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## Beyond reciprocity: The bystander effect of knowledge response in online knowledge communities

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## ABSTRACT

Because new members are important sources of knowledge to online knowledge communities, it is important to retain them after their initial interactions with the community. With a large-scale behavioral dataset collected from a leading online Question and Answer community for programmers, Stack Overflow, we investigated how the community's knowledge responses and social responses to newcomers' questions affected their subsequent likelihood of knowledge contribution (answering others' questions) and knowledge seeking (asking more questions). Contrary to the theory of reciprocity, and in line with predictions by the bystander effect, we found that receiving high quality answers negatively influenced new knowledge seekers' future likelihood of knowledge contribution. Consistent with the social exchange theory, receiving high quality answers positively affected newcomers' future knowledge seeking behaviors. Social responses (votes to the new members' questions) were found to have strong positive effects on both newcomers' future knowledge contribution and seeking behaviors.

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## 1. Introduction

Online knowledge communities, such as Question and Answer (Q&A) sites (e.g. Yahoo! Answers, Stack Exchange, Quora) and Wikipedia, are open collectives created for knowledge sharing, transfer, accumulation, transformation, and co-creation (Faraj, Jarvenpaa, & Majchrzak, 2011). Participation in such communities is usually voluntary (Jeppesen & Lakhani, 2010). Since one can receive knowledge from others regardless of one's own contribution, it creates a social dilemma: rational actors are better off only seeking others' knowledge without making any contribution themselves (Fulk, Flanagan, Kalman, Monge, & Ryan, 1996; Thorn & Connolly, 1987). As a result, many online communities feature high member turnover (Joyce & Kraut, 2006) and high amount of lurking (Preece, Nonnecke, & Andrews, 2004). And even for contributors, the majority of them only post once (Arguello et al., 2006; Butler, 1999). Therefore, retaining visitors who have started participating has become an important challenge for online knowledge communities, and has attracted attention from researchers (Dholakia, Bagozzi, & Pearo, 2004; Galehbakhtiari & Hasangholi pouryasouri, 2015; Lai & Chen, 2014; Ridings & Gefen, 2004;

Wasko & Faraj, 2005; Yan, Wang, Chen, & Zhang, 2016).

When newcomers start seeking help in an online knowledge community by posting questions, the community's response to them constitutes their first direct interaction with the community. Since the social context of mediated online communication tends to be ambiguous and affords limited social cues (Bartel, Wrzesniewski, & Wiesenfeld, 2007; Hong, Hwang, Hsu, Tai, & Kuo, 2015; Walther, Heide, Hamel, & Shulman, 2009), this first direct interaction is likely to provide newcomers with valuable cues about the community's resource and welcomeness, which can potentially influence newcomers' future participation (Joyce & Kraut, 2006; Nistor, Chiru, & Bresser, 2014).

In general, receiving some form of response from an online community is an important predictor of newcomers' future participation (e.g., Joyce & Kraut, 2006; Lampe & Johnston, 2005). Specifically, a response from the community can simultaneously fulfill a number of newcomers' needs (Donovan, LeFebvre, Tardif, Brown, & Love, 2014), including knowledge needs (i.e., answering one's question) and social needs (e.g., welcome, social approval, and emotional support), which could have different effects on newcomers' subsequent behaviors. In this study, we systematically examine community responses by distinguishing the effects of knowledge and social responses, since the underlying mechanisms that drive their effects on newcomers' continued participation might be different.

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Furthermore, because members of knowledge communities can participate by seeking help (e.g., asking questions) from others or by providing help to others (e.g., answering questions), we distinguish between knowledge seeking and knowledge contribution as two separate measures for continued participation. Such an approach allows us to separately identify helping versus help-seeking behaviors, and test the influencers of these behaviors.

Specifically, with regard to the effect of knowledge response on continued knowledge contribution (question answering) behavior, existing theories offer contradicting predictions. The theory of reciprocity (Gouldner, 1960) suggests that receiving knowledge responses (i.e., knowledge provided by the community) would positively predict newcomers' own future contribution, because individuals tend to reciprocate others' help by paying it forward. However, research on the bystander effect (Darley & Latané, 1968) suggests a negative effect of knowledge response on knowledge contribution, since others' help may signal to the newcomers that the current level of help is sufficient and their own contribution is not needed. By separating knowledge responses from social responses and by separating knowledge contribution from seeking we can directly test these two competing hypotheses. Furthermore, the current study can also systematically investigate the effect of knowledge response on continued knowledge seeking behaviors, as well as the impact of social responses on continued participation, which has been demonstrated to be another important predictor of continued participation (Cheshire, 2007; Kim & Sundar, 2014).

Analyzing a large dataset collected from a popular online Question and Answer community, Stack Overflow, the current study contributes to the literature of online knowledge communities by distinguishing and simultaneously examining the effects of two types of community responses (knowledge and social) on two measures of continued participation (knowledge seeking and contribution). Compared to prior research that has either lumped knowledge and social response together as a "response" (Burke, Marlow, & Lento, 2009; Lampe & Johnston, 2005) or that has measured continued participation as simply "posting again" (Joyce & Kraut, 2006; Wang, Kraut, & Levine, 2012; Zhang, Hahn, & De, 2013), this study generates insights on the underlying mechanisms that drive these different behaviors.

## 2. Previous research on community response and online participation

We summarize the body of literature investigating the effect of community responses on members' posting behaviors in Table 1, in which we report each study's main independent variables, dependent variables, attributes of the subjects, and main results. Overall, receiving a response from the community, regardless of its content (knowledge or social), positively predicts one's future participation (Burke et al., 2009; Joyce & Kraut, 2006). With regard to knowledge response in particular, two studies have found mixed results. Both using "posting again" as the measure of continued participation, Zhang et al. (2013) identified a positive effect in open source software discussion forums and Wang et al. (2012) identified a negative effect in online cancer support groups.

Our study differs from these studies. Rather than using posting again as the sole measure of continued participation, we distinguish knowledge seeking and knowledge contribution as separate behaviors. Our study takes advantage of the features of our study site as it clearly labels each post either as a question or as an answer. In doing so, we can examine whether a newcomer is posting again to continue seeking knowledge from others, or to offer help to others. In addition, a number of studies have also reported that newcomers' contribution may increase if they observe knowledge responses received by others (Cheshire, 2007; Lee, Park, & Han,

2014). The current research differs from these studies by focusing on the direct receivers of knowledge responses, which allows us to test predictions by the theories of reciprocity and social exchange.

With regard to social responses, as shown in Table 1, across studies conducted in varying contexts, there is strong evidence that favorable social response positively predicts continued participation, either measured as posting again (Kim & Sundar, 2014; Lampe & Johnston, 2005; Wang et al., 2012), or knowledge contribution (Cheshire, 2007; Tausczik & Pennebaker, 2012). Even negative social response may stimulate immediate posts from newcomers in the short run, presumably to revise and defend their participation (Lampe & Johnston, 2005; Zhu, Zhang, He, Kraut, & Kittur, 2013). Furthermore, prior research has found that observing community social response to other participants may have an impact on participants' own behaviors and the effect is stronger in communities with lower expertise (Lee et al., 2014). The current study focuses on direct receivers of social responses and in addition to examining social response's effect on knowledge contribution, we also study its effect on future knowledge seeking behaviors, which has been relatively understudied by prior research on online communities.

## 3. Theory and hypotheses

We focus on newcomers to online knowledge communities who start by posting questions, because newcomers primarily start their participation by seeking rather than contributing knowledge (Morrison, 1993, 2002). Knowledge response is the type of community response that provides information and satisfies the informational needs of its knowledge seekers. It indicates the community's capability and effort to provide knowledge resources to its members. In contrast, social response is a community's expression of acceptance, approval, or emotional support toward the newcomer, which offers social cues about the community's welcomeness of the newcomers' participation. Social responses can be reflected in textual messages or through voting functions such as "like" and "thumbs-up".

### 3.1. Community response and knowledge contribution

A common explanation of contributions to knowledge communities is reciprocity (Gouldner, 1960). When individuals' knowledge needs are fulfilled by an online community, they are likely to return the favor (Leyton Escobar, Kommers, & Beldad, 2014). Although many may not be able to return the favor to their givers directly (direct reciprocity), they may feel obligated to pay it forward to someone else in the community (Ekeh, 1974; Molm, Collett, & Schaefer, 2007). Scholars have argued that the norm of reciprocity would develop in exchange systems like online knowledge communities (Ekeh, 1974; Molm et al., 2007; Takahashi, 2000). Previous empirical research has also found that participants tend to share their knowledge in order to reciprocate others' help (Faraj & Johnson, 2011; Lakhani & von Hippel, 2003; Wasko & Faraj, 2000; Wu & Korfiatis, 2013), even when competition exists among them (Hall & Graham, 2004). In addition, self-reports from online participants showed that participants reciprocated others' favors after observing reciprocal behavior in online communities and therefore feeling obligated to do so (Feng & Ye, 2016). The amount of knowledge response from other members has been found to positively predict members' continued participation in open source software communities (Zhang et al., 2013). These findings demonstrate the existence of reciprocity in online knowledge communities. We thus predict that a community's knowledge responses to new knowledge seekers will increase new knowledge seekers' own future contribution to the community. Specifically, we hypothesize:

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