

A Systematic Examination of Member Turnover and Online Community Health

Research-in-Progress

Xiaoqing Wang

Robert H. Smith School of Business,
University of Maryland
xwang@rhsmith.umd.edu

Shannon Lantzy

Robert H. Smith School of Business,
University of Maryland
slantzy@rhsmith.umd.edu

Abstract

A key characteristic of online communities is the fast turnover of their membership. Because online communities rely on voluntary member contribution to survive and succeed, member turnover can have important implications on the resource availability and the health of a community. However, empirical research on the effects of member turnover in online communities is rare. Most research assumes that slower turnover and higher retention are positively associated with community outcomes, without directly testing that assumption. A few studies have challenged this view and suggested that turnover can be beneficial in certain conditions. In this study, we contribute to the understanding of member turnover in online communities by systematically examining the relationship between member turnover and multiple dimensions of community health. The results will offer practical implications to online community managers on whether and when to retain member in their communities.

Keywords: Online communities, member turnover, community health

Introduction

Online communities are increasingly important to both businesses and the general public (Agarwal et al., 2008). Successful online communities can generate financial value of hundreds of millions of dollars (Staff, 2006), and therefore knowledge of how to maintain healthy, vibrant communities is of practical interest to community owners and sponsors. A key characteristic of online communities is their fluidity (Faraj, Jarvenpaa, & Majchrzak, 2011; Ransbotham & Kane, forthcoming). Because membership in online communities is often open and participation voluntary, members can join and leave freely with little cost. In fact, most participants leave a community after contributing once: more than two thirds of newcomers to Usenet groups only post once (Arguello et al., 2006); and over half of the developers who register to participate in open-source development projects do not return after posting their first message (Ducheneaut, 2005). Given the prevalence of high member turnover, understanding the impacts of such turnover on community outcomes will guide strategies to allocate resources on member retention efforts, and provide a basis for managing member dynamics to achieve desirable community outcomes.

However, the effects of member turnover on online communities are not well understood. Current literature tends to imply that member turnover has only a negative effect on online communities. Some studies have examined the antecedents of member retention in online communities (Johnson, 2010; Joyce & Kraut, 2006; Farzan, Dabbish, & Postmes, 2011), with the assumption that such retention is important to community success and survival. Others have directly used member retention as one of the indications of online community viability (Butler, 2001; Wang and Butler, 2006). A few exceptions exist. Faraj et al. (2011) suggested that fluid membership can provide opportunities for knowledge collaboration when managed appropriately. Ransbotham and Kane (forthcoming) found a curvilinear relationship between the turnover of Wikipedia editors and the quality of an article. Yet, both of these papers focused on production outcomes, such as the creation of Wikipedia articles. The relationship between member turnover and the health of online communities remains largely untested.

In this study, we build on existing work to systematically examine the relationship between member turnover and multiple dimensions of community health. We define community health to be an aggregation of four interrelated factors (traffic, content volume, responsiveness, and interactivity). We speculate that member turnover may have different effects on different dimensions of community health, and that their relationships may depend on the basis for attachment in a community and the type of member who leaves. We propose hypotheses and plan to test them using longitudinal data of a large online automobile discussion forum.

Member Turnover and Community Health

Member Turnover

There is an extensive body of literature on employee turnover in organizational research. At the organizational and team level, turnover is often defined as the membership change that results from employees leaving their jobs (Shaw, Delery, Jenkins, & Gupta, 1998; Ton & Huckman, 2008) or their workgroups (van der Vegt, Bunderson, & Kuipers, 2009). Because turnover may disrupt the norms, routines, and social network in a team or an organization (Dalton & Todor, 1979; Dess & Shaw, 2001; van der Vegt et al., 2009), reduce the accumulated knowledge (Carley, 1992), and result in direct financial loss (Abelson & Baysinger, 1984; Staw, 1980), much organizational literature has studied the antecedents and consequences of voluntary turnover, and ways in which the negative consequences of turnover can be mitigated (Ton & Huckman, 2008).

More so than in organizations and workgroups, members play essential roles in online communities. Members contribute time and effort, provide information and support, participate in conversations, maintain norms and values, and take on administrative activities in online communities (Bateman, Gray, & Butler, forthcoming; Butler, Sproull, Kiesler, & Kraut, 2007). The ability of a community to constantly attract new members and retain existing members, therefore, is critical to the viability of the community (Butler, 2001). In particular, member retention is considered key to the success and survival of a community, because it is often the long-term participants who provide benefits to others (Ackerman & Palen, 1996) and take on additional responsibilities in a community (Butler et al., 2007). As a result,

researchers have focused on understanding the factors and processes that lead to members staying longer in their communities (e.g. Johnson, 2010; Joyce & Kraut, 2006).

Surprisingly, little research has empirically tested the effect of member turnover in online communities. Although member retention is undoubtedly important, extant research on member retention often assumes a positive relationship between retention and community success but provides little evidence of that relationship. A few exceptions exist. Moon and Sproull (2008), for example, showed that online technical discussion communities with longer contribution duration tend to be more responsive to their members. Ransbotham & Kane (forthcoming) discovered that a Wikipedia article involving more experienced editors is more likely to be of higher quality up to an optimal level of experience, after which the average experience of editors decreases the quality of the article. It is clear that at some level, turnover will hinder a community's ability to function and create value for its remaining members. However, the exact impact of member turnover is not well understood. It is thus our goal to contribute to the extant literature by systematically examining the consequences of online community member turnover.

Turnover and Performance

We turn to the organizational literature to learn how turnover may affect organizational or team outcomes. While there was some early debate in that literature over whether turnover is positive or negative (Dalton & Todor, 1979), it is generally accepted that some turnover is positive, and some is negative for overall organizational performance (Abelson & Baysinger, 1984). Individual turnover can affect an organization's performance through three mechanisms: (1) direct sunk and replacement costs; (2) human capital costs; and (3) social capital costs. The first does not readily apply to the context of online communities, while the second and third are relevant. We describe each in detail in the following paragraphs.

First, turnover causes direct sunk and replacement costs to organizations. When an employee leaves, the employer loses the previous recruitment and training investment made on her (Staw, 1980). In addition, companies must expend resources to recruit, interview, and hire a replacement (Staw, 1980). Online communities generally rely on word of mouth to recruit new members (Kraut, Burke, & Riedl, 2010), so they do not incur these types of costs. As such, this mechanism does not typically apply to online communities.

Second, turnover may reduce the human capital in an organization (Shaw et al., 2005; Carley, 1992). Human capital is defined as the knowledge, perspectives, skills, and certifications that are unique to an individual (Becker, 1962). Knowledge loss is a significant concern for traditional organizations (Carley, 1992). When an employee leaves an organization, she takes with her all the unique knowledge she has accumulated through her tenure and individual experience. The effects of knowledge loss from individual member turnover are somewhat mitigated by the nature of an online community, where all conversations are recorded and archived (Kane & Alavi, 2008). However, not all the knowledge an individual possesses is available through the community archives. Knowledge is sticky, or difficult to transfer, at each step of the knowledge transfer process (Szulanski, 2000). One member may leave behind a description of a hobbyist's technique, but without the opportunity to ask her more questions readers may not be able to implement the technique successfully. Furthermore, a long-term member's knowledge may be tacit, and thus may only surface in response to specific questions or requests for demonstration. Therefore, member turnover in online communities will likely lead to a loss in individual human capital.

Third, turnover may affect organizational performance through reducing social capital (cf. Dess & Shaw, 2001; Shaw et al., 2005; Shaw et al., 1998; van der Vegt et al., 2009). Employees are connected to each other in various ways, forming an informal network through which information flows, social norms develop, and a shared context is created. When individuals in the network leave, they create gaps in the network, causing breakdowns in efficiency and productivity of the teams and groups that they leave behind (Dess & Shaw, 2001; Shaw et al., 2005; Shaw et al., 1998; van der Vegt et al., 2009). For some members in online communities, relationships with other members can be the very reason that they participate (Wasko & Faraj, 2005) and stick around (Ren, Kraut, & Kiesler, 2007). Turnover of members, especially old-timers who have interacted with and developed relationships with many others, will inevitably disrupt the relationships in an online community and reduce its social capital. Therefore, social capital loss is likely an important consequence of member turnover in online communities.

Community health

While performance is the key metric of interest in organizational research, performance is not always relevant to an online community. Open source software communities and groups of Wikipedia editors may collaborate to produce software or articles, but other communities may focus around conversations. As such, we focus on the health, instead of the performance, of an online community. Despite a growing body of academic research in online communities, there is little consensus on how to characterize online community health. It is important to disentangle the concept of community viability from overall community health. Viability is defined as the potential for survival: Will this community continue to exist? Whereas viability is a measure of a future state, health is a measure of a current state. Health is defined as the extent to which an organism's vital systems are performing normally at any given time. Community health is a concern for any leader, owner, or manager of an online community. Not only is the health of a community important for attracting and maintaining resources in the community, it also helps attract funding for the community such as through advertising revenue. It is thus not surprising that the practitioner literature provides useful insight into the measurement of community health. Drawing from a white paper by Lithium Technologies on community health (Lithium Technologies, 2009) and relevant academic literature on online communities, we define the concept of community health as a multi-dimensional construct that involves four key dimensions: content, traffic, responsiveness and interactivity.

First, an online community must have *content*. Richness, growth, and helpfulness of content have been identified as important community outcomes. The content of an online community has been characterized as a community resource similar to the knowledge resources of a firm (Butler, 2001). However, some communities are chat- or interaction-based. Substantive content development and archives are less important than the traffic and discourse between members (Soukup, 2006). In either case, the addition of new content such as new threads and new messages indicates that community content is changing and growing. All else being equal, the increasing volume of content is an indicator of a healthy community.

Second, a community must have *traffic*. Traffic has been previously characterized as the number of messages posted (Jones, Ravid, & Rafaeli, 2004; Raban & Jones, 2010), but this is confounded with content volume. We instead consider all visits to the community, including those by non-members, members, visitors who post and those who do not. Visitors who read but do not post content are sometimes labeled free-riders, but research has shown that these "lurkers" are actually important contributors to a community (Nonnecke & Preece, 2000). The overall traffic to a community reflects the interests that the community is able to attract at any point of time.

Third, a community's *responsiveness* to its members is important in sustaining the interactions in the community. A response may provide answers to a question, advice or support to someone in need, or opinions on a discussion topic. Regardless of the nature of a response, it addresses someone's attempt to initiate a conversation, and signals the benefits that members can receive from the community. The ability of a community to respond to its members influences newcomers' motivation to continue participating (Joyce & Kraut, 2006) as well as the quality of contributions in the community (Moon & Sproull, 2008). Therefore, we also consider community responsiveness as a vital sign for a healthy community.

In addition to being responsive, a community needs to be *interactive*. A community thrives when it provides ample opportunity for members to engage in conversations with others. In online discussion communities, a high level of interactivity can be characterized by long threads that contain many messages around a topic (Preece, 2001). Meanwhile, threads that involve many members allow richer interactions than those that involve only a few (Lithium Technologies, 2009). Interactivity is an indication that an online community is social and is capable of engaging lively conversations (Preece, 2001), and thus we consider it the fourth vital sign for a healthy community.

Hypothesis Development

In this section, we develop hypotheses on how member turnover in online communities affects each dimension of community health, and how those effects may be moderated by the type of a community and the type of members who leave.

Content Volume

Much research on organizational employee turnover and group turnover found that turnover decreases the accumulated learning capability of the group or the organization, and thus decreases the overall productivity in the group or the organization (Shaw et al., 2005; van der Vegt et al., 2009). In a study of the effects of turnover in self-managing work teams, van der Vegt et al. (2009) found that turnover reduced team learning behaviors such as reflecting on past performance, acting on mistakes, and making improvements, and thus negatively affected team effectiveness. Similar to employees in organizations and members in work groups, members in an online community need time to learn how to behave properly and contribute useful content. When newcomers leave, they lose the opportunity to become regular contributors to a community. When old-timers leave, they take with them their knowledge and experience in the community. Regardless of the type of members who leave, member turnover directly reduces the capability of a community to generate content. We thus posit that:

H1: The member turnover rate in an online discussion community is negatively associated with the level of content volume in the community.

Traffic

How member turnover may affect traffic in an online discussion community is not straightforward. As discussed earlier, a high level of member turnover could reduce the content volume in the community. Content is what drives visitors to a community. Therefore, when turnover reduces content volume in a community, the community may become less attractive for its visitors and see lower traffic. Meanwhile, member turnover could also have a positive effect on attracting visits. A community with low turnover may include only a close group of members who speak in codes and enforce strict community boundaries. Such a community may become less welcoming to newcomers, since newcomers are less familiar with the topics in and have not been socialized into the community (Honeycutt, 2006; Kraut et al., 2010). A community with fast turnover tends to be more tolerant towards newcomers, and therefore may attract more visits from new and potential members. A community with fast turnover may also be open to new topics, values and perspectives, making its content attractive to visitors (Kraut et al., 2010; Madsen, Mosakowski, & Zaheer, 2003). To reconcile the presence of both positive and negative effects, we expect to find a curvilinear relationship between member turnover and community traffic; a moderate level of member turnover may attract the most traffic to an online community. When the level of member turnover in a community is low, the community tends to be exclusive and the content within may become stale (Ransbotham & Kane, forthcoming). An increase in turnover can make the community more inclusive and the content more diverse, increasing the potential interest and traffic to the community. When the level of member turnover in a community gets above a certain threshold, further increase in member turnover may reduce the content generation capability of the community, decreasing the interest it can attract.

H2: The member turnover rate in an online discussion community is positively associated with community traffic when the level of turnover is low, but negatively associated with community traffic when the level of turnover is high.

Responsiveness

An online discussion community offers benefits to its members through providing replies to their posts (Butler, 2001). A responsive community is one that provides replies, and provides them quickly. Often, it is the old-timers who are likely to reply to others. Not only are old-timers more likely to contribute in general, they are more likely to contribute content that is helpful to others. On one hand, old-timers have the opportunity to accumulate their knowledge of the topics in the community, and are more familiar with the norms, values, and culture in the community, making it easier for them to respond to others. On the other hand, old-timers have a higher sense of commitment to their communities and are more likely to engage in organization citizen behaviors that are beneficial to other community members (Bateman et al., forthcoming). Research has found that longer-tenured, more experienced members are more likely to be question-answerers than question-askers in a help community (Ackerman & Palen, 1996). Similarly, Moon and Sproull (2008) found that online technical communities with longer average contribution duration are more likely to provide replies to their members than those with shorter contribution

duration. Because old-timers are more capable, they also can provide responses more quickly. In their research on Apache technical support forums, Lakahani and von Hippel (2003) showed that frequent answer providers tend to already know the answers to a question, and spend less time on providing an answer than other occasional answer providers. As a result, an online community with high turnover and a higher proportion of newcomers may be slower in providing responses to members than a community with low turnover. Based on the above arguments, we posit that a community with high turnover will be less responsive to members' attempts at initiating conversations.

H3: The member turnover rate in an online discussion community is negatively associated with the level of community responsiveness.

Interactivity

As noted earlier, old-timers are more likely to provide responses to others. Therefore, a community with low turnover and a higher proportion of old-timers would see a higher tendency of members to reply to others than to start new threads, contributing to higher interactivity of the community. In addition, a community with low turnover is likely to have members who are familiar with one another. Through repeated interactions, these members have a chance to develop trust, reciprocity, and social relationships with others (Faraj & Johnson, 2010; Joyce & Kraut, 2006; Ren et al., 2007; Wasko & Faraj, 2005). Low turnover can also contribute to a relatively stable social context, where community norms, cultures, and ideologies are not constantly challenged. As a result, a community with low member turnover can offer an environment where members feel comfortable to engage in conversations with others. We thus posit that:

H4: The member turnover rate in an online discussion community is negatively associated with the level of interactivity in the community.

The Moderating Role of Community Type and Member Turnover Type

Studies of traditional groups identified two distinct bases for group attachment (Sassenberg, 2002): identity- and bond-based attachment. Some members are attached to groups because of the topics and content offered in their groups. Participants in open source software communities, for example, use the communities to seek and provide information and advice on a software (Lakhani & von Hippel, 2003). Others are attached because of their relationships with other members. For instance, some college students may participate in their fraternities because they like the people there and enjoy interacting with them. Similarly, online communities can be categorized as being either identity- or bond-based (Ren et al., 2007).

We expect member turnover to have differential impacts on community health in bond- and identity-based communities. In bond-based communities, members frequently refer to each other, provide social or emotional support to other members, value the social interaction with others, and are more tolerant towards off-topic discussions (Ren et al., 2007). These behaviors help develop strong interpersonal ties among the members. When existing members leave a community, they not only take with them their knowledge and expertise, but their relationships with other members (Dess & Shaw, 2001). The resulting loss of social capital in the community can be particularly detrimental to a bond-based community, since social relationships between members are vital to their commitment to the community and their motivation to contribute. In identity-based communities, relationships with other members are less important than the content and topics in the community. Therefore, member turnover would be less disruptive to remaining members in an identity-based community.

H5: Member turnover rate may have a larger negative impact on community health in bond-based communities than in identity-based communities.

It is also possible that not all member turnover are equal. In online communities, most members may contribute only once or twice before leaving (Joyce & Kraut, 2006). Fast turnover of regular members prevent them from becoming more knowledgeable and from developing more relationships in a community, and yet they are easily replaceable. A small number of core members contribute much of the content in a community, especially the ones that are helpful to other members (Ackerman & Palen, 1996). Core members are those who maintain community infrastructure, handle administration, and monitor activities in their communities (Butler et al., 2007). The turnover of core members can be more

detrimental to the health of a community. At the most basic level, the turnover of core members leads to the loss of those members' expertise and knowledge, directly reducing the ability of the community to generate content and provide benefits to others. Any reduction in content production would also reduce the value of the community in the eyes of others and reduce community traffic. In addition, because core members are often deeply embedded in their relationships with others, their leaving disrupts the social network in the community, further reducing the motivation for other members to contribute and interact (Krackhardt & Porter, 1985, p.242). Research in organizational setting has found that when key employees leave an organization, other employees may leave with them, causing significant loss to the organization. Therefore, we posit that:

H6: Core member turnover rate has a larger negative effect on community health than overall member turnover rate.

Methods

The North American Subaru Impreza Owners Club (NASIOC) is an online club for Subaru enthusiasts based on vBulletin discussion software. The members interact over a broad range of Subaru-related topics including discussions regarding after-market parts, car pictures, problem troubleshooting, and local events. NASIOC has over 1.8 million threads and 30 million posts; it has over 275,000 registered members, of which over 45,000 are active during any given month.

NASIOC is organized into topical forums. Each forum makes up a community under the NASIOC umbrella. There are sixty-eight forums falling into eight groups: General; Technical; Classifieds; Reviews; Chapters; Regional Areas; Subaru Models; and Miscellaneous. The forums range from small, niche-topic communities with several hundred threads to broad-appeal topics with several hundred thousand threads. We collect data from the full database of NASIOC community archives. In addition, we obtain insights about the community from two key informants: NASIOC's owner, operator, and "Chief Enthusiast", and NASIOC's vendor manager and nine-year member. They helped to ground our understanding of the purpose of each community within NASIOC and how the communities work.

Measures

We measure member turnover as occurring between t_1 and t_2 , and measure community health in t_2 . We follow prior work (van der Vegt et al., 2009) to measure *member turnover* as the percentage of members who posted at least once by t_1 but did not post in t_2 . For example, if 20 members posted at least once in a community by t_1 but 5 of them did not post in t_2 , the turnover rate for t_2 is 25%.

In addition to the measure of overall member turnover, we measure *core member turnover*. Core members are those who play important roles within a community. We consider two types of core member. First, we consider a community moderator as a core member. NASIOC moderators are chosen to moderate within a particular forum. They are selected based on their prior activity in the community, knowledge of the topic area, and have usually been members of NASIOC for a significant period of time. Moderator turnover is expected to be rare, but possibly significant when it does occur. Second, we consider members who occupy key network locations. Members who are structurally central in the community may have a higher impact on the community's social capital, and thus their turnover might have a more significant effect on community health. We follow prior literature by using betweenness centrality to identify central members (Dess & Shaw, 2001; Shaw et al., 1998).

Content volume is operationalized as the number of new messages that are posted in a community in t_2 .

To assess the amount of *traffic* to a subforum, we obtain a Google Analytics measure of unique page views to the subforum landing page in t_2 . This measure counts the number of sessions where a specific IP address loads the landing page one or more times. A session is defined as one 30-minute window. If one user visits the page four times within thirty minutes this is counted as one session. If she is idle for a period more than thirty minutes then returns to the page, this will count as an additional session.

Responsiveness is measured in two ways. First, we measure the likelihood of a new thread receiving a response as the percentage of new threads posted in t_2 that receive at least one reply. Second, we measure

the speed of response in a community as the average time that elapsed between the first and second post in each new thread that receives at least a reply in the community in t_2 .

Interactivity is measured following Lithium Technologies (2009). Let u =number of unique participants in a thread, and m =number of messages in the thread, then the interactivity score of the thread is $(u-1)*\log_2(m)$. The intuition is that interactivity depends on both the number of participants in a thread and the number of messages, but with more weight on the number of participants. For example, interactivity is low when there are only two participants, even when they post eight messages each ($u=2$, $m=16$, $\text{Interactivity}=4$). Interactivity is higher if there are eight participants, even if they only post one message each ($u=8$, $m=8$, $\text{Interactivity}=21$).

Community type of each NASIOC subforum is determined based on its purpose or topic. Some communities are specifically geared toward a technical area of a car, such as the “Normally Aspirated Powertrain” forum. Following Sassenberg (2002), we classify these as identity-based communities. Other forums are more geared toward social interaction in addition to Subaru enthusiasm, such as the regional clubs or the “Off-Topic” section. These forums are more likely to be bond-based communities. To further justify the categorization of community types, the definition of bond-based and identity-based communities will be given to two key NASIOC informants to code.

Some communities are inherently more attractive than others (e.g. a recent model year car community will be inherently more attractive than the older, obscure models). Thus, we will control for unobserved community fixed effects. In addition to individual community effects, we will control for NASIOC-wide time-varying effects such as new member registrations and overall NASIOC thread- and post-counts. We will also control for each community’s size and age at each time period.

Discussion & Conclusion

This paper contributes to the online community literature in several ways. First, we conduct a systematic examination of the impact of member turnover on community health that is lacking in the existing literature. Although fluidity of membership has been considered an important characteristic of online communities (Faraj et al., 2011), research on how it affects different dimensions of online community health is rare. In this study, we examine both the direct relationship between turnover and community health and the moderating role of community type and member type. Our results will provide important evidence on when and what kind of member retention is important for which community outcomes. The results will offer guidance to online community managers on forming strategies around member retention and turnover. Second, we define the concept of community health and identify its four key dimensions. Although the notion of community health is mentioned in many previous studies, there is little consensus on what it means. Existing studies on online communities have adopted a variety of outcome measures that are related to community viability and health, ranging from contribution duration and intensity (Johnson, 2010), member commitment (Farzan et al., 2011; Ren et al., 2007), community responsiveness (Butler & Wang, forthcoming; Moon & Sproull, 2008), collaborative outcome (Ransbotham & Kane, forthcoming), and community survival (Raban & Jones, 2010). Some of these concepts are at the individual level, others at the community level. Some are only applicable to certain types of communities. We propose to focus on community level indicators of health that can be assessed across community type at any point of time during a community’s life time. By doing so, we provide a foundation for future empirical studies to examine the antecedents of community health, and the relationships between community health and other outcomes such as knowledge collaboration and innovation. Third, by offering a definition of community turnover that is grounded in the employee turnover literature, we provide a basis for future research to consistently measure and examine the role that member turnover plays in online communities.

Limitations

This study has several limitations, each of which suggests a direction for future research. First, by directly examining the relationship between turnover and community health, we leave a black box in between. Although we hypothesize that turnover affects community health through reducing knowledge and social capital, future studies should explicitly examine the processes and mechanisms that mediate the relationship between turnover and community health. Second, we only focus on member turnover in this

study, leaving out member attraction, another important aspect of member dynamics in online communities. It is possible that member turnover will influence the ability of an online community to attract new members, which further affects the health of the community. Future studies can examine the interdependency between member turnover and attraction when studying the effects of member dynamics on community health. Third, member turnover could have different effects on individual or task-level outcomes, such as individual satisfaction and commitment to their communities and the quality of the community production. The effects of member turnover on other types of community outcomes remain an opportunity for future research. Fourth, in this study we do not seek an optimal level of turnover for an online community. While our goal is to describe the nature of the relationships between turnover and community health, pinpointing an optimal level of community member turnover remains an area for additional research. Fifth, our operational context is within a hobbyist community, which may be demographically different from other types of communities. This limitation is partially addressed by our investigation of the moderating role of community type. Future studies should examine the relationship between turnover and community health in varying contexts to further test our moderation hypothesis. Finally, we cannot differentiate between involuntary turnover (e.g. a member ceases participation due to external life circumstances) and voluntary turnover (e.g. a member no longer enjoys the forum thus ceases participation). Future studies may dig in to this difference, possibly through surveying the quitting members, to examine whether these two types of turnover affect community health differently.

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