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Spanning Multiple Online Communities and Knowledge Contribution: The Cross-Level Moderating Effects of Environmental Scanning and Membership Fluidity

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ABSTRACT

Many organizations facilitate a host of online knowledge sharing communities to assist internal knowledge sharing and operation. The permeable boundaries and voluntary structures of online communities allow individuals to span community boundaries and affect member resources and structures. Although much research has been done on members' knowledge contribution in online communities, relatively little is known about how a member's contribution to a community is shaped by the cross-level interactions of member's external boundary spanning and the community's environmental scanning or membership fluidity. Drawing from the theoretical lens of boundary spanning and the external view of online communities, we take a multi-level approach in the analysis of the activities of 1,992 members of 126 communities internal to a global company. We find that a member's external boundary spanning activity (e.g., external knowledge acquisition via reading posts) has a positive effect, though at a decreasing rate, on subsequent internal knowledge contribution (e.g., posting replies in the member's home community). This positive effect is stronger in communities that are more active in environmental scanning or have fluid membership and weaker in communities that are less active in environmental scanning or have stable membership.

Keywords: Online Communities, Membership, Knowledge Contribution, Knowledge Acquisition, External Activities, Environmental Scanning, Fluidity, Cross-level Interactions

Ⅰ. Introduction

Online knowledge communities are commonly used in organizations to facilitate knowledge sharing among geographically dispersed employees (Kim et al., 2018; Reus et al., 2022; van Osch and Bulgurcu, 2020). In contrast to other online communities, organizational online communities are managed as part

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of the formal structure of functional practice areas within the organization, with each community aligned with a specific practice area. Employees are professionally identified with their "home" community, which is staffed by senior managers as community leaders and has measurable goals and corresponding accountability and incentive mechanisms (Gray and Ranta, 2010; Kim et al., 2018). In this context, employees are often mindful of how their community activities are viewed by their peers and senior managers. For instance, they are likely to carefully consider their responses to inquiries in an online community, as their reputation may be impacted if their contributions are perceived as incorrect (Kim et al., 2018). The knowledge contributions of members can be a significant asset for organizational online communities, and as a result, research has focused on identifying the factors that drive members to contribute knowledge (Faraj and Shimizu, 2018).

Online communities are characterized by permeable and open boundaries and are sustained through the voluntary contributions of their members (Faraj and Shimizu, 2018). Like any other online community, organizational online communities keep their boundaries permeable by allowing any interested employees to become members (Kim et al., 2018; McDermott and Archibald, 2010). At the individual level, some community members participate in external boundary spanning by engaging in other non-home communities. Members have the freedom to allocate their time and attention across different communities (Dahlander and Frederiksen, 2012). Through external boundary spanning, individual members can access external knowledge relevant to their home community but must devote their limited time and attention (Dahlander and Frederiksen, 2012).

At the community level, permeable boundaries lead online communities to have fluid structures and changing memberships (Butler, 2001; Faraj and Shimizu, 2018; Wang et al., 2012), creating variations in environmental scanning and membership fluidity across communities. Some communities are more active in scanning the external environment when their members, on average, actively engage in acquiring knowledge from other communities by spending time there (Kim et al., 2018). Some communities have more fluidity than others due to more frequent changes in membership triggered by a constant influx and outflow of members (Butler, 2001; Faraj et al., 2011). As such, past research has shed light on the individual- or community-level consequences of the permeable boundaries of online communities. However, little is understood about how the different level consequences interact with each other in shaping individual members' contributions to their home communities.

Recently, scholars in the field of online communities have begun exploring cross-level interactions, which refer to the top-down effects of community-level factors on individual functioning within communities (Foote, 2022; Guo et al., 2022; Lee et al., 2021; Liang et al., 2020). For example, Guo and colleagues (2022) investigated how community self-government management moderates the effects of users' dyadic interactions on their creative output quality and quantity. Liang and colleagues (2020) studied how the informational and normative influence of communities shape the effects of users' reputation and reciprocity on their contributions. However, despite these studies, no research has yet examined cross-level interactions that are relevant to the permeable boundaries of online communities.

The main purpose of this study is to extend prior research on the permeable and open boundaries of online communities by examining how a member's external boundary spanning affects their subsequent knowledge contribution under different community conditions of environmental scanning and membership fluidity. Through the theoretical lens of boundary spanning and the external view of online communities, we propose that a member's external boundary spanning activity has a positive effect, although at a decreasing rate, on the subsequent internal knowledge contribution (e.g., posting replies in the discussion forum of the member's home community). The positive effect is particularly stronger in communities that are more active in environmental scanning or have fluid membership. On the contrary, external boundary spanning is not as beneficial for knowledge contribution when the member's community is less active in environmental scanning or has a stable membership. We test the proposed hypotheses using data from 1,992 members of 126 online knowledge communities internal to a global energy company and find empirical support. We discuss the results and their implications for researchers and practitioners interested in designing a platform of online knowledge communities and managing inter-community collaboration.

Ⅱ. Theoretical Background and Hypotheses

2.1. External Boundary Spanning

Though originally applied to organizational teams, boundary spanning research provides an appropriate theory base for understanding the complex relationships between a member's external and internal activity and the conditions under which external activity maintains a synergistic relationship with internal activity in organizational online knowledge communities. In organizations, the complexity and non-routineness of tasks and lack of resources require teams to engage in a web of external relationships to manage coordination, knowledge transfer, and other tasks (Cummings, 2004). Prior research has sought to understand how teams manage external dependence and obtain resources necessary for internal operation through individual members' external activities (Ancona and Caldwell, 1992; Choi, 2002; Gibson and Dibble, 2013). In particular, individual boundary spanners reach out to the rest of the organization outside the team boundary to find new ideas and resources (Allen, 1977; Ancona and Caldwell, 1992; Kim and Jarvenpaa, 2008; Leonardi and Bailey, 2008; Levina and Vaast, 2005; Pawlowski and Robey, 2004; Tushman and Scanlan, 1981). Empirical evidence shows that teams that manage to acquire critical external resources such as know-how, reference, and support through their members' external boundary spanning activities are more successful than teams that focus solely on internal activity (Cummings, 2004; Hansen, 1999; Katz and Tushman, 1979; Nochur and Allen, 1992).

An acknowledged trade-off between external and internal activities is that they compete against each other over an individual's time, attention, and effort. This is because people can allocate time and attention to a limited number of activities only to a certain degree (Ocasio, 1997). The extent to which external activity interferes with internal activity due to the allocation problem will depend on the amount or intensity of cognitive processing required for the external activity (Gibson and Dibble, 2013).

Furthermore, recent research shows that the features of a team's working environment can influence the usefulness of external boundary spanning activities, suggesting that the nature of the relationship between external activity and internal activity can be moderated by the team environment. For example, Gibson and Dibble (2013) analyzed 140 film-making teams and found that members' external activities were more beneficial when their teams had less stable membership, more fluid member roles, and a more volatile working environment.

In summary, the literature on boundary spanning suggests that both internal and external activities are important for the operation of organizational teams, but the relationship between the two is not straightforwardly positive or negative. There is a need to distinguish the different types of external activity occurring in a given context and also consider the environmental conditions that shape the relationship between external and internal activities. While the basic logic of the literature on boundary spanning is rightly applicable, the specific types of external activity and the community conditions that shape the relationship between external and internal activities need to be re-theorized in the context of online communities.

2.2. External View of Organizational Online Communities

Online community research has long taken a resource-based view (Butler 2001; Wang et al., 2012). A community is viewed as a pool of resources and the availability of resources is essential for a community to be sustainable. Community members act as key providers of resources both tangible (e.g., time, attention, knowledge) and intangible (e.g., effort, sympathy, experience). Community members transform resources to generate benefits for their community (e.g., fulfilling information needs, providing social support) by participating in communication activities. Furthermore, inside an organization, knowledge contribution is a way of self-enhancement, as it helps to reinforce a knowledge worker's own identity as an expert in a competitive environment (Constant et al., 1996; Kankanhalli et al., 2005). Knowledge contributors can earn respect and status when showing others that they possess valuable expertise (Ba et al., 2001).

What is increasingly observed in practice is that organizations create and manage a host of online communities each specialized in a specific domain of knowledge, and some employees participate "externally" in multiple communities beyond the *home* community closest to their functional expertise. As knowledge work becomes ever more complex and non-routine, it is critical that the collective intelligence of employees from various areas can be effectively tapped into (Lu et al., 2011; Teigland and Wasko, 2003). Thus, organizations often deliberatively make community boundaries permeable by keeping community membership open to any interested employee to let knowledge freely flow across functional silos (McDermott and Archibald, 2010). The standardized interface and technical features consistently adopted across communities make it easy for employees to participate in and contribute to the communication activities in different discussion spaces (Gray and Ranta, 2010).

Accordingly, researchers have taken a broader view of online communities, attending to the larger external environment wherein a focal community is embedded and coexists with a host of other communities. For example, it is found that inter-community message broadcasting affects member dynamics, or the inflow and outflow of members, in the respective communities (Butler and Wang, 2012). Competition among communities leads communities to pursue differentiation to better attract and retain members (Gu et al., 2007). Interestingly, a couple of studies offer conflicting findings with respect to the relationship between a community member's external and internal activities. Wang and her colleagues (2012) suggest that external activities constitute trade-offs in time, attention, and effort and thus may interfere with internal activities. They analyzed a 64-month, longitudinal sample of 240 online discussion communities and found that individual communities faced a decrease in the level of internal activity within the community to the extent that their members had participated externally in other communities. In contrast, Dahlander and Frederiksen (2012) suggest that external activities contribute to internal activities. They studied a firm-sponsored online user community devoted to software and found a positive relationship between participating in a variety of communities and innovation; members who spanned external communities were more likely to make innovative, new, and valuable contributions to their community. By reaching out to other non-home communities, a member may expand their knowledge that would enable the member to contribute to the home community. Kim and colleagues (2018) find the conditions under which the extent to which members' time and attention spent externally outside a community increases or decreases the community's responsiveness. It is only when the community has high levels of external bridging (thus spanning many structrural holes by connecting to isolated communities) and internal bonding (thus remaining internally cohesive), the relationship remains positive; otherwise negative.

The permeable boundaries and voluntary structures of online communities give rise to two dominant types of external activity that involve the provision, consumption, and/or acquisition of resources: external knowledge contribution and external knowledge acquisition. In this study, we primarily focus on external knowledge acquisition as a result of members' external boundary spanning.

2.3. External Boundary Spanning

Reading discussion threads is a primary mechanism by which individuals access resources available in a community and obtain information and social benefits such as know-how, best practices, references, insights into others' beliefs and opinions, locating experts, and mapping (i. e., constructing a picture of the external environment, including predicting future trouble spots or potential collaborators) (Bateman et al., 2011; Butler, 2001; Herring, 1996; Lampel and Bhalla, 2007; Teigland and Wasko, 2003). Reading threads as part of the audience also provides important eyeballs that can motivate the contributions of others in a community (Zhang and Zhu, 2011). By spanning multiple non-home communities, a member is naturally exposed to alternative ways of framing problems and solutions manifested in different "thought worlds" (Dougherty, 1992). Other communities can also serve as a means to validate and legitimize ideas and solutions under discussion in a focal community (Cross and Sproull, 2004). Because of the exposure to contextually attuned languages and interpretive mechanisms and different codes of conduct, individuals who are part of multiple communities naturally develop the capability to transfer, translate, and transform knowledge from one community to another (Carlile, 2002; 2004). This capability enables members who do external boundary spanning to bring the externally acquired resources back to their home community and correctly interpret the knowledge for the rest of the community members. Externally acquired knowledge is often perceived as more special and unique and thus highly valued than internal knowledge (Menon and Pfeffer, 2003). For these reasons, we argue that the extent to which a member engages in acquiring external knowledge increases opportunities for internal knowledge contribution.

However, external boundary spanning is not a resource-free activity. While not as cognitively intensive as contributing knowledge, the acquisition of knowledge from, for example, reading threads still takes time because the person has to be involved in the process of search, encoding, and interpretation (Alavi and Leidner, 2001; Markus, 2001). In addition, a person can allocate only a certain amount of attention among the overabundance of information sources and likewise absorb only so much information (Jones et al., 2004), beyond moderate levels of external activity. Hence, an additional amount of external activity of following other communities may produce only marginal benefit at best. In the context of new product development teams, Ancona and Caldwell (1992) found that too much-extended scouting activity could harm internal activity. Hence, we propose that the benefit of external boundary spanning for internal knowledge contribution is likely to be bounded; it increases a member's subsequent internal contribution only up to a point and then contributes little beyond.

H1: A member's external boundary spanning increases the member's subsequent internal knowledge contribution, though at a decreasing rate.

Below, we address how aspects of a community moderate the relationship between a member's external boundary spanning and the member's internal knowledge contribution.

2.4. Environmental Scanning

The permeable boundary and voluntary structure of an online community lead some communities to be more active than others with respect to environmental scanning. A community is considered active in scanning the external environment when its members, on average, actively engage in acquiring knowledge from other communities. We argue that the positive relationship between a member's external boundary spanning and their subsequent internal contribution will be stronger when the home community is active in environmental scanning, as opposed to having a low external emphasis.

The transfer of knowledge across a boundary can be problematic when the receiving end lacks an understanding of the knowledge (Bechky, 2003). While the person who brings in external knowledge through boundary spanning may assist with translation by framing it in a language understood by the recipient (Carlile, 2004), the receiving end must have prior related knowledge to realize the full potential value of the external knowledge (Cohen and Levinthal, 1990). The lack of common knowledge is likely to frustrate attempts to transfer external knowledge across the boundary.

In a community where members are active in acquiring diverse complementary knowledge from outside the community, people have been exposed to and thus accustomed to different ideas and solutions. The more members in the community are used to acquiring external knowledge across boundaries, the more likely they make a collective effort to reconcile differences and take more careful consideration of the issues under discussion to get closer to a consensus (van Knippenberg et al., 2004). This is partly because they are used to considering an issue from the perspective of different people and become better at conveying and absorbing knowledge across boundaries (Reagans and McEvily, 2003). The problem of "representational gaps" often found in diverse groups (Cronin and Weingart, 2007) is unlikely to occur because members in the community share a body of common knowledge upon which the community is built. As others in the community recognize and value multiple perspectives and alternative ideas and solutions, a member active in external boundary spanning is likely to find it easier and thus more willing to contribute to the home community.

In contrast, a member whose home community is not active in scanning the external environment is surrounded by peers limited to interactions within a single knowledge domain. While cohesive, these people tend to hold onto a dominant paradigm and see issues in similar ways (Janis and Mann, 1977; Van Knippenberg and Schippers, 2007). They are less likely to appreciate external knowledge because they are not so accustomed to considering an issue with multiple perspectives or different ways of framing, not to mention lacking related knowledge to understand it. In such a community, a member active in external knowledge acquisition is likely to find it more difficult and thus less willing to contribute to the community.

H2: The positive effect of a member's external boundary spanning on the member's subsequent internal knowledge contribution is stronger when the community is active in environmental scanning.

2.5. Community Fluidity

The permeable boundary and voluntary structure of an online community also cause some communities to operate with a more fluid influx and outflow of members than others. In a community with fluid membership, members deal with the frequent inflow of newly registered members including those joining from other communities as well as the outflow of peers including those leaving the community (by deregistering their membership) for other communities. New members bring in new resources and provide opportunities for existing members to integrate their knowledge with new knowledge (Bruke et al., 2010) and also to increase the community's adaptability (Gibson and Dibble, 2013). Existing members leaving for other communities do the same for the communities they are joining while taking away the resources that used to be exclusively available in the home community. In contrast, a stable community with few member movements is likely to be stagnant in its resources and has limited adaptability, unless its members actively engage in external boundary spanning (Gibson and Birkinshaw, 2004).

We argue that the positive effect of a member's external boundary spanning on the member's internal knowledge contribution will be stronger, when the community has fluid, rather than stable, membership. On the one hand, a community with fluid membership has a frequent influx of newcomers joining from other communities. New members often use information-seeking tactics to assess the responsiveness of and their fit with the newly joined community (Bruke et al., 2010). However, newcomers may often frame their questions or problems in a language or a framing that is foreign to the focal community (Arguello et al., 2006). As the community accumulates experience dealing with new perspectives and bodies of knowledge brought on by newcomers, the community develops learning capabilities to better absorb and integrate new knowledge (Argote and Miron-Spektor, 2011). In this environment where external knowledge is welcome, members active in external boundary spanning are more likely to respond to newcomers' questions or share what they have acquired from other communities with the rest. On the other hand, a community with fluid membership also has a frequent outflux of existing members.

When a community frequently loses its members to other communities, one way to retain, although indirectly, the departing members' knowledge resources would be to keep up with their activities in other communities (e.g., Majchrzak et al., 2007). Members active in external boundary spanning are in the best position to do so, and hence they will naturally find more knowledge transfer and contribution opportunities.

H3: The positive effect of a member's external boundary spanning on the member's subsequent internal knowledge contribution is stronger when the community has fluid membership.

Ⅲ. Methods

3.1. Data

We tested our hypotheses using data collected from online communities internal to a global energy company headquartered in the U.S., with over 30,000 employees worldwide, operating in the oil and gas industry. By testing the research model in one organization rather than in multiple organizations, we could hold constant a number of contextual factors that might influence the hypothesized relationships. The company had long recognized the value of enterprise wide knowledge sharing via online communities to yield cost savings and productivity gains. A dedicated unit, Knowledge Sharing Team, of the corporate planning and strategy group managed all aspects of online communities including approving new communities, assessing community health status, and recognizing and rewarding high-performing communities. At the time of data collection, more than 10,000 employees (or nearly 75% of the employees identified as knowledge workers by the company) were formally registered as members in 100+ online communities, each organized around a specific topic with an explicit link to the organization's work domain (e.g., chemicals, pipeline and subsea systems integrity, defect elimination, well optimization, and geomodeling), spanning geographic and time zone boundaries. Few communities were dominated by members from the same region.

The average size of a community was 162 (SD = 196)-based on the number of registered members. 50% of the employees in our dataset were a member of more than one community (and close to 20% were members of more than three communities), providing an appropriate setting to study the effects of members' external boundary spanning activities and community conditions (environmental scanning and membership fluidity). Community membership sent a signal to the people in the company about one's professional identity. An individual's community membership profile was publicly available in addition to his/her HR information such as job title, position, location, reporting line, and contact information. It was possible to view who was a member of which community since when and to trace his/her past posting records.

Each community had a discussion forum. Discussion topics were strictly work-focused. Common topics include seeking technical or operational advice, procedural know-how, manuals, and site-specific practices. Community members were automatically notified via email whenever there were active discussion threads. Discussion forums were typically open to non-members, and it was rare for non-members to post.

We collected one-year data about the characteristics and activities of individual members and communities. We split the data into two 6-month observation periods (period 1 and period 2) to create a time lag between the dependent variable (i.e., internal knowledge contribution), which was measured based on period 2, and the other key variables (external boundary spanning, environmental scanning and membership fluidity), which were measured based on period 1. We had two reasons for this decision. The first reason was data constraint. We had the raw data concerning (individual-level) external boundary spanning and (community-level) environmental scanning only available for period 1. The data was presented in an individual-community matrix form, containing daily, weekly, and monthly counts of visits over the 6 months. The second reason was to obtain enough variance. By aggregating each member's replies and community visits over a span of 6 months, we can "produce variables that reflect longer-term tendencies, rather than being confounded by short-term bursts of activity" (Bateman et al., 2011; p. 847).

Our unit of analysis is the individual. We used several criteria to select our sample from the dataset. It is well known that a significant number of members of a community never or seldom participate (Nonnecke and Preece, 2000; Riddings et al., 2006). We excluded members with no single discussion participation record in period 1, because it is pointless to examine a member's activities when there is none. We further removed some 20 members who left the company at any time during the observation. The final data set included 1,992 user observations.

For every user, we identified their home community so that we could distinguish members' external activities from their internal activities. Our interviews with selected employees[1] confirmed that everyone had an online community considered as their home community, of which specialization most closely matched their main expertise or functional domain. This is because the online communities we studied closely mirror the formal structure of the company. In identifying the home community, we relied on several sources of data including community membership, community leadership role, knowledge contribution records, and community tenure. First, if a user was a registered member of only one community, that community was labeled as the user's home community. If a user had multiple memberships, we moved onto the next criterion. Second, if there was only one community where the user took a formal leadership role,[2] the community was labeled as the user's home community. Third, if the user took a formal leadership role in more than one community, we choose the home community from them based on where the user contributed the most (i.e., by the number of reply postings) during the year prior to period 1. If the user was not taking any leadership role, we applied the same criterion among the multiple communities the user was a member of. Fourth, if the user's home community was still undecided, which was rare, we finally relied on the user's community tenure. That is, the community where the user had been a member for the longest was labeled as the user's home community. In the end, we identified 126 home communities for the 1,992 users, who were the main focus of our analysis.

3.2. Measures

Internal Knowledge Contribution (Dependent Variable). We measured each member's internal contribution by summing the number of times the mem-

1) Appendix A provides the list of interviewees.

2) There was a list of standardized formal leadership roles in each community: sponsor, leader, core member, and coordinator.

ber responded to another's post in the home community in period 2.

External knowledge acquisition (Independent Variable). We measured each member's external knowledge acquisition by using the percentage of visits made outside the focal community in period 1. It was calculated as the summation of daily counts of visits to non-home communities divided by the total number of visits. A higher measure means a larger portion of attention was allocated to non-home communities, with respect to reading threads.

Environmental scanning. We adapted the concept of "member time and attention spent externally," which was used in Kim et al. (2018). This refers to the extent to which members of a focal community allocate time and attention to other communities and is measured as the relative portion of community visits made by members outside the focal community. In our study, we measured the extent of a community's environmental scanning by the percentage of visits made by its members outside the community in period 1. We first summed the daily counts of visits to non-home communities for each member and aggregated them at the community level. We then divided this by the sum of the total number of visits made by each member. The higher the measure, the more active the community is in environmental scanning.

Community fluidity. A community's membership fluidity was measured by the membership change in period 1. Membership change is caused by the inflow and outflow of members in the community. We adopted the approach of Butler (2001), who measured *member gain* by counting the number of people who newly joined a community during month t and *member loss* by counting the number of members removed from the community during month t. Similarly, for each month, we counted the number of newcomers, who newly signed up for the community, and the number of existing members who withdrew from the community while remaining part of another community. Next, we summed them up and divided by the size of the community (the number of registered members) in a given month. Finally, we averaged the 6 monthly scores to produce the community's membership fluidity.

Controls. Several individual- and community-specific control variables were included to rule out alternative explanations for the hypothesized relationships. As for individual-specific controls, *external knowledge contribution* was measured by the percentage of self-made reply postings outside the home community in period 1. It was calculated as the number of replies made outside the home community divided by the total number of replies. A higher measure means a larger portion of attention was allocated to non-home communities, with respect to responding to another's post. *Organizational (position) level* was measured by the hierarchical distance between a focal individual and CEO of the company. We created two dummies to control for the *geographic location* of a focal individual: Americas and EMEA,[3] with Asia as the base location group. We also included two dummies, *Home community leadership* and *Non-home community leadership*, to control for the formal community leadership role of a focal user in the home community or elsewhere. *First joined online* was measured based on the first time (in months) a focal user registered for a community as a member, ranging from 0 to 65 (the last month of period 1). Similarly, *Joined home community* was measured (in months) by the time a focal user enrolled into their home community as its member.

3) EMEA stands for Europe, Middle East, and Africa. We followed the regional classification scheme used in the company.

<Table 1> Descriptive Statistics of Main Variables

	Variable	Mean	Std. Dv.	Min	Max
Dependent Variable	Internal knowledge contribution	1.29	2.77	0	35
Independent Variable	External knowledge acquisition	0.69	0.20	0	1
Moderator	Environmental scanning	0.83	0.09	0.41	1
Moderator	Community fluidity	0.07	0.08	0.01	1
Controls (Individual)	External knowledge contribution	0.49	0.44	0	1
	First joined online (m)	41.85	15.18	2	65
	Organization (position) level	6.81	1.14	3	10
	Community membership	4.19	2.54	2	30
	Joined home community (m)	37.63	14.05	0	65
	Total number of postings (Period 1)	4.45	6.91	1	138
	Total number of postings (Period 2)	3.21	6.43	0	111
	Total number of community visits	113.41	130.24	1	1940
Controls (Community)	Community founded (m)	24.83	15.71	0	65
	Community size	365.92	295.40	2	1904
	Number of discussion threads	38.73	30.47	0	125
	Community traffic	59.81	26.04	6.24	553.38

Community membership was measured by the number of communities a focal user was a member. All of the controls above were measured as of the last month of period 1. *Total number of postings* was measured twice, at the end of period 1 and period 2, referring to the number of postings a focal user created. Finally, *Total number of community visits* was measured by the sum of the daily counts of visits a focal user made to communities in period 1.

As for community-specific controls, *Community founded* was measured (in months) by the time the community was founded. *Community size* was measured by the number of registered members. Like the other individual-specific controls, both of the controls were measured in period 1. *Number of discussion threads* was measured by the number of discussion threads initiated in the community in period 2.[4] *Community traffic* was measured by the average total number of visits made by a member of the home community in period 1. We also included 10 dummies to control for the functional area of the community, ranging from commercial, operation, and to technology, to name a few.[5]

Ⅳ. Analysis and Results

The means, medians, and standard deviations of all the variables are shown in <Table 1>. The percentage of an individual member's reply postings outside the home community was 49% (st. dv. = 44%) while that of outside community visits was close to 69% (st. dv. = 20%), suggesting that many individual members were actively engaged in external activities out-

4) The number of discussion threads in period 1 was dropped from the model due to multicollinearity.

5) The company categorized each community into one of 11 broadly defined functional areas according to the nature and focus of the community.

side their focal community, though there was a lot more variation in external knowledge contribution than in acquisition. Community-level environmental scanning was, on average, 83% (st. dv. = 9%) and community fluidity was 7% (st. dv. = 8 %). An individual was a registered member of 4.2 communities (st. dv. = 2.5). The overview of the studied population suggests that the permeable boundaries and voluntary structures of the communities created variation both at the individual-level external activity and at the community-level conditions of our interest.

Most of the controls were highly skewed, as is typical in online community behavior research (Bateman et al., 2011; Butler, 2001; Jones et al., 2004; Wang et al., 2012), so we log-transformed them to increase the normality of the data.[6] Appendix B shows the correlations of the main variables after transformation. The correlation table indicates no particular multicollinearity problem. In addition, multicollinearity analysis showed that the variance inflation factors (VIF) for the variables were all below three, with the largest being 2.81. Therefore, multicollinearity was not of concern (Hair et al., 1998). We mean-centered the independent and moderator variables before creating their interaction terms.

To test the proposed hypotheses, we ran a negative binomial regression model with standard errors robust to community clustering using Stata. Here, the standard errors take into account issues concerning heteroskedacity and lack of normality. Since our dataset contains data on 1,992 individual members from 126 communities, it is very possible that the articipation levels within each community may not be independent, and this could lead to residuals that are not independent within communities. We thus assigned each observation a community ID and used the cluster option to indicate that the observations may be correlated within communities. As a robustness check, we employed mixed-effect multi-level model estimation given that individuals are nested within home communities (see Appendix C). The results remain unchanged.

Controls, main effect variables, and the interaction terms were entered in a sequential manner, as shown in Models 1 – 4 in <Table 2>. H1 posited that a member's external knowledge acquisition would positively influence his/her internal contribution, but only up to a point, suggesting a curvilinear relationship. In Model 2, the results showed both significantly positive, linear (β = 2.43, $p < .001$) and negative, curvilinear (β = -3.48, $p < .001$) relationships between external knowledge acquisition and internal knowledge contribution. A subsequent analysis revealed that external knowledge acquisition increased subsequent internal contribution at a decreasing rate. When a member increased the level of external knowledge acquisition from 10% to 20%, the member's subsequent internal contribution would increase by 108%, while the increase of external knowledge acquisition from 70% to 80% would lead to a 30% increase in subsequent internal contribution. The relationship became almost flat when external knowledge acquisition reached 94%. H1 is thus supported.

H2 and H3 further posited that the positive relationship between a member's external boundary spanning and internal contribution would be moderated by the extent to which the focal community was active in environmental scanning or had a fluid membership structure, respectively. To test the moderation effects, we entered both linear-by-linear and

6) A small constant, 0.01, was added to the values of the variables before transformation.

<Table 2> Negative Binomial Regression Results

DV: Internal Knowledge Contribution		Model 1 Controls	Model 2 Main Effects	Model 3 Env Scanning	Model 4 Comm Fluidity	Model 5 Fixed Effects
		Coef. (Std.Er)	Coef. (Std.Er)	Coef. (Std.Er)	Coef. (Std.Er)	Coef. (Std.Er)
	Constant	-.08 (.58)	-.77 (.45)	-.79 (.43)	-.54 (.5)	-.65 (.41)
Individual-Specific Controls	*External knowledge contribution*	-.41** (.1)	-.41* (.1)	-.39*** (.1)	-.36*** (.1)	-.35*** (.1)
	Organization (position) level	-.44 (.39)	-.49 (.31)	-.45 (.31)	-.58 (.31)	-.47 (.3)
	Location: Americas	.05 (.08)	.07 (.08)	.07 (.08)	.07 (.08)	.06(.08)
	Location: EMEA	.14 (.08)	.13 (.08)	.13 (.08)	.12 (.08)	.13 (.08)
	Home community leadership	.19*** (.05)	.04 (.05)	.04 (.05)	.03 (.05)	.04 (.05)
	Non-home community leadership	-.20* (.09)	-.20* (.1)	-.19* (.08)	-.19* (.1)	-.31* (.09)
	First joined online (m)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
	Joined community (m)	-.01** (0)	0 (0)	0 (0)	0 (0)	0 (0)
	Community membership	-1.01*** (.14)	-.31* (.12)	-.33** (.12)	-.31* (.12)	-.42** (.12)
	Total # of postings (Period 1)	-.02 (.08)	-.22** (.08)	-.23** (.08)	-.22** (.08)	-.13* (.08)
	Total # of postings (Period 2)	1.01*** (.03)	1.02*** (.03)	1.03*** (.03)	1.02*** (.03)	1.09** (.04)
	# of comty visits by a focal person	-.09 (.1)	.30** (.1)	.29** (.1)	.29*** (.1)	.28** (.1)
Community - Specific Controls	*Commercial*	-23.2*** (.91)	-25.2*** (.88)	-32.7*** (.9)	-24.8*** (.87)	
	Functions	.02 (.41)	.18 (.37)	.14 (.3)	.19 (.38)	
	HSE	-.12 (.47)	.37 (.36)	.39 (.33)	.43 (.37)	
	IT	.32 (.41)	.47 (.32)	.42 (.27)	.48 (.32)	
	Operation	.16 (.43)	.48 (.33)	.48 (.29)	.53 (.34)	
	Project	.26 (.41)	.42 (.32)	.41 (.27)	.45 (.32)	
	Refining	.54 (.4)	.54 (.31)	.44 (.26)	.53 (.31)	
	Subsurface	.34 (.43)	.51 (.33)	.48 (.29)	.59 (.34)	
	Technology	-.12 (.41)	.02 (.32)	0 (.27)	.04 (.32)	
	Wells	.34 (.44)	.52 (.33)	.49 (.3)	.56 (.34)	
	Focal community founded (m)	0 (0)	0 (0)	0 (0)	0 (0)	
	Focal community size	-.06 (.1)	-.18 (.08)	-.19 (.08)	-.26* (.11)	
	# of discussion threads at focal community	.89*** (.12)	.42* (.11)	.34* (.12)	.44*** (.12)	
	# of community visits made by a focal community member	-.59** (.2)	-.45*** (.18)	-.34** (.18)	-.44* (.19)	
Main Effects	*External boundary spanning*		2.43*** (.63)	2.82*** (.69)	2.49*** (.61)	2.72*** (.65)
	External boundary spanning (squared)		-3.48*** (.61)	-3.74*** (.63)	-3.52*** (.56)	-3.23*** (.59)
	Environmental scanning			-.84 (.6)	-.29 (.49)	
	Community fluidity			-.73 (.49)	-.46 (.53)	

<Table 2> Negative Binomial Regression Results (Cont.)

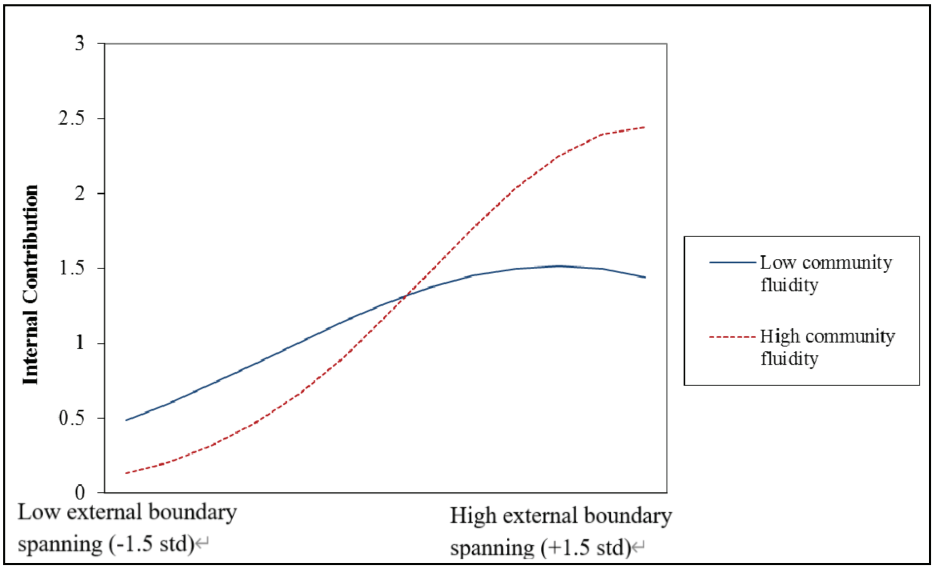
DV: Internal Knowledge Contribution		Model 1 Controls	Model 2 Main Effects	Model 3 Env Scanning	Model 4 Comm Fluidity	Model 5 Fixed Effects
		Coef. (Std.Er)	Coef. (Std.Er)	Coef. (Std.Er)	Coef. (Std.Er)	Coef. (Std.Er)
Inter-actions	*External boundary spanning * environmental scanning*			**13.82** (4.5)**		**7.90* (3.5)**
	*External boundary spanning (sqrd) * environmental scanning*			**-13.95** (4.64)**		**-8.41** (2.81)**
	*External boundary spanning * community fluidity*				**14.17*(6.61)**	**10.42*(5.23)**
	*External boundary spanning (sqrd) * community fluidity*				**-12.10*(6.13)**	**-9.89*(5.11)**
Log pseudo-likelihood		-1,833.57	-1,718.37	-1,712.61	-1,715.96	-1,823.69

Note: N = 1,992; * p < .05; ** p < .01; *** p < .001

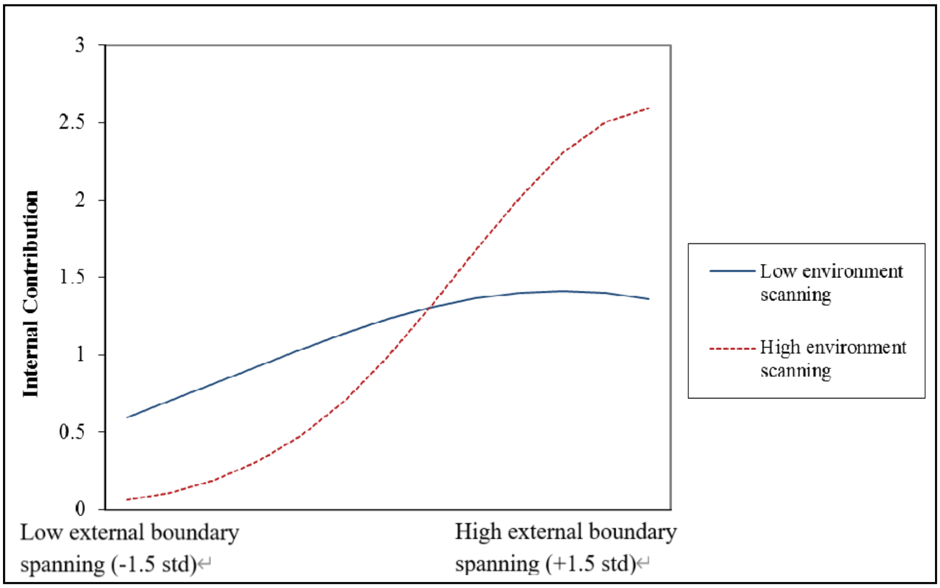
quadratic-by-linear interaction terms of the respective variables into the regression model. As for the moderation effect of community-level environmental scanning (Model 3), we found that the linear-by-linear interaction term was significant and positive (β = 13.82, p < .01) and the quadratic-by-linear interaction term was significant and negative (β = -13.95, p < .01). Similarly, as for the moderation effect of community fluidity (Model 4), we found that the linear-by-linear interaction term was significant and positive (β = 14.17, p < .05) and the quadratic-by-linear interaction term was significant and negative (β = -12.10, p < .05). As a robustness check, we include community fixed effects in the model. Model 5 reveals consistent results, thus suggesting that the main results are not subject to the domain (type) of the community.

To assist the interpretation of each of the moderation effects, we plotted the relationships between external boundary spanning and internal contribution under different levels of the focal community's environmental scanning and fluidity. Both <Figure 1> and <Figure 2> show that, consistent with H1, a member active in acquiring external knowledge contributes more than a member who is not active. Furthermore, <Figure 1> shows that an externally active member contributes even more when other members in the community are similarly active while contributing less when they are not so active. In other words, community-level environmental scanning creates synergy for the positive relationship between external boundary spanning and internal knowledge contribution. Interestingly, a member contributes the least when the member is not active in acquiring external knowledge whereas the community is active in environmental scanning. <Figure 2> shows similar patterns for community fluidity. Taken altogether, the findings support the moderated relationships posited in H2 and H3.

Several controls were found to be statistically significant, yielding sensible results (Model 2). In particular, a member's external knowledge contribution was negatively associated with subsequent internal contribution (β = -.41, p < .05). This result shows that there is a trade-off between the two. Subsequent



<Figure 1> Moderating Effect of Environmental Scanning



<Figure 2> Moderating Effect of Community Fluidity

analysis reveals that 10% increase of external knowledge contribution leads to 5% decrease in internal contribution. A member with a formal role in another community contributed significantly less in the focal community than a member without (β = -.20, p < .05). The more communities an individual was part of, the less contribution made by the person to his or her focal community (β = -.306, p < .05).

In addition, the bigger the focal community, the less contribution made by an individual member (β = -.31, p < .05).

Ⅴ. Discussion

In recent years, organizations have significantly invested resources in creating and managing a host of online knowledge communities, each specialized in a specific functional or expertise domain. These organizations aim to improve employee performance by facilitating knowledge sharing and cooperation through these communities. To promote knowledge sharing across functional silos, organizations often deliberatively make community boundaries permeable by keeping community membership open to any interested employees. As a result, members span multiple communities, and communities share their member resources. Community managers, therefore, need to understand where and how much their members allocate their finite time and attention among communities and how this affects their contributions to the communities.

In this study, we examine how a member's contribution to a community is influenced by the cross-level interactions of the member's external boundary spanning and the community's environmental scanning or membership fluidity. Our multi-level analysis of 1,992 individual members of 126 communities internal to a global company shows that an individual member's external boundary spanning has a positive effect, albeit at a decreasing rate, on the member's internal contribution. The positive relationship becomes stronger or weaker depending on the community's environmental scanning or membership fluidity. Our cross-level interaction findings advance prior theorizing about member participation in online communities.

5.1. Theoretical Contributions

Overall, our research contributes significantly to how scholars understand member contributions in organizational online communities characterized by open, permeable boundaries. Much of the existing research on member participation in online communities has focused on personal motivations and characteristics, internal processes, and dynamics, while ignoring the significant influence of the community's contextual factors on member participation. While recent studies have started examining the cross-level moderation effects of the community's contextual factors on individual functioning, they have not connected this with individual-level external boundary spanning and community-level environmental scanning and fluidity (Foote, 2022; Guo et al., 2022; Lee et al., 2021; Liang et al., 2020).

Building on this research, our study demonstrates that a member's internal contribution is affected by the interplay between the member's external boundary spanning and the community's environmental scanning or membership fluidity. Therefore, our study advances the literature by showing that the relationship between spanning multiple communities and knowledge contribution is more complex than previously thought. Specifically, the knowledge benefit of external boundary spanning is unlikely or less likely to be realized if the community does not have the right member resource or structure in place.

Furthermore, we contribute to the boundary spanning literature by extending the theory to a new context: organizationally situated online communities. Online communities that are internal to a company can be viewed as a virtual form of teams, but with permeable boundaries and voluntary structures, resulting in more fluid membership and participation than traditional teams studied in the literature. Due to these differences, while maintaining the basic logic of team boundary spanning theories, we re-theorized and tested the specific types of external activity and community conditions that shape the relationship between external and internal activities in the context of organizationally situated online communities.

In addition, prior research has long assumed that teams rely on selected members, particularly those with formal roles, to establish and maintain external linkages and perform various external boundary spanning activities (Ancona and Caldwell, 2000; Cross and Parker, 2004; Pawlowski and Robey, 2004; Tushman and Scanlan, 1981; Tushman, 1977). We, on the other hand, find that external boundary spanning has a positive synergistic effect on internal contribution when the external activity is not only carried out by the focal individual but also by the rest of the community (i.e., environmental scanning). The permeable boundaries and voluntary structures of online communities may require most members, not just a few, to be exposed to different bodies of knowledge through external activity for their communities to ensure sustained participation. Our findings thus echo prior studies that advocate for the importance of external boundary spanning carried out informally by members with no related formal roles (Hansen 1999; Levina and Vaast, 2005; Nochur and Allen, 1992).

5.2. Practical Implications

Community managers may be tempted to discourage their members from participating in other communities to ensure that they devote their maximum time and attention within the community's boundaries (e.g., Wang et al., 2012). However, as found in our study, spanning boundaries can increase internal participation and even spark innovation (Dahlander and Frederisken, 2012). In our research, a 10% increase in the relative allocation of attention to external knowledge contribution led to a 5% decrease in internal contribution, while a 10% increase in the relative allocation of attention to external boundary spanning led to up to a 120% increase in internal contribution, depending on the absolute amount of attention spent outside the community. The permeable boundaries and voluntary structures of online communities allow members to participate and move across communities, leading to the transfer, translation, and transformation of knowledge and experiences from one community to another. Our research suggests that such dynamics may create more opportunities for externally connected members to contribute internally while having adverse effects on individual members who are internally focused. To keep communities vibrant and aligned with organization-wide knowledge management strategies, community managers should not prevent their members from engaging in external activities. Individual community members are advised to maintain a balance between their internal and external activities, as external activity is useful for themselves and their communities, but too much external activity and spanning too many communities can have adverse effects on their internal activity.

5.3. Limitations and Future Research

We note some limitations and provide directions for future research. Firstly, our study focused on online knowledge-sharing communities within a single company, and the external environment of a community was limited to other communities within the company's boundary. Future studies should examine the generalizability of our findings to other online community settings, whether public or private. While we believe our findings can be generalized in terms of significance and directionality, the magnitudes and forms of the relationships may vary across different community settings.

Secondly, we used posting replies as a proxy for external boundary spanning, but there are other types of boundary spanning activities, such as initiating dialogue, discussion moderation, and feedback. Additionally, our measures were based on the number of actions, not quality. Future research should examine other types of external activities and investigate the specific resources individuals acquire through different external activities.

Thirdly, our dependent variable, internal contribution, was measured based on the quantity of reply postings, not the quality or significance of the contributions. Future research should examine how people should allocate their time and attention to different types of external activity to achieve better individual and community outcomes. Furthermore, we should examine how external activity may contribute to community innovation, performance, and effectiveness by complementing internal activity.

Fourthly, due to data constraints, we constructed a simple longitudinal model with only two data points. Future research should have more data points to control unobserved time-invariant differences both at the individual and community levels and examine the dynamics of the external environment of communities. The variation of external activities can be investigated across individuals and communities and within communities over time to capture the dynamics of the external environment of communities.

It is interesting to note that while a person's external boundary spanning was positively related to internal contribution, the number of communities wherein a person signed up as a member was negatively related to internal contribution. In the company we studied, once a person signed up for a community as a member, the person was constantly notified of the communication activities in the community. Having a membership in multiple communities can thus significantly distract one's time and attention because of the frequency of updates and the amount and diversity of information to filter and process. Does it mean that one needs to be careful not to sign up for too many communities because doing so can overweight the informational benefit of tapping external information networks? This finding further complicates the discussion over how and why different types and amounts of external activity affect internal activity differently by calling for attention to how being a member of other communities may affect one's internal activity and why. Having a membership in multiple communities may mean more than having access to diverse sources of knowledge.

5.4. Conclusion

The permeable boundaries and voluntary structures of online communities allow for fluid membership and participation across communities. However, our understanding of how these community-level factors affect the individual-level relationship between external boundary spanning and internal knowledge contribution is limited. In our study, we examine the cross-level interactions between a member's external boundary spanning and subsequent knowledge contribution under different community conditions, such as environmental scanning and membership fluidity in organizationally situated online knowledge communities. We believe that our findings are important for information systems scholars, as they shed light on how the external environment of online communities influences member participation in communities. While members' external activities can be costly, they may also be necessary for communities to remain viable.

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<Appendix A> List of Interviewees

We conducted semi-structured on-site interviews with 16 employees with the help of the director of the Knowledge Sharing Group. From our preliminary analysis of the community data, we identified community leaders and active members in discussion participation. We asked several questions related to the following topics during the interview:

- Motivation to participate in online communities
- Motivation to participate in online discussion
- Participation in multiple virtual communities

Interviewee	Job Title	Home Community	Formal Role	# of Memberships
1	Pipeline & Subsea Structure Integrity Specialist	Small Project	Leader	8
2	Senior Process Engineer	Facility Optimization	Leader	10
3	Asset And Operation Integrity Specialist	Asset & Operating Integrity	Leader	14
4	Rotating Equipment Engineer	Upstream Rotating Equipment	Leader	7
5	Pipeline & Subsea Structure Integrity Specialist	Well Optimization	Leader	11
6	Pipeline Engineer	Pipeline & Subsea Structure Integrity	Leader	13
7	Production Engineer	Facility Optimization	Leader	13
8	Process Engineer	Facility Optimization	(Former) Leader	8
9	Planning Specialist	Shutdown Planning	Leader	10
10	LNG Licensing Process Engineering Supervisor	Facility Optimization	Member	7
11	Facilities & Process Engineering Manager	Facility Optimization	Sponsor	10
12	Product Optimization Engineer Principal	Artificial Lift	Subject Expert	9
13	Chemicals Advisor	Global Chemicals	Coordinator	9
14	Supplier Quality Specialist	Contracts and Supplier Excellence	Core Member	15
15	Pipeline Engineer	Pipeline & Subsea Structure Integrity	Core Member	5
16	Inspection Advisor	Facilities Integrity	Core Member	7
17	Integrity Engineer Lead	Pipeline & Subsea Structure Integrity	Core Member	2

<Appendix B> Correlations

	Main Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Internal knowledge contribution	1															
2	External knowledge contribution	-.200**	1														
3	External boundary spanning	-.168**	.569**	1													
4	Environmental scanning	-.139**	.273**	.448**	1												
5	Community fluidity	-0.012	0.034	.084**	0.034	1											
6	First joined online (m)	0.016	-0.017	-0.032	-.048*	-.064**	1										
7	Organization (position) level	-0.034	-0.029	-.126**	0	-.233**	.067**	1									
8	Cmmunity membership	.080**	.199**	.364**	.162**	-0.013	-.121**	-.075**	1								
9	Joined Home Community (m)	-.067**	0.029	0.005	-.047*	0.019	.514**	-0.018	-.193**	1							
10	Total # of postings (Period 1)	.483**	-.110**	-0.029	-.087**	-0.033	0.003	0.009	.260**	-.062**	1						
11	Total # of postings (Period 2)	.493**	-.072**	-0.031	-0.04	0.004	-0.009	-0.019	.208**	-0.029	.532**	1					
12	Total # of community visits	.258**	0.032	.158**	-0.034	-.060**	0.021	-.120**	.402**	0	.501**	.396**	1				
13	Community founded (m)	-0.041	-0.03	-0.042	-.097**	.055*	.243**	-.103**	-.173**	.473**	-.062**	-.066**	-0.004	1			
14	Community size	0.022	-0.041	-.065**	-0.034	-.425**	-.113**	.158**	.082**	-.272**	-0.019	-0.023	0.003	-.407**	1		
15	# of discussion threads	.217**	-.208**	-.283**	-.431**	-.116**	-0.019	.147**	.049*	-.139**	.182**	.164**	.103**	-.318**	.441**	1	
16	Community traffic	0.036	0.003	-0.028	.104**	-.165**	.132**	.057*	.109**	.059**	.143**	.094**	.263**	.065**	-.148**	.057*	1

Note: N = 1,992; *p < .05, ** p < .01

<Appendix C> 2-Level Mixed-Effect Negative Binomial Regression Estimation

As a robustness check, we employed a 2-level mixed-effect negative binomial regression estimation model, which provides the correct coefficient estimates and significance tests by accounting for within-community (level 1) and between-community (level 2) variances and covariances while correcting the standard errors for both within-community and between-community effects (Aguinis et al., 2013; Chen et al., 2007). In doing so, we were able to simultaneously estimate (a) the individual-level non-linear effect of external boundary spanning on the within-community portion of internal knowledge contribution, (b) the cross-level effects of the community's environmental scanning and fluidity on the between-community portion of internal knowledge contribution, and (c) the cross-level interaction effects on internal knowledge contribution (i.e., the effects of community-level conditions on the within-community effect of external boundary spanning on internal knowledge contribution).

The table below reports the results. Following Aguinis et al. (2013), we estimated the cross-level interaction effects, our main interest, in a hierarchical manner. The (unreported) Likelihood-Ratio (LR) test indicates that the multilevel mixed-effect model produces a better model fit than OLS regression without any random effect. In Step 1 (null model), we omitted predictors and only allowed intercepts to vary across communities. Within-community variance is .84, providing evidence for a nested data restructure that recommends a multi-level modeling approach. In Step 2, we entered predictors while only allowing for a random intercept. In Step 3, we allowed for both random intercept and slope. The high slope variance (.54) suggests that the relationship between external boundary spanning and internal knowledge contribution would vary depending on community membership, providing evidence for community-level differences that moderate the effect of external boundary spanning on internal knowledge contribution. Finally in Step 4, we tested whether particular community-level (L2) factors would be able to explain some of the variances in slopes across communities as found in Step 3. Both community-level factors, environmental scanning and fluidity, and moderated the non-linear effects of external boundary spanning on internal knowledge contribution. In sum, the coefficients of the four cross-level interaction effects are all statistically significant and consistent with the main results reported earlier in <Table 2>, providing evidence in support of the robustness of the main results.

DV: Internal Knowledge Contribution		Step 1	Step 2	Step 3	Step 4
		Null	Random Intercept & Fixed Slope	Random Intercept & Random Slope	Cross-level Interactions
		Coef. (Std.Er)	Coef. (Std.Er)	Coef. (Std.Er)	Coef. (Std.Er)
	Constant	-.30**(.11)	-.93(.60)	-.96(.60)	-.98(.60)
Controls	*External knowledge contribution*		-.32***(.08)	-.33***(.08)	-.31***(.08)
	Organization (position) level		-.38(.34)	-.37(.34)	-.34(.34)
	Location: Americas		.10(.08)	.09(.08)	.09(.08)
	Location: EMEA		.14(.09)	.14(.09)	.15(.09)
	Home community leadership		.04(.05)	.04(.05)	.03(.05)
	Non-home community leadership		-.18(.09)	-.18(.09)	-.16(.09)
	First joined online (m)		0(0)	0(0)	0(0)
	Joined community (m)		0(0)	0(0)	0(0)
	Community membership		-.22(.12)	-.22(.13)	-.23(.13)
	Total # of postings (Period 1)		-.19*(.08)	-.20*(.08)	-.20*(.08)
	Total # of postings (Period 2)		1.01***(.03)	1.01***(.03)	1.02***(.03)
	# of comty visits by a focal person		.23*(.09)	.23*(.09)	.22*(.09)
	Focal community founded (m)		0***(0)	0(0)	0(0)
	Focal community size		-.19(.10)	-.18(.10)	-.19(.11)
	# of discussion threads at focal community		.46**(.14)	.45**(.13)	.41**(.14)
	# of community visits made by a focal community member		-.11(.21)	-.11(.21)	-.03(.21)
L1 Predictors	*External boundary spanning*		2.72***(.59)	2.73***(.61)	3.37***(.79)
	External boundary spanning (squared)		-3.82***(.53)	-3.84***(.54)	-4.29***(.65)
L2 Predictors	*Environmental scanning*		-.22(.46)	-.21(.46)	-.58(.50)
	Community fluidity		-.39(.56)	-.36(.56)	-.21(.56)
Cross-Level Interactions	*External boundary spanning * environmental scanning*				16.51**(5.28)
	*External boundary spanning (sqrd) * environmental scanning*				-16.27**(4.72)
	*External boundary spanning * community fluidity*				17.78*(8.87)
	*External boundary spanning (sqrd) * community fluidity*				-13.64*(6.95)
Additional Info	Log likelihood	-2837.87	-1733.89	-1734.45	-1726.52
	Between-Community Intercept (L2) Variance	.84(.19)	.20(.07)	.18(.06)	.17(.06)
	Between-Community Slope (L2) Variance			.54(.76)	.49(.76)
	Intercept-slope (L2) Covariance			-.24(.15)	-.17(.14)

Note: N = 1,992; * $p < .05$; ** $p < .01$; *** $p < .001$

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