowledge (i.e. experts) are more capable than novices of recognizing cause-and-effect relationships represented in pooled observations and are, therefore, able to extract more value from the same set of pooled observations than are novices.

Individuals who communicate via EDG often have a parallel capacity to communicate directly via e-mail. Discussions may leave the public space to be continued in detail between interested participants in a private venue. The possibility that this could happen provides an incentive for individuals to participate in attempts to explain anomalies that interest them, as those who do not demonstrate some willingness to share what they know are unlikely to be invited to participate in an ongoing private exchange on the topic. Demonstrating one's interest publicly both signals an interest in further participation and a willingness to act in the collective interest. Once such a discussion "goes private," many of the disincentives associated with large groups disappear (for instance, it becomes much easier to monitor compliance). The possibility of being left out of valuable private discussions is, therefore, a real incentive to encourage contribution and discourage free-riding by lurking. Although others (e.g., Fulk et al. 1996) have also noted the possibility that private discussions could parallel public discussions, the idea that the very threat of this happening could motivate contributions has not been previously pursued in the literature.

Novices and experts, therefore, stand to benefit in different ways from participation in EDG. Novices are likely to benefit most from experts' advice, which may save them time and effort in solving their problems. Experts are unlikely to benefit from novices' advice, but are more capable of deriving useful cause-and-effect generalizations from anomalies because of their more extensive domain knowledge. Beyond these effects, all participants are motivated to contribute their knowledge as a way of signalling their willingness to act selflessly, thereby improving the chance that they will be included in valuable private discussions that may ensue.

There are, of course, costs associated with posting anomalies. The risk that an anomaly may represent a discovery whose value is lost when broadly shared must be considered. Also, the possibility of appearing ignorant or incompetent in front of one's peer group is also an implicit cost of disclosure. However, the fact that knowledge sharing and observation pooling are commonly observed in EDG even in situations where traditional motivators are likely to be weak or absent (e.g., when participants share no common affiliation and may actually be competitors) suggests that the benefits associated with reconciling anomalies may outweigh their costs.

No Response

The final path through Figure 1 ends in the Responder providing no response, but this is not meant to suggest that an individual Responder will be silent only when he or she has no observations or explanations to provide. Research has demonstrated that it is problematic to infer any single meaning from silence (Durnell Cramton 2001); this path, therefore, is included in Figure 1 merely to indicate that some, but not all, silence occurs as a result of willing Responders merely having nothing useful to say.

DISCUSSION

Several implications for managers can be drawn from this discussion. First, it would appear that even if employees are sharing some of their knowledge with individuals who may be competitors via public EDG, they may be creating new knowledge in the form of reconciled anomalies and new boundaries on their knowledge, which can benefit themselves and their organizations. This kind of participation could be seen as a kind of risk diversification; by spending at least part of their time in such dialogues, employees improve the depth and quality of their knowledge in an area. Secondly, for internal EDG, managers should encourage employees to go beyond sharing their justified true beliefs, and share anomalies that they cannot explain. Although it may appear unnatural for individuals to broadcast that they are unable to understand something, a rich exchange of anomalies may improve knowledge creation within the organization.

For researchers, the assertion that this model improves our ability to explain participation in EDG is clearly in need of empirical testing. This can be accomplished in a variety of ways. Following the research method laid out by Constant et al. (1996), questionnaires could be sent to individuals who participate in EDG but who share no common bonds or affiliations (the most extreme test). Respondents could be asked to indicate the extent to which traditional motivators and those identified in this paper influence their actions. These could then be used as predictors in a multiple regression of an individual's frequency of contribution to the EDG, with semi-partial correlation coefficients revealing whether the motivators set out in this paper explain incremental variance in contribution frequency. Other methods for empirically assessing their usefulness include in-depth interviews and case studies of frequent contributors, and content analysis of EDG archives to establish whether the patterns proposed in this paper actually exist.

Research is also necessary to establish the conditions under which these motivators are more or less likely to be present. In particular, the quality of interaction among participants varies widely across EDG, and this is likely to influence individuals' beliefs about the usefulness of engaging in anomaly reconciliation or remote-controlled experiments. Particularly in settings where

the manipulative motive is high (e.g., stock market bulletin boards where individuals can easily assume multiple identities to hype a stock for their own purposes), the motivations advanced in Figure 1 seem less likely to occur.[1] Aspects of the context, therefore, stand to bound the generality of the ideas proposed in this paper.

This research fits well with the literature on group learning (e.g., Goodman et al. 2001) and organizational learning (e.g., Crossan et al. 1998). Although this literature focuses more on the institutionalization of knowledge in supra-individual forms, the processes described in this paper stand to contribute to our understanding of where these learning processes start, at the individual level.

CONCLUSIONS

This paper has elaborated a typology of interactions that may arise in EDG and used this typology to describe several motivators that have not previously been considered in discussions of knowledge sharing. These are intended to augment what is already known about individuals' motivations to participate in EDG. In particular, the possibility that new knowledge could be created through anomaly reconciliation and remote-controlled experiments may be significant motivators for experts to participate in such groups, especially when traditional motivators such as duty, reciprocity, and reputation may be weak or absent. Further, while this paper has considered interactions in the context of EDG, the model can also be used to describe interactions that occur in other media (for example, addressing a crowd).

EDG have enabled collective action among near-strangers that would quite simply never have been possible without them (Markus et al. 2000). Beyond existing arguments about the possibility of deriving value through the combination of information (e.g., Fulk et al. 1996), this paper has argued that value can be created in more subtle and complex ways than by sharing what is known to be true. While the idea of anomaly reconciliation as a vehicle for knowledge creation is not new (e.g., Campbell et al. 1982), by applying it to distributed contexts, this paper advances our understanding of participation in EDG. The arguments proposed in this paper provide an initial model for anomaly reconciliation as part of a richer conceptualization of the benefits that may accrue to participants in EDG.

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