

The value of questions in organizing : reconceptualizing contributions to online public information goods

Bighash, Leila; Oh, Poong; Fulk, Janet; Monge, Peter

2017

Bighash, L., Oh, P., Fulk, J. & Monge, P. (2017). The value of questions in organizing :
reconceptualizing contributions to online public information goods. *Communication
Theory*, 28(1), 1-21. <https://dx.doi.org/10.1111/comt.12123>

<https://hdl.handle.net/10356/152592>

<https://doi.org/10.1111/comt.12123>

This is a pre-copyedited, author-produced version of an article accepted for publication in
Communication Theory following peer review. The version of record [Bighash, L., Oh, P.,
Fulk, J., & Monge, P. (2017). The value of questions in organizing : reconceptualizing
contributions to online public information goods. *Communication Theory*, 28(1), 1-21 is
available online at <http://doi.org/10.1111/comt.12123>.

Downloaded on 27 Aug 2022 01:13:18 SGT

The Value of Questions in Organizing:
Reconceptualizing Contributions to Online Public Information Goods

Leila Bighash¹, Poong Oh², Janet Fulk¹, and Peter Monge¹

¹Annenberg School for Communication and Journalism, University of Southern California

²Wee Kim Wee School of Communication and Information, Nanyang Technological University

Abstract

In contrast to previous research that treats question-askers as free-riders, this article conceptualizes questions and information requests as important forms of contribution to generating online public information goods. By requesting information, individuals make visible an informational need, calling for attention from those who may be able to fulfill that need and alerting those who share that need. Communicating questions can result in groups forming around particular shared interests, giving rise to permeable group boundaries that distinguish the interested from others. Such groups continue or even grow if new information needs are introduced. Once all information needs are fulfilled, the group will eventually dissolve, leaving their informational assets as public goods for the whole community.

Keywords: public goods, knowledge-sharing, online communities, ICTs, questions

The Value of Questions in Organizing:

Reconceptualizing Contributions to Online Public Information Goods

Judge a man by his questions rather than his answers. —Voltaire¹

Previous literature exploring online public information goods has treated those who only ask questions in online communities as free-riders, taking advantage of the knowledge contributions of those who provide answers (e.g., Kollock & Smith, 1996; Wasko & Faraj, 2005). In this article, we contend that question-askers are not free-riders. Rather, questions are an equally important and interdependent type of contribution to public information goods that, in combination with answers, can organize groups to create knowledge. Including question-askers as contributors to online public information goods results in several theoretical implications that we explore. In brief, we argue that by requesting information, individuals communicate an informational need, calling for attention from those who may be able to fulfill that need as well as alerting those who share the same or similar need for information. In other words, questions render informational demands noticeable (Olson, 1965) or visible (Leonardi, 2014; Stohl, Stohl, & Leonardi, 2016), thus providing a *mechanism* by which private information needs become public leading to collective action (Bimber, Flanagin, & Stohl, 2005). Communicating requests or questions can result in groups forming around particular interests, giving rise to permeable group boundaries that distinguish the interested (i.e., group members) from the others. Such groups continue or even grow as long as new information needs are introduced. Once all the information needs are fulfilled within the group, the group will eventually dissolve, leaving their informational assets as the public goods for the whole community if the infrastructure of that

¹ While widely attributed to Voltaire, some sources (“Voltaire - Wikiquote,” n.d.) claim that this is misattributed and instead is a translation of writing by Pierre Marc Gaston de Lévis in “Maximes et réflexions sur différents sujets de morale et de politique” (1812).

community is built to support some information permanence. Because information is an experience good, meaning the value of the good cannot be sampled or known prior to experiencing or owning it (Huang, Lurie, & Mitra, 2009; Klein, 1998; Nelson, 1970, 1974), requests are critical for the *post hoc* evaluation of information's value. The iterative and symbiotic processes of questioning and answering together are what create the public information good, which can lead to an initiation or birth of a group. This theoretical reconceptualization of contributions leads to several unique propositions regarding the nature of reciprocity and the impact of the distribution of knowledge and topic appeal on community size and viability, unique visitors to a community, and the direction of information flow.

In developing our conceptualization of contributions, we revisit three implicit assumptions in the previous literature that influence what communication practices have been selected for study in public goods and online community literature, as well as how the studies are conducted. First, public information goods are seen as deriving from bounded communities with clear membership guidelines (Olson, 1965; E. Ostrom, 1990). Second, many studies only consider one-time actions for the creation of public goods rather than collective, recurring, and cumulative responses to the recurring demands for maintenance of existing public goods (Marwell & Oliver, 1993; Oliver, 1993; Oliver, Marwell, & Teixeira, 1985). Third, newer literature also makes the implicit or explicit assumption that *providing* uniquely-possessed information, such as responding to information requests by answering questions, are the main behaviors that count as contributions to information goods rather than other forms of participation in the collective, such as asking questions or editing the content of others (Fulk, Heino, Flanagin, Monge, & Bar, 2004; Kalman, Monge, Fulk, & Heino, 2002; Kollock & Smith, 1996; Lakhani & Von Hippel, 2003; Von Hippel & Von Krogh, 2003; Wasko & Faraj, 2005).

We extend this previous theoretical and empirical work to develop a theoretical framework that treats the *request for* information as another important form of contribution to the generation of public information goods, especially in online settings where organizational boundaries are unclear, fuzzy, blurry, and/or permeable. Further, the framework addresses the internal dynamics among group members, focusing on their differentiated roles that stem from heterogeneous informational resources in creating public information goods.

After reviewing the scholarly work on public goods, online communities, and new communication and information technologies that support those communities, we build a new framework that reconceptualizes contributions to include *requests* for information or *questions* as part of continuing actions to create online public information goods.

Background: Public Goods Theory

Since Samuelson (1954) explicated an economic theory of the production of what he termed “collective consumption goods,” public goods have been defined as being non-excludable and non-rivalrous, in other words “a good available to all and where one person’s use does not subtract another’s use” (Hess & Ostrom, 2005, p. 8). For instance, street lights on a city road benefit all people who traverse that road, regardless of whether they contributed taxes to the city to build the street lights or are only visitors. Also, one person’s use of the street lights does not lessen the available light to the others who travel on the road, making it non-rivalrous. As such, one of the main problems with public goods is how to motivate people to contribute rather than free-ride on the efforts of others, since they will benefit even if they do not contribute. Olson’s analysis of collective action and public goods concluded that “rational, self-interested individuals will not act to achieve their common or group interests” (Olson, 1965, p. 2) unless they are incentivized or coerced to do so, or if contributions will make a noticeable impact on the

collective interest². As such, models start with certain assumptions about the particular public goods case, impacting how costs, group size, and noticeability of contributions are theorized to influence outcomes.

Following Olson (1965), scholars examined under what conditions cooperation may occur by using formal models and simulations that evaluate outcomes of different strategies in sequential or repeated interactions (Axelrod, 1984; Oliver et al., 1985) and by developing individual components of collective action (Granovetter, 1978; Marwell & Oliver, 1993). Others conducted extensive experiments to examine if and under what conditions predictions from public goods theories empirically hold, with many finding that people do in fact contribute even when it is irrational to do so according to public goods models (e.g., Andreoni, 1988; Dawes, Orbell, Simmons, & Van De Kragt, 1986; Dawes & Thaler, 1988; Fehr & Gächter, 2000; Marwell & Ames, 1981; Rapoport & Suleiman, 1993).

In more recent years, communication scholars reconsidered the claims made in Olson's seminal work based on developments in information and communication technologies. This work has generated three main streams of communication research. What we label the Public Information Goods stream focuses on information database repositories and the nature of public information goods in comparison to more traditional public goods like bridges or parks (Connolly & Thorn, 1990; Fulk, Flanagin, Kalman, Monge, & Ryan, 1996; Fulk et al., 2004; Markus, 1987; Thorn & Connolly, 1987). The second stream explores online communities as a different context in which individuals engage and develop public information goods (Kollock &

² Group size was the factor that Olson said would determine noticeability or visibility, though he defined group size based on how noticeable a contribution would be, making his argument admittedly tautological. Later formal theorists such as Oliver (1993) and Oliver and Marwell (1988) showed that group size does not necessarily impact noticeability in the simple manner Olson claimed.

Smith, 1996; Lakhani & Von Hippel, 2003; Von Hippel & Von Krogh, 2003; Wasko & Faraj, 2005, 2005; Wasko, Teigland, & Faraj, 2009). The third stream is primarily concerned with how communication technologies change how individuals act together to achieve common goals (Bennett & Segerberg, 2012; Bimber et al., 2005; Bimber, Flanagin, & Stohl, 2012; Lupia & Sin, 2003). Each of these streams is briefly reviewed in the next three sections.

Public Information Goods

Public information goods are special cases of public goods where the primary purpose is the provision of information and knowledge to the public or community it serves. Fulk and colleagues (1996) distinguish between two types of information goods: *connective goods* and *communal goods*. Connective goods directly connect members of a public so that they can communicate with one another. Communal goods allow members of a public to jointly hold a single body of information. Everybody can gain benefit from a communal good, and “at least some must contribute to its maintenance” (Fulk et al., 1996, p. 68). Both direct exchanges and more generalized exchanges are possible in communal systems. Direct exchanges are those exchanges that occur when an individual needs to convey or exchange information with one person. Generalized exchanges occur when “an individual may contribute to and receive resources from different people” (Fulk et al., 1996, p. 68), and contributions are made without the expectation of direct or immediate response or rewards from the party or parties that benefited from that contribution (Boyd & Richerson, 2009; Gintis, Bowles, Boyd, & Fehr, 2003; Nowak, 2006). For example, someone may donate books to his or her favorite library not expecting the library or specific patron to pay in exchange or donate a book directly to him or her, but rather expecting others to donate books as well that he or she will then be able to access (Fulk et al., 1996). Online knowledge-sharing communities generate communal goods because

they connect members of some public through a shared store of information that is produced through generalized exchanges and interactions among community members who then jointly benefit from the knowledge created.

Many scholars use public goods theory to model reasons why online information goods may succeed or fail and why individuals may or may not participate (Connolly & Thorn, 1990; Fulk et al., 2004; Hollingshead, Fulk, & Monge, 2002; Kalman et al., 2002; Thorn & Connolly, 1987; Yuan et al., 2005). For example, Thorn and Connolly (1987) examined under what conditions individuals would hand over “discretionary” private information and put it in a public repository, finding that many of the same pressures limiting contributions in traditional contexts also played a role in information sharing, such as costs and asymmetries. Others have examined the subjective costs, benefits, and perceptions surrounding the development of knowledge-sharing systems in organizational contexts as compared to developing more tangible public goods. For example, Fulk and colleagues (2004) identified four properties that distinguish information goods from other public goods. First, information goods continue to be held privately even after contribution, because information is “reproduced for the collective rather than transferred to it” (p. 570). Second, free-riding is difficult to assess because it is hard to know what unshared information someone possesses. Third, information value depends on time and distribution because (a) value can decay over time, and (b) exclusive rather than extensive distribution may influence value. Fourth, cost is difficult to assess because information may be difficult to create initially but easy to reproduce.

Public Goods in Online Communities

A second stream looks at public goods created in online communities. Preece (2001) defined an online community as “any virtual social space where people come together to get and

give information or support, to learn or to find company” (p. 348).³ An early examination of Internet-based, topic-specific newsgroups and threads (the Usenet) explored how online communities may suffer from some of the same social and communication dilemmas as more traditional public goods and commons contexts (Kollock & Smith, 1996). These scholars found that often the public good that the Usenet members could provide was not realized for many reasons, including overusing bandwidth, not participating, or participating “inappropriately,” which they specifically described as behaviors such as only asking questions or not following norms of communicating (e.g., overly long posts, being off topic, and the like). They evaluated the Usenet based on Ostrom’s (1990) design principles of successful commons, including clearly defined group boundaries, rules that are well-matched to the environment and modifiable by participants, a member-administered monitoring system, a graduated system of sanctions, and low-cost conflict resolution mechanisms. They concluded that cooperation and development of the communal information good was bolstered by self-monitoring within the large community despite the assumed limitations of unclear boundaries, little sanctioning, and no conflict-resolution mechanisms.

Others have conceptualized online communities as electronic network of practices, which are “self-organizing, open activity system[s] focused on shared practice that [exist] primarily through computer-mediated communication” (Wasko & Faraj, 2005, p. 37). Just as with others in the public goods tradition, their aim was to determine why individuals would spend their time and energy sharing information and helping strangers. They defined knowledge contributions as *responses* to questions (p. 45), and they found that expectations of reciprocity were not related to the volume or helpfulness of contributions in a professional association message board,

³ Because knowledge-sharing is the primary concern in this paper, the latter purpose of online communities in her definition, “to find company,” is less applicable.

suggesting that perhaps patterns of generalized exchange could better explain situations in the online community context.

It is clear from the work described above that studies focusing on online communities conceive of contributions as *providing* information or knowledge to a public information good associated with an organization, group, collective or online community. This work has not explored the triggers to this provision as a form of contribution to the community. As we describe in a later section, this oversight has created a gap in our knowledge of how queries and information needs are implicated in contributions to online communities.

Technology and the Changing Nature of Collective Action

A third stream of public goods research has argued that collective action toward the provision of public goods may be different in an age of more advanced communication technologies (Bennett & Segerberg, 2012; Bimber et al., 2005, 2012; Flanagin, Stohl, & Bimber, 2006; Lupia & Sin, 2003). First, although strict membership boundaries were always considered to be an important factor in the successful realization of public goods (Olson, 1965; E. Ostrom, 1990; V. Ostrom & E. Ostrom, 1977), new communication technologies provide opportunities for individuals to come and go, join and leave, without risking the success of the collective action or public good itself (Bennett & Segerberg, 2012; Bimber et al., 2005). In other words, the technologies serve many of the functions of a formal organization mechanism (Bennett & Segerberg, 2012; Bimber et al., 2005, 2012).

Second, the simple binary choice of either contributing or free-riding may not adequately capture decision-making regarding participation when using some communication technologies (Bimber et al., 2005). For example, sometimes it is actually more difficult to keep information private rather than make it public (e.g., having to change privacy settings; Bimber et al., 2005,

2012). In this case, the “rational choice” would be to provide information (the less costly option), not withhold it (the costlier option), flipping the traditional logic on its head. Bimber and colleagues (2005) instead argue that when individuals make their private interests known to others they cross a boundary from private to public, and when this happens among “two or more people in conjunction with a public good” (p.377), collective action occurs.

Two additional extensions proposed in this article further advance the models and conceptualizations from all three streams as applied to online knowledge-sharing communities. First, questions or requests are important contributions in and of themselves in online knowledge-sharing communities; in other words, question-askers are not free-riders. Requests for information, either articulated or expected, render information needs known or visible and can trigger information provisions, while at the same time can establish criteria by which provided information can be evaluated. Second, questions or requests also serve a boundary definition function, such that if answerers exist, this can give rise to a group and group boundary. While membership can be transient at the individual level, continued interest can be sustained at the community level. The remainder of this article develops the argument that these two extensions are necessary to the advancement of public information goods literature, particularly in the case of online knowledge-sharing communities.

Questions as Contributions

Questions play a dual role in online knowledge-sharing community contexts. First, questions as contributions facilitate the knowledge-sharing and group initiation processes by making an informational need known to others. Similar to work done on social movements that conceptualize popular mobilization as the expression of the demand for public goods to regimes (Chong, 1991), questions express demand for answers to a crowd or community. By publicly

indicating an informational need, question-askers can *spur the initiation of a group* by (a) notifying potential information providers (answerers), and (b) publicly alerting others who may have a similar need so that they may gain information from the eventual answers. Whereas previous literature treats groups and goals as given and exogenous, this theoretical development extends the analytical purview to the *emergence* of groups through questioning. In other words, the development of goals is modeled as part of the process. This represents the birth stage of the life cycle of groups (Schulz, 1998). Bimber and colleagues (2005, 2012) suggest that moving private interests to the public results in collective action, and we contend that questioning is a *mechanism* by which individuals cross their informational needs from the private to the public; when those who can provide or find an answer also move their information from private to public, this results in collective action toward the provision of an information public good. Second, questioners also define what information is appropriate and of high quality by the nature of their questions. Unlike other kinds of information provision that do not involve questions or requests, such as gossip, answers attached to specific questions can be assessed to determine what is quality information compared to what may be noise or out of context. Not all answers will be good contributions, and information overload can be more detrimental to the success of a public good than a lack of information (Bawden & Robinson, 2009; Eppler & Mengis, 2004; Jones, Ravid, & Rafaeli, 2004; O'Reilly, 1980; Stohl et al., 2016).

Although theory has not adequately recognized the contribution of questions, there is empirical evidence that questions are important in knowledge generation. One group of scholars examining a question-and-answer website claimed “it is the question as well as all the corresponding answers that *together* bring long-lasting value to the site” (Anderson, Huttenlocher, Kleinberg, & Leskovec, 2012, p. 1, emphasis original). Other scholars have

empirically described the quality and utility of different types of questions or requests in their communities of interest (Gray, Ellison, Vitak, & Lampe, 2013; M. R. Morris, Teevan, & Panovich, 2010; Teevan, Morris, & Panovich, 2011; Wasko et al., 2009), without theoretically explicating what role questions and requests may play in organizing and knowledge generation. Additionally, scholars found that an organization's urgent-request online forum that provided a place to ask questions resulted in dramatic positive outcomes, revealing that "a question posted by a South American manager about insurance matters in the Amazon rainforest was answered within a matter of hours by his Senegalese colleague, whose information helped save the company approximately US\$1 million" (Voelpel, Eckhoff, & Förster, 2008, p. 272). These empirical examples provide evidence that questions spur interaction and information provision, illustrating that questions matter and should be considered contributions.

As explicated above, questions and answers are two different kinds of resources in online communities, both of which are important to the realization of public information goods. Scholarly work outside of public goods has focused on resource heterogeneity as it relates to expertise, role differentiation, and specialization in collective processes (Barney, 1991; Blau, 1970; Brandon & Hollingshead, 2004; Herling & Provo, 2000; Peteraf, 1993; Slater, 1955). For example, a study using computer simulations found that differentiated roles emerged when agents interacted in a network, and the structure that emerged stabilized cooperation over time (Eguíluz, Zimmermann, Cela-Conde, & Miguel, 2005). Similarly, transactive memory systems (TMS) theory (Wegner, 1987) employs concepts of group-level knowledge-resource structures and individual expertise. Integrating public goods theory and TMS is rare but not new, as one group of scholars studying knowledge structures in multinational teams used (1) TMS as a lens to discuss the generation and sustainment of a knowledge structure, (2) public goods theory to

describe motivational elements, and (3) evolutionary theory to describe how knowledge-sharing practices evolve over time (Fulk, Monge, & Hollingshead, 2005). Similar ideas can be applied to online knowledge-sharing communities as well, which share some attributes of distributed work teams who communicate through intranets and are often not collocated. In the specific context of online communities, Majchrzak and colleagues discussed a similar process of “generative role-taking,” described as individuals who “[engage] in the online knowledge conversation by enacting patterned actions and taking on community-sustaining roles in order to maintain a productive dialogue among participants” (2013, p. 45). In the case of knowledge-sharing, there is information demand, knowledge of that information demand, and consequently supply of information. Information moves from the private to the public because of both the request from those with informational needs and the response from those with informational supply. Roles may emerge in online knowledge-sharing communities or subcommunities, where individuals take on the role of questioner or answerer.

In many cases, individuals may be primarily or exclusively questioners or answerers. Experts may use the online community as a space to provide answers, diffuse their ideas, engage with peers, and boost reputation (Fulk & Yuan, 2013). On the other hand, novices may use the online community primarily to obtain information on a topic on which they are less knowledgeable by asking questions or by finding a previously-answered question similar to their informational need through the visibility affordances of the platform (Stohl et al., 2016). Wasco et al. (2009) found in their study of an electronic network of practice that 49% of participants sought information without providing any information in return. Because of this imbalance in giving and receiving information, indirect reciprocity may emerge because “knowledge is distributed and expertise uneven” (Faraj & Johnson, 2010, p. 1468).

While role differentiation may occur in many cases, it is also quite plausible that some people will both ask and answer questions given their unique expertise areas or specializations. For example, people may seek information regarding some questions but have information they can provide for other types of problems that other people in the community may have. People may join and leave different groups within the online community as a whole, taking on different roles at different points in time or within different groups. Also, experts may take on the questioning role in the service of finding information in their network that will answer questions posted by others. This further suggests that experts' questions can be the mechanism that transfers information resources from their network to the whole community. Good questioning and good answering create symbiotic relationships within the community, whose mutual benefit sustains continuing interaction. An expectation of future interaction is critical to the concept of direct reciprocity (Axelrod, 1984), where the same two individuals interact with each other over and over again (Nowak, 2006). Generalized reciprocity, referring to the "pay it forward" phenomenon (Rand & Nowak, 2013, p. 415) where individuals do not necessarily interact with the same person twice but nevertheless reciprocate actions to others in the community, may operate through these symbiotic relationships of heterogeneous actions rather than like actions.

This leads to the following proposition regarding questions as contributions and differentiated roles.

Proposition 1: Individuals who play a specific role in a community (either primarily questioner or primarily answerer) are more likely to contribute again if they receive benefit from individuals with a different primary role.

While questioning and answering occur in both offline and online contexts, online environments like online communities or social networking sites may foster increased organizing

and public good actualization for several reasons. First, the infrastructures can promote affordances like two-way awareness between experts and novices (Fulk & Yuan, 2013). Voelpel and colleagues (2008) suggest that online forums in particular are designed specifically to help people find those who are able to help (i.e., those who can provide answers), and Fulk and Yuan (2013) theorize that enterprise social networking systems have specific functionalities that “contribute to up-to-date understanding of the distribution of relevant expertise” (p. 24). Second, online environments offer persistence (Treem & Leonardi, 2012), the ability to store and retrieve information (Raban & Rafaeli, 2007), and to do so with lower costs (Fulk & Yuan, 2013). Whether through real-time interactions or stored information, questions can be connected with answers in online forums, question-and-answer sites, and other knowledge-sharing online communities. Questions are another type of resource that, in combination with answers, lead to the realization of public goods by helping to form groups around shared interests, resulting in what scholars have called continuous, communal “knowledge conversations” (Majchrzak et al., 2013). While online environments have many features that allow for organizing, realization, and persistence of public information goods, these spaces also often lack clear boundaries for participants resulting in transient membership at the individual level. The following section argues that questioning itself mitigates some of the negative side effects of these features of online communities and social media.

Fuzzy Boundaries and Transient Membership

Information goods are vulnerable to decay and obsolescence if they are not updated with new information (Fulk et al., 1996). However, individuals who participate in online knowledge-sharing communities generally do not have any obligation to continue contributing because the boundaries are porous, resulting in fluid membership (Kollock & Smith, 1996; Lakhani & Von

Hippel, 2003; Olson, 1965; Von Hippel & Von Krogh, 2003; Wasko & Faraj, 2005; Wasko, Faraj, & Teigland, 2004). Without clear boundaries, people may come and go relatively easily, perhaps only participating one time for a very particular need and exiting at a much more rapid pace than in traditional organizations. In the context of porous or unbounded communities of unknown others, knowing who will *continue* to participate or contribute after a one-time contribution becomes quite important. In other words, who will be an active member of the community? Who will join many groups or subcommunities within the community over time? In contrast, who will be peripheral members who may only stay for one interaction, receiving private benefit without regard to the community or the public good as a whole?

Individuals who participate frequently by either questioning or answering may be considered *maintainers*. They are maintaining the public good through frequent, repeated participation. Perhaps frequent contributors feel a stronger sense of commitment and loyalty to the development of the public information good, as scholars have found to be important factors in contributing to public goods (Kalman et al., 2002; Kerr & Kaufman-Gilliland, 1994; Marwell & Oliver, 1993). Among maintainers, generalized reciprocity will be activated more often (Rand & Nowak, 2013), as the “shadow of the future” with the community may be enlarged (Axelrod, 1984).

On the other hand, those individuals that contribute only once or very infrequently may be considered another type of participant in creating the public good, which we call *visitors*. Like visitors to offline communities or neighborhoods, visitors in online communities may not know the norms or traditions but nevertheless affect the community in both positive and negative ways as they interact with others. Visitors may bring in new and different questions and answers than maintainers (March, 1991). Their participation may still be relevant and necessary to maintain

the information good. Having an optimal combination of both types of people, maintainers and visitors, may result in a mixture of exploitation of previously created knowledge and exploration of new knowledge that results in “mutual learning” (March, 1991) capable of generating an overall increase in knowledge and continued vitality of the public information good.

The types of questions asked and the way expertise is distributed to respond to those questions (usually unevenly, e.g., Faraj & Johnson, 2010) not only plays a role in group formation and boundaries, but also may impact the distribution of maintainers compared to visitors and the direction of information flow in online communities. Each of the logical possibilities based on these concepts leads to several propositions. Figure 1 illustrates these possibilities. First, if groups are formed around questions that have wide appeal to a larger audience but need expertise to answer, there may be a transient and large set of visitors who ask questions and a stable core of maintainers who provide answers. Popular science online communities may be an example of this, where a large segment of the general population may have questions and be interested in answers but only individuals with substantial expertise have the knowledge to answer questions consistently.

Proposition 2: As *expertise* needed and topic *appeal* increase (quadrant I), (a) the community *size* will increase, (b) the proportion of *visitor-questioners* will increase, (c) the proportion of *visitor-answerers* will increase, and (d) the *direction* of information flow will become more asymmetric.

On the other hand, if groups are formed around questions that are highly specific and expertise-oriented, this may result in a small community of maintainers who both ask and answer questions. Those in an academic field where only those with advanced degrees could understand the specialized language and have interest in specific questions may be part of an online

community like this. The professional association for social network analysis researchers, for example, has a listserv email service that fits this specialized community description, where those with expertise both ask and answer questions within this specialized field.

Proposition 3: As *expertise* needed increases and topic *appeal* decreases (quadrant II), (a) the community *size* will decrease, (b) the proportion of *visitor-questioners* will decrease, (c) the proportion of *visitor-answerers* will decrease, and (d) the *direction* of information flow will become more symmetric.

If groups are formed around questions that have limited or low appeal and do not need expertise to answer, the communities themselves may be difficult to sustain over time because the small number of both questioners and answerers are likely to leave once their easily-answered questions are fulfilled. As such, specific examples may be difficult to find or imagine because such communities are not sustainable, although if one existed it would likely be a community where people ask very individually specific, one-off questions with answers that neither garner reputation (Milinski, 2006; Milinski, Semmann, & Krambeck, 2002; Nowak & Sigmund, 1998) nor take skill to answer.

Proposition 4: As *expertise* needed decreases and topic *appeal* decreases (quadrant III), (a) the community *size* will decrease or disappear, (b) the proportion of *visitor-questioners* will increase, (c) the proportion of *visitor-answerers* will increase, and (d) the *direction* of information flow will become more asymmetric.

Finally, if groups are formed around questions that have wide appeal and do not need expertise to answer, both questioners and answerers may make up the large transitory membership of visitors in the online community. For example, online communities focused on

subjects like easy-to-make recipes or opinions on blockbuster movies have both broad appeal and little need for expertise.

Proposition 5: As *expertise* needed decreases and topic *appeal* increases (quadrant IV), (a) the community *size* will increase, (b) the proportion of *visitor-questioners* will increase, (c) the proportion of *visitor-answerers* will increase, and (d) the *direction* of information flow will become more symmetric.

In sum, these different kinds of communities vary in terms of the expertise needed and the appeal of the topic, and this is theorized to impact the overall size of the community, the proportion of visitor-questioners and visitor-answerers, and the direction of information flow (either symmetric or asymmetric).

[FIGURE 1 HERE]

Conclusion

In this article, we argue that (1) contributions can take the form of *both* answers *and* questions in the context of online knowledge-sharing communities, and (2) individual contributions must be examined as potentially repeated interactions within unbounded or more permeable communities. This framework allows scholars to improve public information goods models by accounting for changing levels of participation among heterogeneous contributors who participate not only by answering questions but also by asking them in the first place. Rather than treating groups and goals as given, the analytical purview extends to the initiation or birth of a group. The organizing process begins with a question, helping define group objectives.

Theoretical Implications

Questioning can trigger provision so that privately-held information can become visible. While information can be provided without questions, that information may not be associated

with a specific problem or issue. Questions can provide standards for evaluating information value, which is essential in perceptions of personal gain and perceptions of the value of the entire information public good (Fulk et al., 2004). Additionally, questions themselves can provide information either intentionally or unintentionally, thus contributing more directly to the contents of the information public good. For these reasons, requests for information fit into the core existing theories of information goods which have yet to include them as essential for understanding things like information diffusion, the kinds of information provided, and the composition of communities in which information goods are created. Without including the motivating aspects of asking questions, models of production for information goods are now substantially underspecified.

A unique contribution of this framework is that it provides insights into understanding the ecological dynamics in organizational populations as groups and communities. Scholars examining contemporary organizational forms note that membership can be fluid as it ebbs and flows depending on the interests and needs of those in communication with one another (Bimber et al., 2005; Kollok & Smith, 1996; among others). Ultimately membership is *always* fluid, as individuals must eventually leave or die, regardless of the type of organization. What helps maintain an organization's existence is not the specific individuals who make up that organization at any point in time, but rather attention to a set of common problems or questions. Public information goods can be maintained through an iterative process of requesting/questioning and providing/answering. When interest wanes, group membership decreases. When maintaining an information good is no longer of interest to those with the diverse resources (both questions and answers) to do so, that information good will not be maintained, the iterative process will end, and the group will disband. In sum, this model begins

with the request or question, through providing information or answer. This continues to the request again, explicating an iterative process among heterogeneous contributors to information public goods.

Scholars examining knowledge-production in these communities can now account for different types of contributive behavior. Until now, very few scholars considered requests or questions as contribution to online knowledge-sharing communities, and even those who considered them did so *post hoc* or purely descriptively (Anderson et al., 2012; Voelpel et al., 2008; Wasko et al., 2009). By examining questions, group formation and emerging organizing process that occurs can be modeled to provide information goods to a community or public.

Reconceptualizing contributions also has implications for those concerned with how to motivate individuals to contribute, as they must now consider what motivates not only the provision of information but also the act of question-asking. Why would someone ask questions in online communities rather than find similar-enough questions or search for information in other ways? What motivates individuals to ask questions using community norms or rules, possibly resulting in more efficient information provision or more positive overall interaction? The motivational possibilities change when also considering also information requesters.

Future Work

Theoretically, this work could be expanded in several directions. An important extension must consider the variation in quality of questions and how this impacts the creation and maintenance of the public information good. In some online communities, like the software programmers' question-and-answer website *Stackoverflow* (<http://www.stackoverflow.com>), moderators monitor questions to determine if they meet community guidelines as appropriate and good. If questions do not meet those standards, moderators will close the question. There are

many possibilities for defining a good question. For instance, good questions could help define the parameters of what would be an appropriate answer. Perhaps the generality or specificity of questions could impact the quality of the provision of information. Establishing a theoretical basis for defining questions as good or bad could be an important next step in this question-and-answer knowledge-sharing paradigm. In a similar sense, determining the point at which a question is sufficiently different where it results in a new group would be important to examining the group initiation process fully.

Although we currently examine the process when questions demand answers, other possible outcomes are possible when questions are asked. For example, what happens when questions are challenged or problems are denied (e.g., “this is not a problem” or “we do not need to address that”)? Similarly, what if answers are refused? This could impact organizing, possibly resulting in a breakdown of the process, where those who hold information resources do not respond to those with information demand and thus do not help to create the public information good. These situations could be examined in depth in theoretical and empirical work. Similarly, questions sometimes are asked to make a point rather than demand an answer. These types of questions also make information visible, but information provision comes from the questioner rather than the answerer. This is yet another nuance for further development of the questioning concept in theory development and empirical work.

Future work also should explore how features or affordances of different online communities influence both the questions and answers that are asked initially and available long-term, as well as the compositional diversity of the community itself in terms of questioners and answerers, maintainers and visitors. A solid body of research is currently undertaking exploration and understanding affordances of online spaces (Ellison, Gibbs, & Weber, 2015; Gibbs, Rozaidi,

& Eisenberg, 2013; Majchrzak et al., 2013; Treem & Leonardi, 2012), and tying this to specific communicative behaviors of questioning and answering could advance this work even further. For example, how do algorithmic and/or community-controlled features of online communities either promote or demote the importance of certain questions or answers? What is the impact of specific affordances like visibility, editability, persistence, and association (Treem & Leonardi, 2012) on both the asking and answering of questions, as well as the compositional makeup of the community?

While our work focused primarily on how this extension to information public good theory applies in contexts such as online communities, large groups, and organizations, future work may wish to examine how this may apply in other settings, as well. For example, areas such as public broadcasting (e.g., Bardoel & d'Haenens, 2008), intellectual property (e.g., Lessig, 2004, 2006), and social movements and mobilization (e.g., Jenkins, 1983; Snow & Benford, 1992; Tarrow, 2013) may find applicability in conceptualizing questions as contributions when exploring ways to trigger action. Additionally, media effects theorists may find that questions work as more specific mechanisms in the context of more general principles, such as agenda setting (McCombs, 2014; Protess & McCombs, 2016).

Finally, empirical work should begin to examine online knowledge-sharing communities from this extended information goods perspective. A challenge will be to determine appropriate operational measures of the concepts in previous literature and as explicated above. Online knowledge-sharing communities such as *Stackoverflow* will give scholars the chance to test predictions. Other question-and-answer sites like *Quora* and *Yahoo! Answers* are potential sites where this theoretical framework and the propositions of interest could be put into action. Question-and-answer sites are particularly interesting because the behaviors of interest are

observable over time. Online crowd-sourced encyclopedia sites such as *Wikipedia* have forums and metasites where contributors can engage in question-and-answer behavior as well. The opportunities to empirically explore how questioners and answerers, as well as maintainers and visitors, promote the viability of public information goods in online knowledge-sharing communities pave the way for a new stream of research on public goods, information and knowledge-sharing, and online communities.

We have undertaken reconceptualizing contributions in online communities, but we must acknowledge that this article does not account for other possible contributory behavior and actions. However, while there are many kinds of possible contributions in collective action toward the provision of online public information goods, we contend questions are uniquely valuable in the life cycle of groups because questions can initiate group formation and trigger information provision that will become part of a public good.

References

- Anderson, A., Huttenlocher, D., Kleinberg, J., & Leskovec, J. (2012). Discovering value from community activity on focused question answering sites: A case study of Stack Overflow. In *Proceedings of the 18th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining, Beijing, China*, 850–858.
<https://doi.org/10.1145/2339530.2339665>
- Andreoni, J. (1988). Why free ride?: Strategies and learning in public goods experiments. *Journal of Public Economics*, 37(3), 291–304. [https://doi.org/10.1016/0047-2727\(88\)90043-6](https://doi.org/10.1016/0047-2727(88)90043-6)
- Axelrod, R. (1984). *The evolution of cooperation*. New York, NY: Basic books.
- Bardoel, J., & d'Haenens, L. (2008). Reinventing public service broadcasting in Europe: prospects, promises and problems. *Media, Culture & Society*, 30(3), 337–355.
<https://doi.org/10.1177/0163443708088791>
- Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99–120. [https://doi.org/10.1016/S0742-3322\(00\)17018-4](https://doi.org/10.1016/S0742-3322(00)17018-4)
- Bawden, D., & Robinson, L. (2009). The dark side of information: overload, anxiety and other paradoxes and pathologies. *Journal of Information Science*, 35(2), 180–191.
<https://doi.org/10.1177/0165551508095781>
- Bennett, W., & Segerberg, A. (2012). The logic of connective action: Digital media and the personalization of contentious politics. *Information, Communication & Society*, 15(5), 739–768. <https://doi.org/10.1080/1369118X.2012.670661>

- Bimber, B., Flanagin, A., & Stohl, C. (2005). Reconceptualizing collective action in the contemporary media environment. *Communication Theory*, 15(4), 365–388.
<https://doi.org/10.1111/j.1468-2885.2005.tb00340.x>
- Bimber, B., Flanagin, A., & Stohl, C. (2012). *Collective action in organizations: Interaction and engagement in an era of technological change*. New York, NY: Cambridge University Press.
- Blau, P. (1970). A formal theory of differentiation in organizations. *American Sociological Review*, 35(2), 201–218. <https://doi.org/10.2307/2093199>
- Boyd, R., & Richerson, P. (2009). Culture and the evolution of human cooperation. *Philosophical Transactions of the Royal Society of London B: Biological Sciences*, 364(1533), 3281–3288. <https://doi.org/10.1098/rstb.2009.0134>
- Brandon, D., & Hollingshead, A. (2004). Transactive memory systems in organizations: Matching tasks, expertise, and people. *Organization Science*, 15(6), 633–644.
<https://doi.org/10.1287/orsc.1040.0069>
- Chong, D. (1991). *Collective Action and the Civil Rights Movement*. Chicago, IL: University of Chicago Press.
- Connolly, T., & Thorn, B. (1990). Discretionary databases: Theory, data, and implications. In J. Fulk & C. Steinfield (Eds.), *Organizations and Communication Technology* (pp. 219–234). <https://doi.org/10.4135/9781483325385.n10>
- Dawes, R., Orbell, J., Simmons, R., & Van De Kragt, A. (1986). Organizing groups for collective action. *American Political Science Review*, 80(4), 1171–1185.
<https://doi.org/10.2307/1960862>

- Dawes, R., & Thaler, R. (1988). Anomalies: Cooperation. *The Journal of Economic Perspectives*, 2(3), 187–197. <https://doi.org/10.1257/jep.2.3.187>
- Eguíluz, V., Zimmermann, M., Cela-Conde, C., & Miguel, M. (2005). Cooperation and the emergence of role differentiation in the dynamics of social networks. *American Journal of Sociology*, 110(4), 977–1008. <https://doi.org/10.1086/428716>
- Ellison, N., Gibbs, J., & Weber, M. (2015). The use of enterprise social network sites for knowledge sharing in distributed organizations the role of organizational affordances. *American Behavioral Scientist*, 59(1), 103–123. <https://doi.org/10.1177/0002764214540510>
- Eppler, M., & Mengis, J. (2004). The concept of information overload: A review of literature from organization science, accounting, marketing, MIS, and related disciplines. *The Information Society*, 20(5), 325–344. <https://doi.org/10.1080/01972240490507974>
- Faraj, S., & Johnson, S. (2010). Network exchange patterns in online communities. *Organization Science*, 22(6), 1464–1480. <https://doi.org/10.1287/orsc.1100.0600>
- Fehr, E., & Gächter, S. (2000). Cooperation and punishment in public goods experiments. *The American Economic Review*, 90(4), 980–994. <https://doi.org/10.1257/aer.90.4.980>
- Flanagin, A., Stohl, C., & Bimber, B. (2006). Modeling the structure of collective action 1. *Communication Monographs*, 73(1), 29–54. <https://doi.org/10.1080/03637750600557099>

- Fulk, J., Flanagin, A., Kalman, M., Monge, P., & Ryan, T. (1996). Connective and communal public goods in interactive communication systems. *Communication Theory*, 6(1), 60–87. <https://doi.org/10.1111/j.1468-2885.1996.tb00120.x>
- Fulk, J., Heino, R., Flanagin, A., Monge, P., & Bar, F. (2004). A test of the individual action model for organizational information commons. *Organization Science*, 15(5), 569–585. <https://doi.org/10.1287/orsc.1040.0081>
- Fulk, J., Monge, P., & Hollingshead, A. (2005). Knowledge resource sharing in dispersed multinational teams: Three theoretical lenses. *Advances in International Management*, 18, 155–188. [https://doi.org/10.1016/S0747-7929\(05\)18006-8](https://doi.org/10.1016/S0747-7929(05)18006-8)
- Fulk, J., & Yuan, Y. (2013). Location, motivation, and social capitalization via enterprise social networking. *Journal of Computer-Mediated Communication*, 19(1), 20–37. <https://doi.org/10.1111/jcc4.12033>
- Gibbs, J., Rozaidi, N., & Eisenberg, J. (2013). Overcoming the “ideology of openness”: Probing the affordances of social media for organizational knowledge sharing. *Journal of Computer-Mediated Communication*, 19(1), 102–120. <https://doi.org/10.1111/jcc4.12034>
- Gintis, H., Bowles, S., Boyd, R., & Fehr, E. (2003). Explaining altruistic behavior in humans. *Evolution and Human Behavior*, 24(3), 153–172. [https://doi.org/10.1016/S1090-5138\(02\)00157-5](https://doi.org/10.1016/S1090-5138(02)00157-5)
- Granovetter, M. (1978). Threshold models of collective behavior. *American Journal of Sociology*, 83(6), 1420–1443. <https://doi.org/10.1086/226707>
- Gray, R., Ellison, N., Vitak, J., & Lampe, C. (2013). Who wants to know?: Question-asking and answering practices among Facebook users. In *Proceedings of the 2013 Conference*

on Computer Supported Cooperative Work, San Antonio, TX, 1213–1224.

<https://doi.org/10.1145/2441776.2441913>

Herling, R., & Provo, J. (2000). Knowledge, competence, and expertise in organizations.

Advances in Developing Human Resources, 2(1), 1–7.

<https://doi.org/10.1177/152342230000200102>

Hess, C., & Ostrom, E. (2005). *Understanding Knowledge As a Commons : From Theory to Practice*. Cambridge, MA: MIT Press.

Hollingshead, A., Fulk, J., & Monge, P. (2002). Fostering intranet knowledge sharing: An integration of transactive memory and public goods approaches. In P. Hinds & S. Kiesler (Eds.), *Distributed work* (pp. 335–355). Cambridge, MA: MIT Press.

Huang, P., Lurie, N., & Mitra, S. (2009). Searching for experience on the web: An empirical examination of consumer behavior for search and experience goods. *Journal of Marketing, 73(2), 55–69.* <https://doi.org/10.1509/jmkg.73.2.55>

Jenkins, J. (1983). Resource mobilization theory and the study of social movements. *Annual Review of Sociology, 9(1), 527–553.*

<https://doi.org/10.1146/annurev.so.09.080183.002523>

Jones, Q., Ravid, G., & Rafaeli, S. (2004). Information overload and the message dynamics of online interaction spaces: A theoretical model and empirical exploration.

Information Systems Research, 15(2), 194–210.

<https://doi.org/10.1287/isre.1040.0023>

Kalman, M., Monge, P., Fulk, J., & Heino, R. (2002). Motivations to resolve communication dilemmas in database-mediated collaboration. *Communication Research, 29(2), 125–*

154. <https://doi.org/10.1177/0093650202029002002>

- Kerr, N., & Kaufman-Gilliland, C. (1994). Communication, commitment, and cooperation in social dilemma. *Journal of Personality and Social Psychology*, 66(3), 513–529.
<https://doi.org/10.1037/0022-3514.66.3.513>
- Klein, L. (1998). Evaluating the potential of interactive media through a new lens: Search versus experience goods. *Journal of Business Research*, 41(3), 195–203.
[https://doi.org/10.1016/S0148-2963\(97\)00062-3](https://doi.org/10.1016/S0148-2963(97)00062-3)
- Kollock, P., & Smith, M. (1996). Managing the virtual commons. In S. Herring (Ed.), *Computer-Mediated Communication: Linguistic, Social, and Cross-Cultural Perspectives*, (pp. 109–128). <https://doi.org/10.1075/pbns.39.10kol>
- Lakhani, K., & Von Hippel, E. (2003). How open source software works: “free” user-to-user assistance. *Research Policy*, 32(6), 923–943. [https://doi.org/10.1016/S0048-7333\(02\)00095-1](https://doi.org/10.1016/S0048-7333(02)00095-1)
- Leonardi, P. (2014). Social media, knowledge sharing, and innovation: Toward a theory of communication visibility. *Information Systems Research*, 25(4), 796–816.
<https://doi.org/10.1287/isre.2014.0536>
- Lessig, L. (2004). *Free culture: The nature and future of creativity*. New York, NY: Penguin Group.
- Lessig, L. (2006). *Code*. New York, NY: Basic Books.
- Lévis, P. (1812). *Maximes et réflexions sur différents sujets de morale et de politique*. Renouard.
- Lupia, A., & Sin, G. (2003). Which public goods are endangered?: How evolving communication technologies affect “The Logic of Collective Action.” *Public Choice*, 117(3/4), 315–331. <https://doi.org/10.1023/B:PUCH.0000003735.07840.c7>

- Majchrzak, A., Faraj, S., Kane, G., & Azad, B. (2013). The contradictory influence of social media affordances on online communal knowledge sharing. *Journal of Computer-Mediated Communication*, 19(1), 38–55. <https://doi.org/10.1111/jcc4.12030>
- March, J. (1991). Exploration and exploitation in organizational learning. *Organization Science*, 2(1), 71–87. <https://doi.org/10.1287/orsc.2.1.71>
- Markus, M. (1987). Toward a “critical mass” theory of interactive media: Universal access, interdependence and diffusion. *Communication Research*, 14(5), 491–511. <https://doi.org/10.1177/009365087014005003>
- Marwell, G., & Ames, R. (1981). Economists free ride, does anyone else?: Experiments on the provision of public goods, IV. *Journal of Public Economics*, 15(3), 295–310. [https://doi.org/10.1016/0047-2727\(81\)90013-X](https://doi.org/10.1016/0047-2727(81)90013-X)
- Marwell, G., & Oliver, P. (1993). *The critical mass in collective action*. New York, NY: Cambridge University Press.
- McCombs, M. (2014). *Setting the agenda: The mass media and public opinion*. Malden, MA: Polity Press.
- Milinski, M. (2006). Reputation, personal identity and cooperation in a social dilemma. In P. Kappeler & C. van Schaik (Eds.), *Cooperation in Primates and Humans*, (pp. 265–278). https://doi.org/10.1007/3-540-28277-7_14
- Milinski, M., Semmann, D., & Krambeck, H.-J. (2002). Reputation helps solve the “tragedy of the commons.” *Nature*, 415(6870), 424–426. <https://doi.org/10.1038/415424a>
- Morris, M., Teevan, J., & Panovich, K. (2010). What do people ask their social networks, and why?: A survey study of status message Q&A behavior. In *Proceedings of the SIGCHI*

Conference on Human Factors in Computing Systems, Atlanta, GA, 1739–1748.

<https://doi.org/10.1145/1753326.1753587>

Nelson, P. (1970). Information and consumer behavior. *Journal of Political Economy*, 78(2), 311–329. <https://doi.org/10.1086/259630>

Nelson, P. (1974). Advertising as information. *Journal of Political Economy*, 82(4), 729–754. <https://doi.org/10.1086/260231>

Nowak, M. (2006). Five rules for the evolution of cooperation. *Science*, 314(5805), 1560–1563. <https://doi.org/10.1126/science.1133755>

Nowak, M., & Sigmund, K. (1998). Evolution of indirect reciprocity by image scoring. *Nature*, 393(6685), 573–577. <https://doi.org/10.1038/31225>

Oliver, P. (1993). Formal models of collective action. *Annual Review of Sociology*, 19, 271–300. <https://doi.org/10.1146/annurev.so.19.080193.001415>

Oliver, P., & Marwell, G. (1988). The paradox of group size in collective action: A theory of the critical mass. II. *American Sociological Review*, 53(1), 1–8. <https://doi.org/10.2307/2095728>

Oliver, P., Marwell, G., & Teixeira, R. (1985). A theory of the critical mass. I. Interdependence, group heterogeneity, and the production of collective action. *American Journal of Sociology*, 91(3), 522–556. <https://doi.org/10.1086/228313>

Olson, M. (1965). *The logic of collective action: Public goods and the theory of groups*. Cambridge, MA: Harvard University Press.

O'Reilly, C. (1980). Individuals and Information Overload in Organizations: Is More Necessarily Better? *Academy of Management Journal*, 23(4), 684–696. <https://doi.org/10.2307/255556>

- Ostrom, E. (1990). *Governing the commons: The evolution of institutions for collective action*. New York, NY: Cambridge University Press.
- Ostrom, V., & Ostrom, E. (1977). Public goods and public choices. In E. Savas (Ed.), *Alternatives for Delivering Public Services. Toward Improved Performance* (pp. 7–49). Boulder, CO: Westview Press.
- Peteraf, M. (1993). The cornerstones of competitive advantage: A resource-based view. *Strategic Management Journal*, 14(3), 179–191.
<https://doi.org/10.1002/smj.4250140303>
- Preece, J. (2001). Sociability and usability in online communities: Determining and measuring success. *Behaviour & Information Technology*, 20(5), 347–356.
<https://doi.org/10.1080/01449290110084683>
- Protest, D., & McCombs, M. (2016). *Agenda setting: Readings on media, public opinion, and policymaking*. New York, NY: Routledge.
- Raban, D., & Rafaeli, S. (2007). Investigating ownership and the willingness to share information online. *Computers in Human Behavior*, 23(5), 2367–2382.
<https://doi.org/10.1016/j.chb.2006.03.013>
- Rand, D., & Nowak, M. (2013). Human cooperation. *Trends in Cognitive Sciences*, 17(8), 413–425. <https://doi.org/10.1016/j.tics.2013.06.003>
- Rapoport, A., & Suleiman, R. (1993). Incremental contribution in step-level public goods games with asymmetric players. *Organizational Behavior and Human Decision Processes*, 55(2), 171–194. <https://doi.org/10.1006/obhd.1993.1029>
- Samuelson, P. (1954). The pure theory of public expenditure. *The Review of Economics and Statistics*, 36(4), 387–389. <https://doi.org/10.2307/1925895>

- Schulz, M. (1998). Limits to bureaucratic growth: The density dependence of organizational rule births. *Administrative Science Quarterly*, 43(4), 845–876.
<https://doi.org/10.2307/2393618>
- Slater, P. (1955). Role differentiation in small groups. *American Sociological Review*, 20(3), 300–310. <https://doi.org/10.2307/2087389>
- Snow, D., & Benford, R. (1992). Master frames and cycles of protest. In A. Morris & C. Mueller (Eds.), *Frontiers in social movement theory* (pp. 133–155). New York, NY: Yale University Press.
- Stohl, C., Stohl, M., & Leonardi, P. (2016). Digital Age | Managing opacity: Information visibility and the paradox of transparency in the digital age. *International Journal of Communication*, 10, 123-137. Retrieved from
<http://ijoc.org/index.php/ijoc/article/view/4466>
- Tarrow, S. (2013). Contentious politics. In D. Snow, D. Porta, B. Klandermans, & D. McAdam (Eds.), *The Wiley-Blackwell Encyclopedia of Social and Political Movements*. Wiley Online Library. Retrieved from
<http://onlinelibrary.wiley.com/doi/10.1002/9780470674871.wbespm051/full>
- Teevan, J., Morris, M., & Panovich, K. (2011). Factors affecting response quantity, quality, and speed for questions asked via social network status messages. In *Proceedings of the Fifth International AAI Conference on Weblogs and Social Media, Barcelona, Spain*, 630–633. Retrieved from
<http://www.aaai.org/ocs/index.php/ICWSM/ICWSM11/paper/view/2795/3219>

- Thorn, B., & Connolly, T. (1987). Discretionary data bases: A theory and some experimental findings. *Communication Research*, 14(5), 512–528.
<https://doi.org/10.1177/009365087014005004>
- Treem, J., & Leonardi, P. (2012). Social media use in organizations: Exploring the affordances of visibility, editability, persistence, and association. *Communication Yearbook*, 36, 143–189. <https://doi.org/10.1080/23808985.2013.11679130>
- Voelpel, S., Eckhoff, R., & Förster, J. (2008). David against Goliath? Group size and bystander effects in virtual knowledge sharing. *Human Relations*, 61(2), 271–295.
<https://doi.org/10.1177/0018726707087787>
- Voltaire - Wikiquote. (n.d.). Retrieved from
<https://en.wikiquote.org/wiki/Voltaire#Misattributed>
- Von Hippel, E., & Von Krogh, G. (2003). Open source software and the “private-collective” innovation model: Issues for organization science. *Organization Science*, 14(2), 209–223. <https://doi.org/10.1287/orsc.14.2.209.14992>
- Wasko, M., & Faraj, S. (2005). Why should I share? Examining social capital and knowledge contribution in electronic networks of practice. *MIS Quarterly*, 29(1), 35–57.
Retrieved from <http://www.jstor.org/stable/25148667>
- Wasko, M., Faraj, S., & Teigland, R. (2004). Collective action and knowledge contribution in electronic networks of practice. *Journal of the Association for Information Systems*, 5(11), 493–513. Retrieved from <http://aisel.aisnet.org/jais/vol5/iss11/2/>
- Wasko, M., Teigland, R., & Faraj, S. (2009). The provision of online public goods: Examining social structure in an electronic network of practice. *Decision Support Systems*, 47(3), 254–265. <https://doi.org/10.1016/j.dss.2009.02.012>

Wegner, D. (1987). Transactive memory: A contemporary analysis of the group mind. In B. Mullen & G. Goethals (Eds.), *Theories of group behavior* (pp. 185–208).

https://doi.org/10.1007/978-1-4612-4634-3_9

Yuan, Y., Fulk, J., Shumate, M., Monge, P., Bryant, J., & Matsaganis, M. (2005). Individual participation in organizational information commons: The impact of team level social influence and technology-specific competence. *Human Communication Research*, 31(2), 212–240. <https://doi.org/10.1093/hcr/31.2.212>

Figures

Figure 1. The Influence of Expertise and Appeal on Community Size, Proportion of Visitors, and Direction of Information Flow

