

Leadership in innovation communities: The impact of transformational leadership language on member participation

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Abstract

Many organizations seek to establish online innovation communities (ICs) to obtain valuable knowledge and innovative ideas, though both research and practice suggest that they also struggle to sustain continued, high-quality member participation. Designated IC moderators might be able to stimulate IC members to participate regularly and make high-quality contributions. In response to calls to integrate organizational behavior and IC research, this study addresses the impact of community moderators' uses of transformational leadership (TFL) language on member participation. By operationalizing the TFL dimensions—charisma, individualized consideration, and intellectual stimulation—with language cues, this article uses an automated text analysis approach to review 64 firm-hosted ICs with 538,805 posts, analyzed with two hierarchical linear models. The findings show that moderators' charismatic language cues enhance members' participation quality and quantity. Although individualized consideration and intellectual stimulation increase participation quality, they decrease participation quantity. Organizations thus should assign moderators to lead ICs by using TFL language strategically, in accordance with the focal IC goals, in terms of the quality and quantity of member contributions to their innovation processes. This article contributes to the literature by exploring how leadership language in online communities can facilitate the development of innovative ideas. In addition, this study offers a more nuanced view on the effects of TFL by revealing both positive and negative outcomes in firm-hosted online ICs and it introduces a new, objective measure of TFL built on linguistic markers. This article also includes specific guidelines for how moderators can achieve effective leadership through their language use, as well as managerial implications for the effective selection, training, and support of IC moderators.

KEYWORDS

innovation communities, language, text analysis, transformational leadership, user participation

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1 | INTRODUCTION

To gather customers' innovative ideas, companies establish online innovation communities (ICs) that also receive growing attention from researchers (Li et al., 2016). These firm-hosted ICs are a form of online user communities that rely on Internet-based platforms, on which users can communicate and share information (Autio et al., 2013; Coussement et al., 2017). Firms can achieve benefits related to building their brands, encouraging product use, collecting feedback and ideas, or promoting innovations (Jeppesen & Frederiksen, 2006). For example, companies such as Air France, Dell, Starbucks, and Honeywell International have established ICs to encourage customers to participate in innovation, seeking to leverage their external creative resources and ideas (Li et al., 2016; Troch & Ruyck, 2014). ICs form a social environment, in which members interact to work collectively on problems or challenges (Coussement et al., 2017; Dahlander & Frederiksen, 2012). Thus, their active participation is critical to ICs' value-creation potential (Reischauer & Mair, 2018).

However, firm-hosted ICs often struggle to encourage participation and motivate members to continue contributing high-quality innovation ideas, in which case ICs may not always turn out to be a success for the hosting companies (Gebauer et al., 2013). Companies thus need insights on how to steer innovation processes in their ICs (Beretta et al., 2018) and encourage members' continued, high-quality contributions. Research proposes the critical need for effective leadership in ICs (Fleming & Waguespack, 2007) and organizational research likewise points out that leadership exerts a strong influence on followers' innovation (Hughes et al., 2018). But members of an IC are volunteers, not employees, so these communities feature relatively weak hierarchies (Dahlander & Frederiksen, 2012), with little formal power (Johnson et al., 2015). In addition, interactions in online communities are mediated by the technology, which limits them to text-based, often asynchronous communications (Johnson et al., 2015). Without face-to-face interactions, leaders in these communities face additional challenges in motivating members to contribute to innovation processes. A certain kind of formal online community leaders are designated community moderators who engage in technology-mediated interactions with members to facilitate their high-quality solution suggestions (Noble et al., 2012) or initiate productive conversations (Coussement et al., 2017). Although previous literature has already addressed the question who emerges as a leader in online communities, only a few studies have focused on the effectiveness of formal online community leaders. Research indicates that, despite their egalitarian norms, a formal role of authority is an important predictor of effective online community leadership (Johnson et al., 2015),

Practitioner Points

- Online IC moderators can act as leaders in ICs and stimulate member participation by using TFL language.
- Different dimensions of TFL language have distinct impacts on member participation quality and quantity. Charismatic language enhances participation quality and quantity, while individualized consideration language and intellectual stimulation language promote participation quality but reduce participation quantity.
- Managers should be aware of the contrary effects of different TFL dimensions and offer trainings to IC moderators through which they can learn which linguistic indicators to use to achieve the intended effects on member participation quality and/or quantity. Learning management systems might support moderators in practicing TFL language use properly and dashboards can help monitor their TFL language use in real-time.
- Managers can encourage virtual innovation team leaders to use TFL language in order to enhance innovation processes in virtual team settings.

but important questions, such as how moderators can steer community discussion remain mostly unanswered. This study addresses this research gap by examining moderators' impact on IC members' participation quality and quantity.

To stimulate innovative behavior in organizations, transformational leadership (TFL) has proven to be effective (Sivasubramaniam et al., 2012) and prior research indicates that TFL is especially instrumental for achieving targeted performance outcomes under virtual communication conditions (Purvanova & Bono, 2009). That is, community leaders who adopt TFL might be able to prompt valuable innovation input by enhancing members' participation quality and quantity. Transformational leaders articulate desirable goals and visions, raise followers' performance expectations, and increase intrinsic motivation (Jung et al., 2003), as manifested in the behavioral components charisma (i.e., idealized influence and inspirational motivation), individualized consideration, and intellectual stimulation (Avolio et al., 1999).

But because interactions are limited to written communication, leadership in ICs differs substantially from traditional in-person and synchronous settings (Johnson et al., 2015). To display TFL, community leaders need to rely exclusively on their language in online ICs. This is because traditional leadership behaviors, that include non-verbal cues and physical

status characteristics, can hardly be observed in virtual settings (Johnson et al., 2015). Even prior research that emphasizes to study TFL behaviors in virtual settings in fact analyzes leaders' communication and how they speak to their followers in a detailed coding process (Purvanova & Bono, 2009). To understand what community leaders actually do to influence members in community settings, it is consequently necessary to study their language (Johnson et al., 2015) with an automated text-analysis approach. Hence, studying TFL language use promotes the understanding of social influence relationships in an online setting (Huffaker, 2010). As previous research shows, leaders' language affects followers' perceptions and behaviors (e.g., Carton et al., 2014; Weiss et al., 2018). However, with regard to moderator's formal leadership role in online ICs, extant literature does not provide sufficient insights on how language may be strategically used to encourage members' participation. Furthermore, although TFL is widely suggested to positively affect teams' and individuals' performances, empirical findings on whether its effectiveness is lower or even higher in virtual settings are divergent (e.g., Howell & Hall-Merenda, 1999; Purvanova & Bono, 2009). These tensions are attributable to prior research's predominant tendency to ignore dimension-level effects of TFL by operationalizing it with a single scale score (Hughes et al., 2018). Therefore, to advance TFL research and the field of leadership in online communities, it is necessary to conceptualize the three TFL dimensions' materialization in leaders' language and their distinct impacts on member participation quality and quantity. To address the outlined research gap, we seek to answer the following research question: *How does TFL language use by moderators influence member participation quality and quantity in ICs?*

To investigate this research question, we perform an automated text analysis of 538,805 IC posts by 3759 members and moderators of 64 firm-hosted ICs with an average of 58 members per IC. To support our novel language-based operationalization of TFL, we consider theoretically derived linguistic indicators of moderators' TFL from actual posts and comments, using Linguistic Inquiry and Word Count (LIWC) software. To ensure validity of all LIWC-based variables in our study, we perform comprehensive validity checks by involving independent coders. Noting the hierarchical nature of our data set, in which IC members are nested in communities, we use hierarchical linear models (HLMs) to assess the distinct impacts of the three language-based TFL dimensions on members' participation quality and quantity.

This study makes three main contributions to current research. First, in relation to innovation management research, we explore the impact of moderators' leadership on community members' participation in firm-hosted ICs that are designed to facilitate the generation of innovative ideas. We thus answer calls to investigate human components of innovation communities and the impact of moderators' interventions on

the quality and quantity of members' participation (Beretta et al., 2018). This extension of extant research also incorporates organizational behavior and communication research perspectives, by identifying TFL as a promising leadership approach and modeling it in terms of linguistic style. As we show, TFL can be applied to virtual community contexts characterized by text-based interactions.

Second, leadership research tends to present TFL as universally positive, but we reveal both positive and potential negative outcomes of well-intended leadership behaviors in firm-hosted online ICs. We enrich TFL research by linking these opposing effects according to a theory-based mechanism involving high cognitive demands. This dialectical perspective clarifies the impacts of TFL on members' participation quality and quantity; it also challenges the general assumption that TFL is a universal remedy. With this more nuanced view, our study reveals that the appropriateness of TFL depends on the intended outcomes.

Third, noting criticisms of existing TFL measures as lacking in validity (e.g., Antonakis et al., 2016; van Knippenberg & Sitkin, 2013) because they ignore its multidimensional structure (Hughes et al., 2018) or measure its effects on outcomes rather than TFL behavior (van Knippenberg & Sitkin, 2013), which could create endogeneity biases, we propose an objective measure of TFL (Antonakis et al., 2016). With this alternative measurement approach, we build on linguistic markers of the TFL dimensions. It supports a rigorous analysis of TFL dimensions, in terms of language uses and their effects.

2 | CONCEPTUAL BACKGROUND AND HYPOTHESES

2.1 | Member participation in online (innovation) communities

Customers not only buy and use products and services but also possess relevant knowledge that might enhance the quality and value of firm offerings (Lauritzen, 2017). By integrating customers (Ngo & O'Cass, 2013) and users (von Hippel, 2001, 2009) into innovation processes (Lauritzen, 2017), customer participation can occur at different new product development (NPD) stages, such as idea generation, idea screening, idea selection, and concept testing (Oertzen et al., 2018) and involve a variety of knowledge, feedback, or concept tests. In turn, customer participation in innovation processes can provide various benefits; companies can gather customers' experience and product expertise, gained through regular product use, and leverage their creative potential, reflecting different perspectives and access to diverse information (Magnusson, 2009). With such contributions, companies potentially can reserve their own resources, get innovations

to market faster, and reduce the risk of new product failures by achieving better fit (Carbonell et al., 2009). Such idea generation methods thus can outperform traditional NPD efforts, in terms of novelty and customer benefits (Poetz & Schreier, 2012).

By leveraging information technology advances, online, firm-hosted ICs make such customer participation easier, such that they have become important sources of innovation across industries (Balka et al., 2014). Online platforms grant firms wider access to broad customer bases and knowledge, which increases the likelihood of generating innovative NPD ideas (Bretschneider et al., 2015). In these firm-hosted ICs, members interact in a social environment, share knowledge, post innovative ideas, and comment on others' ideas (Dahlander & Frederiksen, 2012; Langner & Seidel, 2015), so they also tend to elaborate on and improve their ideas collaboratively, which ultimately may help convert these ideas into new or improved solutions (Baer, 2012). However, many online ICs struggle to maintain high levels of value-creating member participation (Dahlander & Piezunka, 2014; Langner & Seidel, 2015), which is characterized by continued contributions (*quantity*) and well-presented content of postings and comments (*quality*) (Di Gangi et al., 2010; Koh et al., 2007).

That is, member participation quantity and quality largely determine viable online ICs (Beretta et al., 2018; Coussement et al., 2017). Member participation quantity reflects how much members contribute, such as by promoting new topics or stimulating continuing discussions (Ludwig et al., 2014). Many lively discussions provide a key sign of a prospering, dynamic IC (Coussement et al., 2017). Member participation quality instead pertains to efforts to develop communications, in terms of elaborating a valuable and useful reasoning, presenting ideas, and commenting on others' suggestions (Coussement et al., 2017; Ludwig et al., 2014), which produce better group discussion outcomes (Gouran, 1990). As communication research shows, the quality of an argument, rather than its strength or force, predicts decision outcomes in computer-mediated groups (Ludwig et al., 2014; Seibold et al., 2010). If members craft posts with well-developed arguments, it implies high participation quality, which should relate directly to innovation success in ICs (van de Ven, 1986). Moreover, conceptualizing participation quality in terms of argumentation development facilitates the comparison of ICs with different content and tasks (Ludwig et al., 2014).

2.2 | Drivers of participation in ICs

2.2.1 | Responsiveness

Previous research on crowdsourcing and firm-hosted online communities identifies some reasons why members are motivated to participate, including their interest in innovation

activities (Füller et al., 2008), enjoyment of online interactions (Wiertz & de Ruyter, 2007), or desire for access to learning benefits and fun (Nambisan & Baron, 2009). Research at the organizational level also notes, for example, that members who develop dual social identities, with both the community and the organization, exhibit sustained participation in online ICs (Langner & Seidel, 2015). Some researchers suggest the importance of companies' responsiveness to and recognition of users' innovative ideas in firm-hosted online communities to make members feel more valued, which should motivate their further participation (Di Gangi et al., 2010; Jeppesen & Frederiksen, 2006). Similarly, Dahlander and Piezunka (2014) show that organizations' proactive and reactive attention to suggestions posted in online suggestion boxes have a positive impact on the number of ideas submitted by external contributors in the future. Even rejections can increase innovative contributors' continued interaction with the organization, especially when the rejections include explanations and mimic the submitted idea's linguistic style (Piezunka & Dahlander, 2019). Arguably then, beyond just responsiveness, the writing or linguistic style that marks online interactions may be influential (Lauritzen & Karafyllia, 2019). In sum, these findings provide insights for the design of organizational practices (e.g., to be responsive and to provide feedback to IC members) to sustain participation.

2.2.2 | Leadership

Community leaders also can encourage collaboration and participation (Beretta et al., 2018; Preece, 2002); for example, Beretta et al. (2018) highlight the unique role of moderators in firm-internal systems for supporting innovation processes and stimulating the quantity and quality of submissions. They suggest that the moderator role might be similarly important in open innovation communities.

A large body of research on online communities, however, concentrates on the emergence of leadership (Mu et al., 2019). This research stream tends to emphasize which behaviors in online communities contribute to members' potential identification or emergence as leaders, rather than how they might influence others. Technical contributions, active participation in discussions, communication content, and members' communication network position in terms of centrality, among others, are relevant factors to indicate members' emergence as community leaders (Dahlander & O'Mahony, 2011; Faraj et al., 2015; Fleming & Waguespack, 2007; Huffaker, 2010; Lee et al., 2019). Johnson et al. (2015) revealed that, in addition to their network position, members' language seemingly can establish them as community leaders, according to other participants. In particular, members who tend to adopt the vocabulary embraced by the community when writing posts and whose language is simpler, more

readable, and more positive in sentiment also are more likely to be identified as online community leaders (Johnson et al., 2015). By combining social network and linguistic analyses, Huffaker (2010) also determines that online leaders produce lengthier messages and influence others by using language that is more affective, assertive, and diverse.

Overall, these studies provide insights on *who* emerges as a leader in online communities and that writing and linguistic style are relevant for being identified as online community leaders. However, these prior findings do not provide sufficient answers on *how* designated leaders can influence community discussions, *if* and *how* they can employ their language to stimulate participation and their effectiveness in doing so. Only a few studies have begun to investigate the effectiveness of formal online community leaders. Mu et al. (2019) emphasize the influential role of formal leaders in online ICs and find that relationship-oriented behaviors contribute more to open collaborative innovation success than task-oriented leadership behaviors. With a simulation, Oh et al. (2016) test the impacts of two leadership styles (uniform leader-member exchange [LMX] and differential LMX) in open collaborative work communities; they find influences on members' participation, though the effectiveness of both leadership styles appears to vary across environmental conditions. Li et al. (2012) instead study open source software communities and their leaders, in which TFL mediated by developers' intrinsic motivation positively affects contributions, but extrinsic motivation mediates the effect of transactional leadership. Although they offer some suggestions of the importance of formal leaders in online ICs and their effectiveness in stimulating member participation, these studies suffer from limited explanatory power due to their small sample size (Li et al., 2012), a lack of real-world and empirical data (Oh et al., 2016), or uses of community-level proxies to measure leadership behavior (Mu et al., 2019).

Overall then, we glean from current literature that formal leaders are important to ensure communities' viability, in terms of member participation, and that language use may be a crucial manifestation of leadership behavior in online communities. Considering the unique environment of online ICs though, with moderators as designated leaders, extant research cannot establish how moderators' leadership behaviors materialize in ICs or affect member participation. We propose to model leadership behavior by writing style and language use, with a particular focus on TFL, which has proven effective for encouraging innovative work behaviors when task complexity is high (Afsar & Umrani, 2020), as is the case in online ICs. Furthermore, some prior research has suggested that TFL is manifested in leaders' language (e.g., Baur et al., 2016; Boies et al., 2015), but studies of its impact on innovation outcomes, especially in virtual settings, remains scarce and produces some mixed results. While some research suggests that TFL produces higher follower

performance in situations with low physical distance (e.g., Howell & Hall-Merenda, 1999), other scholars find that TFL has a stronger effect in teams that purely rely on virtual interactions (e.g., Purvanova & Bono, 2009). Furthermore, meta-analytic findings of Hughes et al. (2018) reveal the largest range of observed correlations (ranging from small negative to strong positive effect sizes) between TFL and both creativity and innovation compared to other leadership approaches. We posit that these mixed findings might be the result of treating TFL as a homogenous construct, rather than considering its different dimensions (Hughes et al., 2018). That is why we examine the impact of each of the three TFL dimensions on member participation quality and quantity individually. This approach promises to provide new insights for enriching TFL theory. Table 1 summarizes some relevant research insights and gaps as well as the present study in relation to previous work, to establish the motivation for our study.

2.3 | Transformational leadership and innovation-focused behavior

Leaders' behaviors provide key antecedents of followers' creative and innovative endeavors (Anderson et al., 2014; Hughes et al., 2018), such as developing novel, useful ideas and then converting those ideas into new or improved solutions (Baer, 2012). In this context, TFL might be especially pertinent in driving innovation processes (Gumusluoğlu & Ilsev, 2009), because it involves leaders who convince followers to move beyond their immediate self-interest by exhibiting (a) charisma (which comprises idealized influence and inspirational motivation), (b) intellectual stimulation, and (c) individualized consideration (Avolio et al., 1999; Bass, 1999). According to Judge and Piccolo (2004), idealized influence is the degree to which leaders display conviction, set an example to follow, and appeal to recipients on an emotional level. Inspiration means that leaders express long-term visions that are appealing and inspiring to their followers, as well as optimism about reaching future goals. Intellectual stimulation arises when leaders encourage followers to challenge assumptions and solicit their ideas. Thereby leaders stimulate their followers' creativity and help them to become more innovative. Finally, individualized consideration refers to the extent to which leaders pay attention to each follower's needs and concerns.

Innovation and organizational behavior studies assert that TFL increases innovation at multiple levels (Gumusluoğlu & Ilsev, 2009; Jiang & Chen, 2018; Jung et al., 2003; Kraft & Bausch, 2016). At the individual level for example, TFL may boost proactivity (Den Hartog & Belschak, 2012), personal initiative, and constructive voice (Schmitt et al., 2016). Followers with a transformational leader also tend to be more intrinsically motivated (Shin & Zhou, 2003)

TABLE 1 Overview of selected studies discussing online (innovation) communities, community leadership, and language use

Author(s), year, and journal	Context	Type of study and sample	Dependent variable/ outcome focused	Type of leadership (emergent vs. designated)
Langner and Seidel (2015), <i>Journal of Product Innovation Management</i>	Firm-hosted innovation communities	Qualitative case study of two firm-hosted ICs	Sustained engagement by members	–
Dahlander and Piezunka (2014), <i>Research Policy</i>	Crowdsourcing via online suggestion boxes	Quantitative field study of 23,809 firms	Eliciting suggestions from external contributors	–
Piezunka and Dahlander (2019), <i>Academy of Management Journal</i>	Crowdsourcing via online suggestion boxes	Quantitative field study using data of 70,159 firms and 1,336,154 contributors	Continued interaction	–
Beretta et al. (2018), <i>Journal of Product Innovation Management</i>	Web-enabled ideation systems (firm-internal)	Qualitative case study of a Swedish ICT company that uses virtual idea boxes	Employee sustained participation, quantity and quality of submissions, implementation chances of ideas, nature of ideas generated and selected	Designated
Faraj et al. (2015), <i>MIS Quarterly</i>	Open online communities	Social network analysis and qualitative content analysis using 6706 messages from 976 participants; survey of 318 participants	Recognition of a member as a leader by other participants	Emergent
Lee et al. (2019), <i>Information & Management</i>	Online product community	Social network analysis and qualitative content analysis using 15,959 messages of 1077 participants	Sustained user participation	Emergent
Johnson et al. (2015), <i>Information Systems Research</i>	Online communities	Quantitative analysis (using social network analysis, survey, and natural language processing data) of three online communities with 14,396 participants	Recognition of a member as a leader by other participants	Emergent
Huffaker (2010), <i>Human Communication Research</i>	Online discussion groups/ communities	Quantitative (automated text analysis, social network analysis, HLM)	Online leadership (operationalized through reply trigger, conversation creation, and language diffusion)	Emergent
Oh et al. (2016), <i>Information System Research</i>	Online collaborative work communities (OCWCs)	Computer simulation experiments based on Monte Carlo techniques	Sustained participation	Designated
Li et al. (2012), <i>Information & Management</i>	Open source software (OSS) communities	Survey of 118 OSS developers from various projects of a large OSS community	Contribution of OSS developers (measured as the amount of time a developer spends on an OSS project)	Designated

Leadership in (innovation) communities	Effectiveness of community leaders	Impact of language (in communities)	Key insight
–	–	–	Identification of eight organizational practices that support dual social identity
–	–	–	Organizations' proactive and reactive attention increase the likelihood of receiving suggestions from externals
–	–	X	Receiving a rejection positively impacts newcomers' willingness to submit ideas in future. This effect is stronger if the rejection includes an explanation and is particularly pronounced if the explanation matches the original idea in terms of linguistic style
–	–	–	Identification of three practices implemented by moderators to manage ideation and discussion how these practices overcome shortcomings of web-enabled ideation systems
X	–	–	Knowledge contributions and structural positioning in the communication network directly predict members' identification as a leader
X	X	–	Identification of three types of emerging and coexisting online leadership types. The online community's viability relied on online leadership shifting between the different leaders
X	–	X	Communication network position—in terms of formal role, centrality, membership in the core, and boundary spanning—and the generation of a large number of positive, concise posts with simple language increases the likelihood of being viewed as leaders by other participants
X	–	X	Findings reveal that online leaders influence others through high communication activity, credibility, network centrality, and the use of affective, assertive, and linguistic diversity in their online messages
X (Uniform LMX and differential LMX)	X	–	Leader behavior (in terms of uniform LMX and differential LMX) affects member retention and sustained participation in OCWCs, but its impact is significantly moderated by contextual factors, such as community size, structure, maturity, and environmental uncertainty
X (TFL and transactional leadership)	X	–	Results indicate that leaders' TFL is positively related to developers' intrinsic motivation and that leaders' active management style is positively related to the developers' extrinsic motivation, both leading to more contributions of OSS developers

TABLE 1 Continued

Author(s), year, and journal	Context	Type of study and sample	Dependent variable/ outcome focused	Type of leadership (emergent vs. designated)
Mu et al. (2019), <i>Industrial Management & Data Systems</i>	Open collaborative innovation community	Quantitative field study using data from 1012 blockchain projects on GitHub	Project success	Designated
Present study	Online innovation communities	Quantitative field study using 538,805 posts from 3759 members of 64 firm-hosted ICs	IC member participation quality and quantity	Designated

and express greater perceptions of psychological empowerment, which drives them to make high-quality contributions at work (Dust et al., 2014), think “outside the box” (Afsar et al., 2014), and search for creative problem-solving approaches (Sosik et al., 1998). Not only does TFL relate positively to improved idea generation (Sosik et al., 1998) and implementation (Afsar et al., 2014), but Li et al. (2016) also assert that TFL directed toward individual followers increases innovation behavior. Similarly, Pieterse et al. (2010) show that followers exhibit innovative behavior while working with a transformational leader and consider themselves psychologically empowered. Accordingly, we anticipate in line with the general assumption of leadership-innovation research that transformational leaders can enhance both the quantity and quality of innovation displayed by followers (Hughes et al., 2018). This is supported by the study of Kovjanic et al. (2013) that reveals the impact of TFL on both the quality and quantity of innovation-related ideas. The authors and other previous research (e.g., Charbonneau et al., 2001; Shin & Zhou, 2003) emphasize an underlying influence mechanism through which TFL shapes employees’ performance (e.g., creativity or innovation). This mechanism suggests that transformational leaders enhance employees’ intrinsic motivation, such that followers want to perform and express interest in their job tasks (Ng, 2017; Shin & Zhou, 2003). Li et al. (2012) found that this motive is also salient among members of open source software communities in that they participate in community projects due to the desire to experience pleasure and satisfaction, i.e., being intrinsically motivated. Similarly, Wendelken et al. (2014) stress perceived personal relevance of the activity as a crucial motivational aspect for members’ involvement in ICs. Their personal interest in engaging and contributing in ICs is, for example, attributable to hedonistic values, such as fun and enjoyment (Füller et al., 2008; Nambisan & Baron, 2009; Wendelken et al., 2014). West and Bogers

(2014) also mention external innovators’ intrinsic motivation as a key driver to participate in open innovation activities. Therefore, the intrinsic motivation mechanism behind the effect TFL has on performance-related outcomes is also likely to apply for members’ contributions in ICs.

Companies that establish ICs often appoint moderators to manage and structure the community (Noble et al., 2012), assigning them some label that reflects their special status and formal roles. If they take on such a formal role, moderators prompt perceptions among others that they are leaders (Johnson et al., 2015). Therefore, moderators likely function as leaders in an IC (Panteli, 2016), tasked with establishing a vision, creating a constructive environment to facilitate innovation, shaping agendas, and defining the initial task or collective goals (Oh et al., 2016). They also might initiate innovation-related discussions to stimulate members to participate and share their ideas, knowledge, and opinions in posts (Coussement et al., 2017). In the course of these discussions, moderators interact with the community members to purposely steer their participation. In this sense, moderators are responsible to increase and then maintain participation quantity and quality. Their interactions with members resemble a traditional leader–follower relationship: They lead by trying to influence, mobilize, and motivate followers (members) (Yukl, 2009).

Prior work highlights that communication is a key channel for leadership (Barge, 1994; Johnson et al., 2015; Joullié et al., 2020), though the lack of face-to-face communication in ICs mandates text-based, asynchronous moderator-member interactions (Johnson et al., 2015) and limits communication richness. The exclusive reliance on text-based communication eliminates the influences of elements such as tone of voice, appearance, body language, and gestures (Balthazard et al., 2009). Instead, moderators must rely on linguistic cues to stimulate members’ participation in ICs. Prior organizational behavior and communication research indicates that leaders’

Leadership in (innovation) communities	Effectiveness of community leaders	Impact of language (in communities)	Key insight
X (task-oriented & relation-oriented leadership)	X	–	Relation-oriented leadership behavior positively affect open collaborative innovation success while task-oriented leadership behaviors have little influence on the success of open innovation projects
X (TFL)	X	X	Identification of ambivalent patterns of the different dimensions of TFL operationalized through leaders' language use. Charisma positively relates to member participation quality and quantity while intellectual stimulation and individualized consideration relate positively to participation quality but negatively to participation quantity

language and word use affect their followers' perceptions and behaviors. For example, motivational language can enhance followers' job performance and satisfaction (Mayfield & Mayfield, 2010), and specific language styles applied to give written instructions or feedback can affect creative performance (Fan et al., 2014). If team members receive instructions in empathetic language for example, their creative performance improves, especially if they also receive encouraging feedback (Fan et al., 2014). These results indicate that the language that leaders use to communicate with followers in a virtual context impacts followers' participation and their innovation endeavors in online discussions and activities. Accordingly, we predict that moderators' language use affects members' participation in ICs. In particular, TFL language use should be especially effective, in line with Purvanova and Bono's (2009) argument that TFL is particularly relevant to stimulate performance in virtual contexts characterized by ambiguous communication conditions. Balthazard et al. (2009) even assert that individual word usages in written media reflect TFL in virtual settings. However, research on TFL and its manifestation through language use, especially in virtual contexts, is still scarce. We aim to address this research gap by operationalizing TFL language and investigating its impact on members' contributions to innovation endeavors in ICs. Therefore, to analyze moderators' TFL language use in ICs, we seek to identify linguistic-style indicators that reflect the different TFL dimensions charisma, individualized consideration, and intellectual stimulation, which we study separately (Antonakis et al., 2003). By investigating the influences of these three dimensions of TFL on members' participation, we seek new insights for theory.

2.3.1 | Charisma

Moderators who lead their communities and members in a transformational way provide an attractive image for future

opportunities and describe a well-articulated vision that inspires members to develop new approaches for solving problems (Piccolo & Colquitt, 2006). If they optimistically illustrate the innovation tasks that need to be accomplished and express confidence in members' abilities, moderators might influence members to develop feelings of competence and regard their contributions as meaningful (Ashkanasy & Tse, 2000; Dust et al., 2014; Piccolo & Colquitt, 2006), i.e., perceive self-determination, a key characteristic of intrinsic motivation (Gagné & Deci, 2005). The members then should be motivated to contribute to innovation topics initiated by the moderator and to share their knowledge and expertise with other community members to solve the innovation tasks, because the moderator's posts and comments encourage them to view their participation as impactful. Presenting a compelling vision and acting as a role model energizes followers and increases their concentration through an intrinsic motivation mechanism (Shin & Zhou, 2003), which positively affects both performance quality and quantity (Cerasoli et al., 2014).

As Bono and Ilies (2006) highlight, charismatic leaders also tend to express more positive emotions in their written and spoken communications, which enhances followers' positive affect, so transformational leaders who use emotional, inspirational language can enhance their followers' emotions (Schmitt et al., 2016). Those positive emotions prompt creativity, cognitive flexibility, and innovation (Isen, 2001). In an online community context, leaders' affective language use triggers members' participation quantity in terms of replying to leaders' posts (Huffaker, 2010). Furthermore, charismatic leaders provide engaging role models for innovation-focused thinking and behavior and articulate strong visions of innovation, which also stimulate followers' intrinsic motivation (Gumusluoğlu & Ilsev, 2009; Kraft & Bausch, 2016) and mobilize them to work toward performance quality (Jung et al., 2003; Keller, 1992). To

communicate innovation vision, the language of charismatic leaders, spoken and written, is essential (Conger, 1991). We suggest that moderators in ICs can use particular language to communicate innovation goals and express psychological closeness, which mobilizes members to share their own ideas and knowledge in ICs. By displaying charisma and their personal attachment with the IC's innovation goals in communications, moderators stimulate members' proactivity (Den Hartog & Belschak, 2012), engagement, effort (Shamir et al., 1993), task performance (Dust et al., 2014), and participation. Therefore, we propose:

H1 Moderators' charismatic language use relates positively to members' participation (a) quality and (b) quantity.

2.3.2 | Individualized consideration

Exhibiting individualized consideration of followers stimulates their intrinsic motivation to increase their job performance (Gumusluoğlu & Ilsev, 2009). Transformational leaders provide individual support, empathy, and constructive feedback; they attend to followers' needs and offer individual recognition (Judge & Piccolo, 2004). In turn, followers become aware of their full potential and develop feelings of competence (Dust et al., 2014). Encouraged by their leaders' individualized consideration, followers might feel free to experiment with ideas and try new and different approaches, which should boost their intrinsic motivation (Shin & Zhou, 2003) and result in improved performance quality and quantity (Cerasoli et al., 2014).

In characterizing transformational leaders' language as open and careful, Berson and Avolio (2004) explain that they effectively establish two-way communications with followers and display consideration of followers' individual needs. By responding directly to or approaching individual members, moderators can act as transformational leaders and show their care and concern. Furthermore, Huffaker (2010) indicates that online community leaders engage in reciprocity to develop relationships and thereby can stimulate members' participation in dialogue. With regard to transformational leaders' impacts, Tse et al. (2013) argue that followers reciprocate leaders' individualized consideration by engaging in positive behaviors that benefit the organization. Afsar et al. (2014) also suggest that followers feel psychologically empowered and intrinsically motivated by a leader's individualized consideration, which prompts greater creativity and innovativeness. In an IC context, members might contribute more often and with greater effort when a moderator addresses them individually and reacts to their posts. Thus, we hypothesize:

H2 Moderators' individualized consideration language use relates positively to members' participation (a) quality and (b) quantity.

2.3.3 | Intellectual stimulation

Transformational leaders' intellectual stimulation offers a social cue prompting followers to develop new methods and to adopt innovative problem-solving approaches (Rafferty & Griffin, 2004; Zhou et al., 2012). Leadership behaviors associated with intellectual stimulation include suggesting alternative perspectives, encouraging followers to rethink prevalent assumptions about how things are done (Bass, 1985; Zhou et al., 2012), actively questioning followers' assumptions, reframing problems, and calling for new approaches and solutions. Thus, transformational leaders can stimulate followers' effort on innovative tasks (Jung et al., 2003), gauged in terms of quality and quantity, because these followers are intrinsically motivated to pursue their intellectual curiosity and experiment with ideas and solutions (Shin & Zhou, 2003). Similarly, IC moderators can intellectually stimulate IC members by challenging their views and notions about the innovation problem.

For example, moderators might use a questioning tone in interactions with members (Boies et al., 2015) or ask them to avoid established processes and develop new ways to complete tasks (Den Hartog & Belschak, 2012). Through extensive virtual interactions, requesting varied perspectives from IC members, moderators also demonstrate intellectual stimulation and indicate their activity level, as is typical of transformational leaders (Balthazard et al., 2009). Such activity should increase members' interest in and awareness of problems (Rafferty & Griffin, 2004) and encourage critical thinking and debate in ICs (Boies et al., 2015), because leaders' activity (e.g., frequent, longer messages) stimulates conversations in online communities (Huffaker, 2010). Transformational leaders' intellectual stimulation also induces followers' proactive behavior (Den Hartog & Belschak, 2012), because teams exposed to intellectual stimulation behaviors tend to communicate more (Boies et al., 2015). Furthermore, transformational leaders can enhance followers' problem-solving skills through intellectual stimulation and support them in developing innovative solutions for unprecedented problems (Zhou et al., 2012). We therefore anticipate that moderators induce IC members to participate in discussions about innovation problems and contribute their expert knowledge proactively, by intellectually stimulating them through their language use and activity. They also might enhance members' problem-solving capabilities by helping them comprehend and analyze the problems, which should improve the quality of their contributions (Bass & Avolio, 1990; Rafferty & Griffin, 2004). Finally, they might motivate IC members to increase their efforts to generate high-quality, well-conceived contributions to innovation tasks by challenging their assumptions and reframing the innovation problems to be solved. We hypothesize:

H 3 Moderators' intellectual stimulation language use relates positively to members' participation (a) quality and (b) quantity.

3 | METHODOLOGY

3.1 | Research setting

To test our hypotheses about the impact of moderators' TFL language uses on members' participation quality and quantity, we gathered 538,805 posts written by 3759 members of 64 firm-hosted ICs. With the help of a marketing research consultancy, a global leader in the IC market, we obtained all posts since each IC started. This consultancy organizes various innovation tasks, including NPD, new service development, upgrades of existing products, and new marketing strategies, for a variety of clients from various sectors (e.g., consumer goods, media, government, financial services). Moderators are recruited by internal human resources managers, according to their experience and affinity with (qualitative) marketing research. Each IC thus is managed by a moderator, who receives training to be the formal leader. Moderators do follow an internal training trajectory that clarifies their role as leaders in the IC. In turn, the moderators are responsible to deliver key insights to clients, by steering their IC through semi-structured topic guides and encouraging participation by members. Members are recruited based on their extensive usage experience or interest in the innovation topic, so intrinsic interest should drive some level of participation. They receive small financial incentives as compensation. On average, 58 members appear in each IC, though the smallest has 13 members and the largest includes 121. Members participate by sharing their opinions about a moderator-introduced topic or interacting with other members' posts.

3.2 | Data and measures

3.2.1 | Writing style extraction

To operationalize member participation quality and TFL dimensions present in the posts, we use an automated text analysis tool, the Linguistic Inquiry and Word Count (LIWC; <http://www.liwc.net/>) (Tausczik & Pennebaker, 2010), which relies on a dictionary-based approach to compare texts with pre-categorized dictionary words and produces, as an output, the percentage of words in the text that belong to a certain word category. The dictionary is predefined, so no additional learning is needed to apply linguistic markers to the IC data.

The validity and reliability of LIWC has been confirmed previously, and strong evidence indicates good agreement between extracted LIWC variables and ratings by human coders (e.g., Ludwig et al., 2014; Tausczik & Pennebaker, 2010); it thus is a popular tool for extracting psychological and linguistic constructs from texts, used frequently in publications in top journals (e.g., Kim et al., 2019; Ludwig et al., 2013; Ludwig et al., 2014).

3.2.2 | Dependent variables

Member participation quality and quantity are the dependent variables in this study. In line with definitions offered by Ludwig et al. (2014) and Coussement et al. (2017), we use a count measure to assess the participation quality of each member of the IC, as the average number of cognitive words written per post, according to the cognitive words LIWC category (*cogmech*), which contains 1068 words (e.g., cause, know, ought). The mean and standard deviation for participation quality are 9.894 and 4.912, respectively. Participation quantity instead is a proportion, measured as the percentage of active community topics with which a member interacts. Its mean and standard deviation are 0.601 and 0.305, respectively.

3.2.3 | Independent variables

To operationalize the dimensions of TFL, we consider direct interactions of the moderators with each IC member. For each IC member, we extract linguistic markers from the moderator's direct posts, using LIWC. Then we use them to operationalize the TFL dimensions (charisma, individualized consideration, and intellectual stimulation). First, we measure charisma as positive emotions and psychological distance. Positive emotions are an important feature of charismatic leaders' language use (Bono & Ilies, 2006), to articulate a vision and paint a positive picture of the future to inspire and motivate followers (Madera & Smith, 2009). By applying the positive emotions LIWC category, we determine the percentage of positive emotions (e.g., love, nice, sweet) the moderator uses in direct conversations with an IC member. Psychological distance, versus psychological closeness, to a particular topic instead is a factor-analytically derived construct variable. Cohn et al. (2004) have operationalized it using LIWC scores for articles and words of more than six letters, along with inverse scores for first-person singular pronouns, terms that indicate discrepancy from reality (e.g., would, should, could), and present-tense verbs. A characteristic of transformational leaders' charisma is that they communicate an inspiring but realistic vision (Judge &

Piccolo, 2004) and provide action-oriented frames for followers (Holladay & Coombs, 1994), which requires sharing a vision in a personally attached, vivid, and immediate manner. Thus, to stimulate member participation in online ICs, they likely use activity-oriented, intelligible language that reflects closeness to reality. We therefore measure moderators' closeness to topics in a reversed way and rely on the psychological distance LIWC category; high values on this measure represent abstract, impersonal, and rational tones, whereas low values signal personal, experiential language focusing on the here-and-now and thus greater charisma (Cohn et al., 2004; Wiener & Mehrabian, 1968).

Second, we use two variables to operationalize individualized consideration. Transformational leaders establish personal relationships with their followers, characterized by reciprocal care and concern (Zhu & Akhtar, 2014). Second-person pronouns (e.g., the *you* category in LIWC) signal such individualized consideration because messages that include second-person pronouns inherently emphasize the individual (Cruz et al., 2017) and focus on his or her needs. Furthermore, transformational leaders establish two-way interactions with followers and ask directly for their opinions (Berson & Avolio, 2004). Addressing a member directly, by using second-person pronouns, creates a sense of personalization (Cruz et al., 2017). Therefore, transformational leaders can make the organizations' mission and vision more accessible to followers through individualized consideration (Berson & Avolio, 2004) and the corresponding use of second-person pronouns. By adjusting their messages accordingly, transformational leaders also stimulate members' sense of identification (Berson & Avolio, 2004). Hence, moderators who display individualized consideration show higher levels of second-person pronoun use to address members and their needs directly. Additionally, establishing reciprocal relationships is a relevant element of individualized consideration. In online ICs, reciprocity often is measured by taking the leader's participation in dyadic interactions into account (Huffaker, 2010); for this study, we measure the intensity of the relationship and thus reciprocal exchanges between the moderator and the member as a ratio of the number of members' posts replied to by the moderator.

Third, we rely on exclusive words and the average number of words a moderator uses in interactions with each IC member to operationalize intellectual stimulation. For the former, we use the *excl* category of LIWC (e.g., but, without, however), such that we determine the percentage of words in a moderator's posts that belong to this category. Because intellectual stimulation involves challenging the status quo, questioning previously held assumptions, and suggesting alternative perspectives (Bass, 1985), linguistic cues entailing a questioning and challenging tone reflect leaders' intellectual stimulation (Boies et al., 2015). Exclusion words

also signal cognitive complexity (Pennebaker, 2011) which should be a relevant prerequisite of grammatical complexity. Grammatical complexity, in turn, is an important characteristic of transformational leaders' written communication (Balthazard et al., 2009). Finally, extensive personal participation allows leaders to demonstrate intellectual stimulation in virtual settings (Balthazard et al., 2009). Being talkative is a characteristic of transformational leaders (Balthazard et al., 2009), and online leaders tend to produce lengthier messages than other members (Huffaker, 2010). Therefore, we also measure intellectual stimulation by taking the average number of words a moderator uses to communicate with each IC member into account.

3.2.4 | Validity checks

We conducted validity checks of the operationalizations of all LIWC-based variables. Following recommendations for text analysis, which suggest relying on human experts to evaluate the extent of agreement between computer- and human-coded text snippets (e.g., Humphreys & Wang, 2018), we asked independent coders to evaluate the LIWC operationalizations of moderators' posts according to the TFL dimensions and of members' posts according to participation quality. Thus, validity checks apply to the automated, text analysis-based derivations of positive emotions and psychological distance (charisma), second-person pronouns (individualized consideration), exclusive words (intellectual stimulation), and cognitive mechanism words (participation quality). For each variable, we randomly identified a subsample of 60 posts (30 low and 30 high scoring) and matched them to form 30 high–low post pairs. The two human coders separately reviewed each pair, to identify which post within each pair matched best the definition of the focal TFL dimension or participation quality, which we had explained carefully to them in advance. The TFL dimension definitions given to the human coders are borrowed from Judge and Piccolo (2004). Then we calculated the level of agreement between the LIWC software and human coders, with two measures (see Table 2). The hit rate is the percentage of accurately classified posts; it should be at least 80% (Wade et al., 1997). These values ranged from 86.67% to 96.67%. The percentage agreement is the extent of agreement among human coders and should be greater than 0.70 (Krippendorff, 2007, 2010). It ranged from 83.33% to 93.33% for all LIWC-based variables. Thus, the checks confirm validity.

3.2.5 | Control variables

In addition to the TFL-related independent variables, several member-related factors could influence participation quantity

and quality. To capture differences in members' general disposition toward IC participation, we assess membership length, defined as the number of days since a member's first post. Previous research suggests a negative effect of membership length in the initial weeks on member participation (Langerak et al., 2003). The network position of a member in the IC also might be relevant (e.g., Wang et al., 2020), so we include the closeness and betweenness centrality of members, based on their direct interactions. Gender can influence leadership relationships (e.g., Li et al., 2016), such that we control for the gender of both the member, at the member level, and the moderator, which is a community-level variable. Because work experience affects leadership relationships (Bass, 1999), we include the total number of moderated days as the tenure of the moderator. At the community level, community size may affect members' participation behavior (Butler, 2001), as could the general IC atmosphere. Therefore, in line with previous research, we control for overall, community-level participation quality and quantity (Ludwig et al., 2014; Ransbotham & Kane, 2011).

3.3 | Data analysis

Our IC data set exhibits a hierarchical structure, such that multiple members are nested within each IC. The behaviors of members in the same IC may be more similar than those of members in another community, so we use two hierarchical linear models (HLMs) to estimate the nested relationship between member participation quantity and quality on the one hand and the independent variables on the other hand (Hox et al., 2010). Both HLMs are intercept models that include individual-level independent variables and control variables. To regress the influence of these independent and control variables on members' participation, we use a Poisson HLM for participation quality (Hox et al., 2010) and a Beta HLM for participation quantity (Ferrari & Cribari-Neto, 2004), in accordance with the nature of the dependent variables. Maximum likelihood estimation with Laplace approximation applies to both models (Wolfinger, 1993). We rely on a completely unstructured covariance matrix; the models are implemented in SAS 9.4. By rescaling the participation quantity dependent variable (Smithson & Verkuilen, 2006), we also ensure that it remains in the (0,1) interval. The independent and control variables are standardized for both models. Neither HLM suffers from

major multicollinearity issues, according to the correlation matrix in Table 3 and the low variance inflation factor scores (maximum of 2.94).

4 | RESULTS

Table 4 contains the standardized estimates and their significance levels for the impact of the TFL dimensions and control variables on participation quality and quantity. A positive (negative) beta represents a positive (negative) relationship between the independent variable and participation type.

4.1 | Charisma

Positive emotions have a significant positive effect on participation quality ($\beta = 0.024$, $p < 0.01$), but psychological distance has no significant influence ($\beta = 0.002$, n.s.). For participation quantity, we find no significant impact of positive emotions ($\beta = 0.022$, n.s.) and a significant negative relationship of psychological distance ($\beta = -0.333$, $p < 0.01$). Therefore, H1a and H1b are partially supported.

4.2 | Individualized consideration

In support of H2a, second-person pronouns have a positive impact on participation quality ($\beta = 0.014$, $p < 0.01$). The ratio of the moderator's to a member's posts also is positively related to the quality of members' posting behavior ($\beta = 0.037$, $p < 0.01$). Surprisingly though, we find significant contrary effects to those we predicted in H2b, such that second-person pronouns ($\beta = -0.066$, $p < 0.01$) and the ratio of the number of moderator's posts to a member's posts ($\beta = -0.155$, $p < 0.01$) have significant negative impacts on participation quantity.

4.3 | Intellectual stimulation

The number of exclusive words used by the moderator exerts a significant positive impact on participation quality ($\beta = 0.012$, $p < 0.05$); the average word count per post has no effect ($\beta = -0.003$, n.s.). We thus find partial support for H3a. The number of exclusive words used by the moderator in the

TABLE 2 Validity check

Evaluation metric	Positive emotions	Psychological distance	Second-person pronouns	Exclusive words	Participation quality
Hit rate	96.67%	96.67%	86.67%	95%	86.67%
Percentage agreement	93.33%	93.33%	83.33%	90%	93.33%

relationship instead has a significant negative impact on the member's participation quantity ($\beta = -0.085, p < 0.01$). We also find a significant negative relationship of the average number of words a moderator uses to interact with a member and participation quantity ($\beta = -0.076, p < 0.01$), in contrast with H3b.

4.4 | Control variables

Membership length has no impact on post quality ($\beta = -0.020, n.s.$) but a significant and positive effect on participation quantity ($\beta = 0.227, p < 0.01$). Although gender has no impact on the quality of the posting ($\beta = -0.003, n.s.$), female members post significantly more ($\beta = -0.140, p < 0.01$). Closeness centrality has no impact on participation quality ($\beta = -0.006, n.s.$), but betweenness centrality does ($\beta = -0.024, p < 0.01$). We also find positive impacts of closeness ($\beta = 0.067, p < 0.05$) and betweenness ($\beta = 0.224, p < 0.01$) centrality on participation quantity. Regarding the gender of the moderator, we find no significant impacts on participation quality ($\beta = -0.021, n.s.$) or quantity ($\beta = 0.055, n.s.$). No significant effects arise for moderator tenure (quality $\beta = 0.000, n.s.$; quantity $\beta = -0.000, n.s.$). Although the size of the community significantly increases the quality of posting ($\beta = 0.023, p < 0.05$), it has a negative impact on quantity ($\beta = -0.103, p < 0.05$). The overall level of participation quality in the IC has a significant positive impact on members' posting quality ($\beta = 0.282, p < 0.01$) but does not influence their participation quantity ($\beta = 0.051, n.s.$). Finally, the IC's posting quantity positively influences the posting quantity

of members ($\beta = 0.659, p < 0.01$) but does not affect quality ($\beta = 0.007, n.s.$).

5 | DISCUSSION

In online ICs, moderators may serve as formal leaders, entrusted with the demanding task of encouraging and motivating members to provide frequent, high-quality input for innovation tasks. Yet, both research and practice lack insights into what constitutes effective leadership in such settings, in which leadership largely is limited to written communication. By conceptualizing and operationalizing established TFL dimensions in an IC context, this study offers new insights into *if* and *how* an IC moderator's TFL language use can increase members' participation quality and quantity.

With regard to charisma, a moderator's use of positive emotion words increases participation quality, but it does not affect participation quantity, as also indicated in context-specific prior research (Coussement et al., 2017) that implies positive emotions prompt creativity, cognitive flexibility, and innovation (Isen, 2001)—outcomes more closely linked to participation quality than quantity. A moderator's psychological distance hinders participation quantity but not quality; greater attachment and closeness to the innovation topic exhibited by a moderator seemingly prompts IC members to provide more rather than better input. Therefore, charismatic language cues can increase IC members' participation quality and quantity, though with varying impacts.

For the individualized consideration and intellectual stimulation dimensions of TFL, the findings indicate some

TABLE 3 Means, standard deviations, and correlation matrix for the independent and control variables

		Level	M	SD	1	2	3	4
1	Positive emotions	M	3.910	4.650				
2	Psychological distance	M	0.000	1.000	0.061			
3	Second-person pronouns	M	5.476	3.420	0.077	-0.094		
4	Ratio moderator's comments on member's posts	M	0.830	0.578	0.044	-0.104	0.031	
5	Exclusive words	M	3.618	2.417	-0.131	-0.305	0.011	-0.044
6	Word count	M	44.957	39.403	-0.146	-0.202	-0.214	0.001
7	Membership length	M	1410.000	1505.470	-0.009	0.075	0.009	-0.024
8	Gender user	M	-	-	0.032	-0.054	0.027	0.082
9	Closeness	M	0.003	0.004	0.011	-0.065	-0.046	0.202
10	Betweenness	M	18.044	73.797	-0.011	0.030	-0.045	-0.208
11	Gender moderator	C	-	-	0.047	-0.048	0.016	0.058
12	Tenure moderator	C	2288.59	2631.27	-0.054	0.046	0.021	0.044
13	Size	C	82.421	34.973	-0.018	0.198	-0.050	-0.161
14	Participation quality	C	9.837	2.866	0.007	0.091	0.075	-0.089
15	Participation quantity	C	0.594	0.147	0.031	-0.016	-0.015	-0.117

Abbreviations: C, community; M, member.

TABLE 4 HLM analysis results

Transformational leadership dimension	Variable	Level	Participation type			
			Quality		Quantity	
Charisma	Positive emotions	M	0.024	(4.44)**	0.022	(1.03)
	Psychological distance	M	-0.002	(-0.42)	-0.333	(-14.47)**
Individualized consideration	Second-person pronouns	M	0.014	(2.63)**	-0.066	(-3.17)**
	Ratio posts on member's posts	M	0.037	(6.65)**	-0.155	(-6.97)**
Intellectual stimulation	Exclusive words	M	0.012	(2.06)*	-0.085	(-4.17)**
	Average word count per post	M	-0.003	(-0.63)	-0.076	(-3.65)**
Control variables	Membership length	M	-0.020	(-1.49)	0.227	(4.74)**
	Gender user ^a	M	-0.003	(-0.23)	-0.140	(-3.48)**
	Closeness	M	-0.006	(-0.68)	0.067	(2.11)*
	Betweenness	M	-0.024	(-4.22)**	0.224	(7.44)**
	Gender moderator ^a	C	-0.021	(-0.72)	0.055	(0.49)
	Tenure moderator	C	0.000	(0.44)	-0.000	(-1.14)
	Size	C	0.023	(1.94)*	-0.103	(-2.04)*
	Participation quality	C	0.282	(34.55)**	0.051	(1.58)
	Participation quantity	C	0.007	(0.74)	0.659	(17.87)**
	Intercept		2.25	(155.72)**	0.539	(10.11)**
	Number of members		3759		3759	
	Number of communities		64		64	
	-2 Log likelihood		20,317.77		-3033.09	

Note: Standardized estimates with t-values between () are reported. Asterisks indicate significance levels.

Abbreviations: C, community; M, member.

^aReference category = "female".

* $p < 0.05$.; ** $p < 0.01$.

impact of designated moderators in IC-based innovation processes, we show how leaders in online communities can exert their influence: They can specifically use TFL language to encourage participation. This specific focus on actual communication processes, instead of perceived leadership behaviors, represents a related contribution to this research stream. Language has powerful influences on followers (e.g., Weiss et al., 2018), and with this study, we establish the effect of leaders' written language in virtual interactions, a setting that is gaining increasing importance at present. By applying well-established TFL theory and identifying linguistic cues of TFL, we bridge organizational behavior, communication, and innovation management research and thereby affirm that leaders can influence others through their TFL language use. This promising approach is relevant for the challenging context of online ICs, with their lack of face-to-face interactions (Johnson et al., 2015).

Second, we advance TFL theory by identifying potential downsides, in line with some recent leadership studies (e.g., Diebig et al., 2016; Qin et al., 2020). In particular, we show that TFL behaviors are not universally positive. For example, a moderator's individualized consideration and intellectual stimulation language can decrease participation

quantity, because members might feel encouraged by attentive and challenging language to contribute high-quality innovation input, but they do not necessarily contribute more. These ambivalent patterns of the two TFL dimensions reveal the differential influences that emerge within and across the three TFL dimensions. In line with Jung and Avolio (2000), who note a positive effect of TFL on performance quality and a simultaneous, negative impact on performance quantity in organizational leadership contexts, we identify a conflict between participation quality and quantity in an IC context. This is also in line with some prior research in IC contexts that already pointed at a trade-off between how much IC members post and the quality of their arguments (Li et al., 2016). Diebig et al. (2016) argue that a leader's intellectual stimulation imposes high cognitive demands on employees who must reappraise their current ways of thinking, which may encourage them to forfeit quantity to focus on quality to fulfill the high expectations addressed to them (Jung & Avolio, 2000). We posit that a similar mechanism holds for individualized consideration. For example, a moderator's intensive use of "you" might cause members to believe they are personally responsible to meet the high demands and expectations in the IC. To avoid disappointing the moderator, a

feeling strongly induced by TFL (Reuvers et al., 2008), members might seek to participate with greater quality but feel unable to increase their quantity. Arguably, contributing more increases the risk of contributing redundant ideas, whereas putting all one's energy and cognitive capacity into developing fewer, stronger ideas diminishes the risk of disappointing the moderator. Thus, regarding the trade-off between performance quality and quantity, our findings indicate that TFL might be especially beneficial for quality-related performance outcomes. This finding is in accordance with the TFL conceptualization that predicts that a transformational leader tries to stimulate followers' innovation and creativity intellectually (Bass, 1999), which might cause followers to focus on the quality of their ideas. Similarly, Sosik (1997) found that employees as part of computer-mediated groups, who have worked under transformational leaders, produced more quality-related comments whereas employees of leaders exhibiting low TFL have focused on quantity-related comments. This might be attributable to transformational leaders' attempts to enhance critical and creative thinking, which results in driving quality-related comments (Sosik, 1997). Thus, quantity-related performance outcomes might be enhanced by other leadership approaches, such as transactional forms (Jung & Avolio, 1999). That is, offering rewards encourages more ideas, because followers have motives to produce as many ideas as they can (Jung & Avolio, 1999). In establishing that TFL is not a universal remedy, we also demonstrate that the choice to deploy it should reflect the desired outcome.

Third, we demonstrate the effective use of a new, objective measure of TFL. Leadership researchers (e.g., Antonakis et al., 2016; van Knippenberg & Sitkin, 2013) question the validity of existing, popular measures, such as the Multifactor Leadership Questionnaire (MLQ) (Bass, 1999) or the Transformational Leadership Inventory (Podsakoff et al., 1990). Notably, because the TFL dimensions correlate strongly, it is common for researchers to form a single index and ignore dimension-level relationships (Hughes et al., 2018); such measures cannot reflect the multidimensional structure of TFL (van Knippenberg & Sitkin, 2013). In addition, some measures assess the effects of TFL on outcome variables, rather than transformational leadership behaviors (van Knippenberg & Sitkin, 2013), so the dimensions appear as endogenous variables, which creates endogeneity bias concerns (Antonakis et al., 2016). Concerns about survey-based questionnaires and associated biases (Eva et al., 2019) highlight the need for more objective and creative measures of TFL (e.g., Antonakis et al., 2016), which we address by identifying linguistic markers of the three TFL dimensions. These markers are unlikely to change as a function of what they predict (i.e., dependent variables) or other, omitted causes (Antonakis et al., 2016), so we can perform a rigorous analysis of particular TFL behaviors, in terms of language

use and its effects. This alternative measurement approach overcomes the limitations of existing TFL measures and thus can be applied to test conceptual models in other contexts.

5.2 | Managerial implications

This study has insights for IC managers planning to implement or revise their ICs. In particular, we highlight the relevance of TFL language use by a moderator. According to our results, it can increase members' participation quality, but only charismatic language use positively affects participation quantity. Noting these contrary effects, moderators should receive training to learn which linguistic indicators are optimal and how to apply them to ensure positive effects and avoid potential downsides. Just as frontline employees' language can inform consumer participation and satisfaction (Holmqvist et al., 2019), moderators should understand how their words can promote or diminish IC members' participation quality and quantity. Training in when to use relevant linguistic cues, depending on the primary objective, thus might feature learning management systems that give moderators practice in using positive emotion words to increase participation quality or avoiding psychological distance to prevent discouraging participation quantity. In line with frequent calls to enhance the communication skills of frontline employees (e.g., Bono & Ilies, 2006; Zolfagharian et al., 2018) and leaders (Cohrs et al., 2020), we recommend communication training, which even might be relatively easier for written than spoken language, because its use is more conscious. Finally, IC managers can hire and promote moderators according to their level of TFL language use, perhaps by applying automated linguistic style analyses to identify appropriate candidates.

Companies also might implement dashboards to help moderators monitor their TFL language use in real-time. In addition to insights about the types and amount of relevant linguistic cues in conversations with IC members, such systems could proffer helpful suggestions about which words or phrases to use in ongoing posts and responses, if moderators seek to enhance members' participation quality or quantity. Our results also suggest the potential viability of automated moderators (i.e., chatbots), which appear used more widely to communicate with customers (Araujo, 2018). A potential option would be to train chatbots to ensure their posts and responses to members' comments contain appropriate TFL language.

Finally, our results may be beneficial for virtual innovation team leaders. Similar to ICs, virtual teams lack face-to-face interactions and require collaboration through electronic means (Raghuram et al., 2019), so virtual team leaders often struggle to establish coordination, trust, and team cohesion (Malhotra et al., 2007) as well as to motivate virtual team

members to contribute to team-based innovations. Our study results suggest the possibility of using TFL language to enhance innovation processes in these team settings.

5.3 | Limitations and further research

Several limitations of this study suggest paths for further research. First, we explore the impact of TFL dimensions on IC members' participation quality and quantity, representing innovation-focused behavior of external participants in firms' innovation processes. While both members' amount and quality of input can be important indicators of the community's viability (Coussement et al., 2017), they also are prerequisites of, not measures of, companies' innovativeness. Continued research might use language-based measures of leadership behavior in ICs to predict organizational innovation in terms of the company's tendency to develop new or improved products and its success in bringing these products to market (Gumusluoğlu & Ilsev, 2009). Second, this cross-sectional study cannot reveal any changes in moderators' TFL language use or members' participation over time. Further studies might zoom in on the timing aspect to investigate contagion effects between moderators' TFL language use and members' participation. Third, although the average size of the online ICs included in our analysis, which ranges around 50, is not uncommon (Oh et al., 2016), it might be possible that the impact of moderators' TFL language differs in larger online ICs. Furthermore, although members' financial compensation is small, the incentives might have affected members' participation in the innovation tasks. Further research might test the impact of moderators' TFL language use on member participation in larger ICs that explicitly provide no financial compensation. Fourth, in addition to textual data, which represent important, unstructured data sources, other types of unstructured data might be informative, such as images or videos (e.g., Liu et al., 2018; Villarroel Ordenes et al., 2019). Information extracted from these unstructured data sources could deliver new insights on how to steer member participation in ICs. Fifth, dictionary-based text analytical approaches like LIWC are popular and can effectively extract language use features from textual content (e.g., Coussement et al., 2017; Ludwig et al., 2014). They have gained traction due to their ease of use, the wide variety of academically validated dictionaries available, and the usefulness of embedding extracted language use concepts within existing academic theories. Yet dictionary-based methods do not consider what has been said or the context. The IC domain thus might benefit from large-scale content analyses that rely on advanced topic modeling algorithms (e.g., latent Dirichlet allocation, joint sentiment/topic modeling) or human coding to investigate the impact

of moderators' textual content and the context on members' participation.

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