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RESEARCH ARTICLE

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The Effect of Community Managers on Online Idea Crowdsourcing Activities

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Abstract

In this study, we investigate whether and to what extent community managers in online collaborative communities can stimulate community activities through their engagement. Using a novel data set of 22 large online idea crowdsourcing campaigns, we find that moderate but steady manager activities are adequate to enhance community participation. Moreover, we show that appreciation, motivation, and intellectual stimulation by community managers are positively associated with community participation but that the effectiveness of these communication strategies depends on the form of participation managers wish to encourage. Finally, the data reveal that community manager activities requiring more effort, such as media file uploads vs. simple written comments, have a stronger effect on community participation.

Keywords: Crowdsourcing, Crowdsourced Innovation, Ideation, Managerial Attention

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> *Most organizations attempting to receive suggestions from external contributors will not be successful in doing so* (Dahlander & Piezunka, 2014, p. 825).
>
> *Managers establish and modify the direction and the boundaries within which effective, improvised, self-organized solutions can evolve [and] tune the system by altering the constraints* (Andreson, 1999, p. 228).

1 Introduction

To remain competitive, firms are under constant pressure to generate innovations. Traditionally, firms have managed innovations within their own boundaries through hierarchical governance mechanisms, which have long been deemed superior to market-based mechanisms, in part because they are more efficient in reducing transaction costs arising from coordination problems (Sawhney & Prandelli, 2000). Market-based mechanisms, however, foster creativity and reduce the risk of path dependence in innovation management. The development of open source software provides an often-cited example in the literature (e.g., the Linux operating system, the Apache web server software)—products were successfully developed largely without a hierarchical governance structure and formal coordination mechanism (Foss et al., 2016). Thus, relying on an online community can constitute a competitive advantage for a firm that intends to generate innovations (Jeppesen & Frederiksen, 2006). In recent years, not only have online communities grown in size and scope, but academic interest in these communities has also gained momentum (Faraj et al., 2016).

Online idea crowdsourcing, in particular, has become an important corporate tool to promote the development of new ideas (Erickson et al., 2012). By using these platforms, commercial companies expose a group of individuals with diverse views and skills to a problem-

solving task. Openness and suggestions from external contributors often lead to new directions in management, accelerate product development and innovation, and may possibly foster a permanently more horizontal organization (Chesbrough et al., 2006; Eisenhardt, 1989; Kozinets, 1999). Extant research has shown that, in particular, a large and heterogeneous crowd can spur innovation in diverse fields such as software and algorithm development (Boudreau, 2012), medical research (Guinan et al., 2013), and cosmetics (van Delden, 2014). In general, collaborative online communities are complex organizational systems that allow firms to dynamically interact with users, employees, and the interested public from different geographic locations and social backgrounds and can consequently enable large groups of diverse individuals to propose new ideas (Foss et al., 2016; Malhotra et al., 2017). Typically, complex systems such as online idea crowdsourcing platforms are managed by some form of hierarchy. In the absence of hierarchical governance mechanisms, open source software development and online idea crowdsourcing platforms often decompose the respective problem into easier-to-address subproblems to enable users to solve these problems. Moreover, in practice, many online idea crowdsourcing platforms have market-based as well as hierarchical features built in. One of these hierarchical features is the institution of a community manager[1] who coordinates and supports the innovation efforts of the crowd.

Platform operators[2] often employ community managers because online idea crowdsourcing activities do not benefit from user network effects to the same extent as other social media sites and the horizontal structure of the platform contradicts the hierarchical structure of traditional companies that use online communities to generate innovations (Gallus et al., 2020). If the crowd were to rely solely on technology, such as online discussion boards, and were essentially left to its own devices, online idea crowdsourcing communities would quickly die out (Wu & Huberman, 2007). Phang et al. (2009) therefore suggest that usability and sociability are two important factors that can foster community participation. In addition to promoting community sociability, we draw on transformational leadership theory (Bass, 1985; Judge & Piccolo, 2004) to propose the important role of community managers as leaders. Community managers might, for example, motivate and stimulate the crowd and provide it with new and relevant information. In this sense, managers can play an important role in the idea-generation process and success of the campaign. In doing so, they create a bridge between traditional vertical organizations that leverage online communities and horizontal online communities themselves.

To investigate the role of community managers in online idea crowdsourcing, we use a novel data set that allows us to examine the crowdsourcing of ideas of multiple collaborative online communities. In contrast to previous studies on the crowdsourcing of ideas, we focus on whether and how community managers can motivate the crowd to participate. The data set covers 22 large-scale campaigns run on two distinct online idea crowdsourcing platforms. We gathered the data from a software vendor that provides white-label crowdsourcing platforms to major international and medium-sized enterprises, among them manufacturing companies from the automotive, cosmetics, outdoor, and other sectors. Overall, we find that the engagement of community managers has a positive effect on community activities. More precisely, we observe a pattern that suggests that moderate but steady manager activities (i.e., six to 10 contributions per day) are adequate to enhance community participation. Moreover, we provide evidence that managers' appreciation, motivation, and intellectual stimulation increase community participation but that the effectiveness of these strategies depends on the form of community participation managers want to encourage. Furthermore, we show that different forms of communication, such as suggestions, comments, and media uploads by the manager, have a differential impact on community participation. Finally, we use different statistical tests to assess the causal relationship between manager engagement and community participation and to prove the robustness of our results.

Our results have important theoretical and practical implications. While ample evidence in the psychological and economic literature shows that financial incentives increase performance quantity (Horton & Chilton, 2010; Jenkins et al., 1998), money can also negatively affect creativity and innovation (Amabile, 1998). Our research contributes to the recent and growing literature highlighting the importance of nonfinancial incentives for online idea crowdsourcing (e.g., Camacho et al., 2019; Gallus et al., 2020; Phang et al., 2009). We find that community managers play a decisive role in the activities of the crowd, which presumably is a prerequisite for campaign success. Moreover, we show that manager engagement must occur in a specific way to be successful and that some concepts from leadership research (e.g., Bass, 1985) can be transferred to online communities.

For practice, we derive concrete hints on how to make the best use of such online idea crowdsourcing platforms. First, we show that firms can promote the development of new ideas through nonfinancial incentives and that community managers' appreciation, motivation, and intellectual stimulation play a crucial

[1] In this article, we use "community manager" and "manager" interchangeably.

[2] The platform operator could be the software vendor or the client running the campaign, depending on the case.

role in crowd participation. While this role should be self-evident, our conversations with the software vendor that provided the data to us indicate that the community manager's role is often neglected or underestimated. Consequently, platform operators are well advised to train and support community managers accordingly so that their actions also correspond to the expectations of the crowd and thereby contribute to the success of the firm. In turn, middle managers also need to constantly check and maintain the contributions of community managers. Second, for managers' appreciation, motivation, and intellectual stimulation to work, the crowd must be made up of real people who have a true interest in supporting the organization. If the community consists of too many bots (Dreyfuss, 2018) or users who want early access to competitors' ideas and future products, the contributions of the community manager are of limited use. The monitoring and selection of the community by the platform operator and client must then play a special role if the community manager's contributions are to have an effect.

The structure of this article is as follows: We begin by discussing the literature and outlining the research gap. The next section details the theoretical background and derives testable hypotheses. Thereafter, we describe our data set and explain how online crowdsourcing works on the platforms we analyze. The subsequent section summarizes the empirical results. Finally, we conclude with managerial implications, limitations, and avenues for future research.

2 Literature

2.1 Online Idea Crowdsourcing

In online crowdsourcing, a group of individuals with diverse views and skills is exposed to a problem-solving task by a commercial company. The company, also referred to as the online crowdsourcing *sponsor*, identifies the problem and posts it on an online crowdsourcing platform. The sponsor can either set up its own platform and define the IT architecture and standards according to which the community is organized (Sawhney & Prandelli, 2000) or it can use an established online crowdsourcing platform such as Amazon Mechanical Turk. If the sponsor establishes its own platform, it can either program it itself or use a white-label solution from a software vendor. In the latter case, the community might be recruited by the sponsor, or the software vendor provides a community from other online crowdsourcing projects previously run on the white-label solution. Furthermore, according to Boudreau and Lakhani (2013), online crowdsourcing can take four forms: crowd contests, crowd complementors, crowd labor markets, and crowd collaborative communities.

In a *crowd contest*, the sponsor offers a prize, often in the form of cash, and only the winner of the contest receives the prize, with the remaining crowd missing out. Typical examples of crowd contest platforms are HYVE, Tongal, TopCoder, and Kaggle. These platforms are particularly helpful if the sponsor wants to crowdsource a design or software-coding problem and needs professional help with community management, intellectual property, or payment issues (Boudreau & Lakhani, 2013). Such contests can also take the form of online innovation contests, in which users provide solutions to innovation challenges (von Briel & Recker, 2017). *Crowd complementors* create innovations that can serve as complements to the original platform. Well-known examples are applications that can be used in combination with mobile devices such as phones or tablets. *Crowd labor markets* are markets in which microtasks, such as the renaming of files or the screening of pictures, are contracted between a sponsor and individual crowd workers. An example of such a crowdworking task is the analysis of satellite images on Amazon Mechanical Turk (Maisonneuve & Chopard, 2012). Finally, *crowd collaborative communities* work together to solve a specific problem. In these communities, the platform sometimes coordinates the work of individual members to make online crowdsourcing successful. Online idea crowdsourcing through crowd collaborative communities is often curated by the respective sponsor. Because sponsors have typically not specialized in setting up online crowdsourcing platforms, they often resort to software vendors to create and manage a collaborative community. In the domain of idea crowdsourcing, such communities can operate both online and offline; in the former case, communities are also referred to as *private-collective innovation communities* (von Hippel & von Krogh, 2003), *community-based innovation communities* (Lakhani & von Hippel, 2003), *company-sponsored online co-creation brainstorming communities* (Chen et al., 2012), or *online open innovation communities* (von Briel & Recker, 2017). Examples of companies that have used collaborative communities are Coty, Ford, IBM, and Lego.

Cash prizes can be awarded to these communities but are not particularly common because company policies or regulatory concerns may prohibit such payments (Chen et al., 2012). Instead, these communities often rely on some form of intrinsic motivation. Jeppesen and Frederiksen (2006) therefore show that only hobbyists can presume a sufficient level of intrinsic motivation, while professionals will leave the community without any monetary rewards. The online idea crowdsourcing communities we investigate herein fall under the category of crowd collaborative communities. None of the sponsors offered a cash prize, though the software would have made this theoretically possible. The projects we investigate differ in their organization and, in some cases, the community received a toolkit to

experiment and test the ideas at home. However, the products delivered were not the final products and did not resemble a perk valued for consumption.

2.2 Previous Findings on User Motivation

The extant research on the crowdsourcing of ideas has analyzed user motivation, investigating why users participate in communities and contribute ideas, often in the absence of a traditional employment relationship and wage payments (Faraj et al., 2016; Zwass, 2010). That research has mainly focused on the motivation for participating in open source software projects (Hann et al., 2002, Hars and Ou, 2002) and found that the signaling of competence through, for example, a higher status in a merit-based ranking (Kosfeld and Neckermann, 2011) and future rewards in terms of human capital are important factors for software developers to contribute. More generally, factors motivating individual contributions to an online community fall under three broad categories (Faraj et al., 2016).

First, users often exhibit *economically driven extrinsic motives*, such as receiving support for their own software problems or obtaining resources such as music or movies by sharing their resources in peer-to-peer networks (Chen et al., 2012; Ray et al., 2014). In particular, the extent to which participation in online communities affects career prospects, social capital, and, as a consequence, earning potential has a strong impact on contribution decisions (Lerner & Tiróle, 2002; Wasko & Faraj, 2005). Sponsorships by nonmarket organizations and nonrestrictive licenses are also positively associated with contributions by software developers (Stewart et al., 2006).

Second, in the absence of traditional employee rewards such as a higher wage or promotions, *psychologically based intrinsic motives* play a decisive role. Early studies have identified the satisfaction of participants' needs, such as the existence of a support system or certain security functionalities (Franke & von Hippel, 2003; Lakhani & von Hippel, 2003), the pleasure of participation (Füller et al., 2007), and the joy of helping others (Kankanhalli et al., 2005), as important factors to participate in an online community. Jeppesen and Frederiksen (2006) also provide survey evidence that feedback by the project initiator is a key motivating factor for individual participation. Chen et al. (2012, p. 168) confirm that in the absence of proper incentive mechanisms, sponsoring companies should focus on a feedback system to keep cocreators engaged. Similarly, Moon and Sproull (2008) show that positive feedback increases the duration of participation. Community members are also driven by the opportunity to learn (Lakhani & Wolf, 2005) and self-efficacy goals (Ray et al., 2014).

Third, the repeated nature of interactions in online communities often leads to the emergence of social structures. As such, many scholars have argued that *sociologically driven prosocial motives* play a role in participation decisions. Porter and Donthu (2008) indicated that personal beliefs and trust in a community are relevant factors to develop new products and for customers to share information with a community. Stewart and Gosain (2006) found that a specific ideology among contributors fosters trust within the community and thus encourages contributing behavior; however, such trust can often be fragile and temporal in global and virtual communities (Jarvenpaa & Leidner, 1999). In a similar vein, individual identification and a sense of belonging to a group are important factors to participate in a community, especially in the absence of extrinsic motivators (Boons et al., 2015; Fang & Neufeld, 2009; Hertel et al., 2003; Ma & Agarwal, 2007; Shah, 2006; Spaeth et al., 2015; Zhang, 2010).

Chen et al. (2012, p. 143) found a "dearth of in-depth studies on factors or facets that motivate individuals to voluntarily contribute to the idea generation." Chan et al. (2015, p. 42) stated that "questions about whether and how customer's online interactions with the firm … influence idea generation behavior remain unanswered." Goes et al. (2016) investigated the deployment of incentive hierarchies on a large online crowd-based knowledge exchange and find that glory-based incentives are only temporarily effective. Particularly little attention has been paid to whether the crowd can also be actively managed by a community manager. The research closest to ours is that of Camacho et al. (2019), who experimentally investigate how to stimulate ideators' participation in crowdsourced innovation tournaments. They differentiated between positive and negative feedback and found, in stark contrast to Moon and Sproull (2008), that negative feedback has a stronger effect on user participation than positive or no feedback. While laboratory and classroom experiments have clear advantages over field data in terms of experimental control and statistical identification, they also come at the disadvantage of external validity. Our study goes beyond the findings of Camacho et al. (2019) in this respect, and investigates which activities real community managers actually undertake to activate the community and how the community responds to these activities in terms of participation.

2.3 Addressing the Research Gap

Our study contributes to the extant literature in at least three ways. First, while most studies examine the type of ideators important for successful idea creation and the factors that lead to the implementation of ideas, we analyze how initiators and operators of a crowdsourcing project can contribute to a successful

campaign. In particular, we evaluate the role of the community manager in attracting contributions from the crowd. While empirical research has reported that community managers are important for online communities in general (e.g., Gray, 2004; Ye et al., 2015), scant empirical research has investigated the activities and effectiveness of community managers on online idea crowdsourcing platforms. Chen et al. (2012) provide anecdotal evidence of the importance of community managers by showing that the change of the official Dell IdeaStorm manager led to a noticeable spike in participation. A recent case study by Nohutlu et al. (2022) supports the suggestion that community managers significantly influence customers' cocreation in collaborative online communities.

Second, drawing from 22 large-scale online campaigns to increase the external validity of previous findings, we systematically investigate not only *whether* community managers elicit community participation but also *how* they should ideally behave to foster online idea creation. We consider these important research questions because empirical studies on open source software development have shown that many projects suffer an early death (Stewart et al., 2006) and that sustaining an initial community engagement level is important (von Briel & Recker, 2017). More recently, Gallus et al. (2020) investigated managerial recognition as an incentive for National Aeronautics and Space Administration (NASA) employees to engage in activities on the platform NASA@WORK. They found that managerial recognition affected whether NASA employees again logged into the platform, while peer recognition, platform recognition, organizational mission, and information about the platform's effectiveness did not. We rely on transformational leadership theory (Bass, 1985) and examine whether the community manager in the role of a leader stimulates crowd participation. Manager activities can be quite similar to those in traditional work settings, in which transformational leadership successfully increases work motivation and efforts (for a meta-analysis, see Wang et al., 2011). According to transformational leadership theory, leadership tactics fall into four categories: idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration. The data we examined allow us to categorize manager activities according to these four categories and to test the effectiveness of transformational leadership tactics in collaborative online communities.

Third, we contribute to the literature on the dynamics of crowd behavior more generally. While the dynamics of the crowd have recently been investigated in reward-based crowdfunding (Kuppuswamy & Bayus, 2018) and equity crowdfunding (Hornuf & Schwienbacher, 2018), the dynamics of online idea creation are largely underresearched. Our study does not, however, contribute to the literature on how to differentiate successful from unsuccessful projects. Such an analysis has been conducted by others and, in the context of open source software, has been termed a "nebulous concept that may have different meanings across projects and stakeholders" (Stewart et al., 2006, p. 128). However, we argue that generating voluntary input from the crowd is a necessary precondition and, therefore, a key factor for project success (Stewart et al., 2006). Furthermore, the posting of ideas can be "essential for the survival of crowdsourcing communities and firms' profitability" (Chan et al., 2015, p. 44), with the intensity of participation being a critical driver of idea quality (Camacho et al., 2019). Moreover, Keum and See (2017) examined how the hierarchy of authority affects the idea generation versus the idea-selection phases of the innovation process. They found that hierarchy of authority is detrimental to the idea-generation phase of innovation but that hierarchy can be beneficial during the screening or selection phase of innovation. Table 1 summarizes the motivators for participating in online communities identified in previous research.

3 Theory and Hypotheses

In online communities, community managers, also referred to as *moderators* or forum *leaders*, enforce the social norms and formal rules for behavior and interaction within the community, if any exist. In addition, they can provide technical support or even actively guide participants and support group processes. Examining an online knowledge sharing community, Gray (2004) analyzed data from interviews in which participants were not explicitly asked about their manager. Still, the participants found that the manager was *absolutely critical* in establishing, supporting, and maintaining a meaningful learning environment. Because information on the internet is often so plentiful that the attention of the community decreases over time (for results from consumer research, see Hodas & Lerman, 2013; Wu & Huberman, 2007), managers are most likely needed to maintain the scarce resource of attention. Ye et al. (2015) show that perceived manager support is almost as important for users' knowledge contribution as interaction with the community itself, with perceived manager co-presence being a prerequisite for perceived support. Nohutlu et al. (2022) use a case study to explore the role of the community manager in collaborative innovation in online communities. They argue that the way communication is handled during the co-creation process is the most important factor in its success and that leadership qualities and team dynamics decisively shaped the community members' experience. Akcigit et al. (2018) show that in addition to creating a pleasant experience, it is important to engage and interact with others because this is how inventors learn and generate knowledge.

Table 1. Literature Overview on User Motivation to Participate in Online Communities

Motivation category	Motivators	Related publications
Economically driven extrinsic motives	Get help with own problems or attain resources in exchange	Chen et al., 2012; Ray et al., 2014
	Career prospects and building up social capital	Lerner & Tiróle, 2002; Wasko & Faraj, 2005
	Sponsorships and nonrestrictive licenses	Stewart et al., 2006
Psychologically based intrinsic motives	Pleasure of participation and the joy of helping others	Füller et al., 2007; Kankanhalli et al., 2005
	Feedback, opportunity to learn, and self-efficacy	Chen et al., 2012; Lakhani & Wolf, 2005; Moon and Sproull, 2008; Ray et al., 2014
Sociologically driven prosocial motives	Ideology, beliefs, and trust in the community	Porter & Donthu, 2008; Stewart & Gosain, 2006
	Sense of belonging to a group	Boons et al., 2015; Fang & Neufeld, 2009; Hertel et al., 2003; Ma & Agarwal, 2007; Shah, 2006; Spaeth et al., 2015; Zhang, 2010
Community manager		
… in online communities in general	Manager support	Gray, 2004; Ye et al., 2015
… in online idea crowdsourcing platforms	Feedback	Camacho et al., 2019 (students contributing ideas for the future of their school)
	Recognition	Gallus et al., 2020 (NASA employees)
	Handling of communication and team dynamics	Nohutlu et al., 2022 (case study)

On the online crowdsourcing platforms we investigated, community members can post as many ideas—so-called suggestions—as they want and comment on the ideas of other community members. The community manager is charged with overseeing all user activities,[3] but the manager can also post suggestions, comments, and media files and thereby encourage the community to become involved. Thus, the community manager has the necessary tools to engage with the community, motivate members to get involved and interact with each other, and create a pleasant experience. Still, the manager's capacity to attract the community's attention is not limitless. On the one hand, while engaging with the community can give the community the feeling that the manager appreciates and values member suggestions and comments, the manager's engagement with individual suggestions might only have marginal positive returns to the entire community. On the other hand, the community manager might engage too much, such that the community becomes less motivated and the creative process of the community is curbed. Keum and See (2017), for example, show that managers might suffer from a bias toward selecting their own ideas while undervaluing the advice or ideas of community members. If community managers behave that way, they may well reduce the incentives of the community to contribute to the idea-generating process. Therefore, community participation might increase with a decreasing rate of community manager engagement. We thus formulate the following hypotheses:

Hypothesis 1a. In online idea crowdsourcing, the community manager's engagement fosters community participation.

Hypothesis 1b. In online idea crowdsourcing, the community manager's engagement fosters community participation at a decreasing rate.

Dahlander and Piezunka (2014) distinguish between *proactive* and *reactive* attention by organizations. In their setting, proactive attention refers to the sponsoring company posting suggestions about its own corporate initiatives to signal its activity and stimulate collaboration among external contributors. By contrast, reactive attention refers to the sponsoring

[3] Comments by the community remain on the platform if they contribute in some way to the development of the idea and product. To function effectively, crowd collaborative communities often require a semblance of order and some form of screening mechanism to help eliminate misleading comments (Sawhney and Prandelli 2000). On our platforms, redundant suggestions or comments such as "I had the same idea" are deleted or merged by the manager. In general, community managers do not select suggestions according to their specific content, for example, to include them in the next voting phase.

company responding to suggestions from external contributors, thereby sustaining their activity. Translated to our context, the impact of proactive community managers' suggestions could differ from that of more reactive manager comments. For example, community managers' proactive attention in the form of suggestions might generate more community activities, while their reactive attention in the form of comments might have a somewhat smaller impact on community activities.

The leadership literature offers an even finer distinction, suggesting that the specific content of managers' suggestions and comments matters. In online idea crowdsourcing, the community manager can take the role of a leader, with community members acting as followers. Leadership research shows that using leadership techniques can enhance followers' motivation to exert effort and improve their creative performance (Jaussi & Dionne, 2003; Martins & Martins, 2002; Zerfass & Huck, 2007). In particular, transformational leadership is a relevant predictor of creative performance (Elkins & Keller, 2003; Gumusluoglu & Ilsev, 2009; Nemanich & Keller, 2007).[4] In an early contribution, Sosik et al. (1998) showed that transformational leadership enhances creative ideas and solutions of individuals working in computer-mediated groups. Transformational leadership stimulates employees intellectually, appreciates proposals, and is directed toward supporting and empowering employees (Elkins & Keller, 2003; Gumusluoglu & Ilsev, 2009; Sosik et al., 1998). In summary, transformational leadership is characterized by four dimensions (Bass, 1985):

1. *Idealized influence*: Leaders serve as role models for their followers by setting high expectations for both their followers and themselves, thereby fostering belief and trust in the leaders.
2. *Inspirational motivation*: Leaders motivate their followers by articulating an inspiring vision and optimism to achieve goals, but in an easy-to-understand way.
3. *Intellectual stimulation*: Leaders stimulate their followers to generate creative ideas and new solutions by challenging the status quo, thereby also constantly challenging followers to achieve higher performance levels.
4. *Individualized consideration*: Leaders personally respect and acknowledge the feelings and needs of their followers for performance and growth through individual promotion.

Countless studies have confirmed the positive effects of these leadership tactics but mostly tested them in traditional work environments (for a meta-analytic review, see Wang et al., 2011). Community members are usually not employed by either the crowdsourcing platform or the sponsoring company. Moreover, collaborative online idea crowdsourcing communities differ significantly from traditional work environments in terms of team size and anonymity. Team size can mitigate the positive effects of leadership tactics such as intellectual stimulation and individualized consideration (Kim & Vandenberghe, 2018). Anonymity affects the group's contributions, leading to more critical comments and less problem clarification (Sosik, 1997). Furthermore, the leader's empathic and interpersonal skills are particularly important for leader-member exchange quality (Mahsud et al., 2010) and, therefore, effective leadership. In online communities, leaders may not be able to develop and apply these leadership skills in the same way as in the traditional work environment if community members remain anonymous. Thus, differences in team size and anonymity could challenge the effectiveness of transformational leadership tactics.

Managerial attention as one specific aspect of individualized consideration, for example, is a tactic that recognizes worker performance (Halac & Prat, 2016). In turn, workers appreciate this attention and reciprocate through higher performance. Given the anonymity of followers in online idea crowdsourcing, the theoretical concept of individualized consideration by managers is practically limited, and thus we can only analyze managers' appreciation of user activities as a fraction of what is covered by individualized consideration in the literature. Jeppesen and Frederiksen (2006, p. 51), however, suggest that managerial attention has a similar effect in online communities because users are responsive to "firm recognition," which, in their setting, means that the firm posts the innovation or related information on its website. Moreover, empirical evidence shows that in online communities, the manager's recognition is correlated with timely responses to individual suggestions, which can motivate the crowd (Morrison & Bies, 1991). Ye et al. (2015) found that in addition to the perceived presence of the manager, the manager's perceived recognition is a precondition of perceived managerial support fostering community activities. Joschi et al. (2009) highlighted the importance of inspirational leaders for service employees in geographically dispersed teams for a multinational Fortune 500 hardware and software company. Although their setting is only indirectly comparable to online communities, they show that leadership is also important in organizational contexts in which there is no close, sustained, and personalized contact between leaders and followers. Taking the previous evidence and this discussion together, we suggest that transformational leadership tactics are

[4] For a critical assessment, see van Knippenberg and Sitkin (2013).

similarly valuable for managers of collaborative online communities. Thus:

Hypothesis 2a. In online idea crowdsourcing, community managers' inspirational motivation is positively associated with community participation.

Hypothesis 2b. In online idea crowdsourcing, intellectual stimulation by the community manager is positively associated with community participation.

Hypothesis 2c. In online idea crowdsourcing, individualized consideration in the form of managerial attention and appreciation is positively associated with community participation.

Note that we do not formulate a hypothesis for idealized influence because we do not observe behaviors in our data set that would fit into this category, which could be because this form of leadership behavior usually emerges in a context of crisis or major change (Yukl, 1994). Instead of idealized influence, we analyze the impact of giving *feedback* because this community manager activity was observed frequently in the data set and is also related to the transformational leadership model. Using a meta-analytic review, Anseel et al. (2015) found that transformational leadership is positively associated with individuals' feedback-seeking behavior, and feedback can affect performance in traditional work environments as well. Chan et al. (2015) argued that feedback on customer ideas generates social benefits for customers and a sense of partnership (Nambisan & Baron, 2010). In line with this conjecture, they found that the prior speed of sponsor company feedback on suggestions has a positive effect on the current idea submission rates. Providing additional *information* is another common managerial behavior observed in our data set, which might empower the users to exert more specific and better-informed influence on their suggestions and comments. Previous research has shown that the communication of information is important for the creation, sharing, integration, and application of knowledge (Grant, 1996; Kogut & Zander, 1992) and that it encourages the community to participate (Dahlander & Piezunka, 2014). As a result, comments by the community manager that contain new information might also attract the attention of the community. In summary, we include five different categories in our empirical analysis. We derive motivation, stimulation, and attention directly from extant literature, while feedback and information come from the analysis of our data but are also supported by theory.

4 Data and Empirical Specification

4.1 Data

We used data on crowdsourced innovation projects initiated by 22 large and medium-sized international companies between 2011 and 2016. The data came from a large idea crowdsourcing software vendor that started operating in 2010. The software vendor has developed two similar types of white-label solutions of platforms that differ somewhat in their layout and the type of projects they have attracted but not in their basic software features. Campaigns on Platform Type 1 (n = 15) differ in product categories, while campaign categories on Platform Type 2 (n = 7) are rather similar. Projects are split into two types of phases, so-called *suggestion* and *voting* phases. During the suggestion phase, users give suggestions and comments. Suggestions are users' written statements outlining ideas for the respective product. Comments are users' written statements related to other users' suggestions. To better express their ideas, users can also upload media files such as photos or videos. After the suggestion phase, the community commonly votes on the suggestions previously made. In most projects, users are also allowed to make suggestions and comment during the voting phase. At the end of the voting phase, another suggestion phase can transpire, for example, to further develop or combine previous ideas. The longest-running project covers eight phases (four suggestions phases, each followed by a voting phase).

On the online crowdsourcing platforms we investigated, community managers are installed by the platform operator or the respective project initiator and do not receive any particular instructions on how to handle the community. While community managers receive financial remuneration to manage the community, their pay is not related to any metrics of the online community. In general, their performance is not evaluated on any predefined measures. In some cases, the campaign sponsor picks the community manager and managers often work on the same team as the community at the sponsor company. They can participate in the same way as users: they can make suggestions or comment, upload media, and vote for the suggestions they like. Furthermore, community managers can inquire about whether suggestions have been fully understood and motivate the crowd to engage in the project.[5]

The data contain detailed information on each activity that was executed during a project phase. From these data, we constructed a panel data set by aggregating the

[5] While it would be interesting to learn more about the community managers in our data set, the information we obtained from the software vendor did not provide more information. However, the econometric approach we chose (i.e., the fixed-effects Poisson model) allowed us to control for unobserved community manager characteristics.

activities undertaken on a single day in the course of a particular project. Thus, for each project, our number of observations was equivalent to the number of days the project ran. As all kinds of user activities are potentially important for the innovation process, we initially analyzed the impact of an actively involved community manager on users' motivation to exert effort by summing up suggestions, comments, and media uploads, which we call the "number of user activities." Given that suggestions, comments, and media uploads, however, might differ substantially in the amount of time that users may need to invest, we also estimated our specifications separately for each category of user activities.

To test our hypotheses, we considered different explanatory variables of interest. First, we constructed the *number of manager activities* as previously done with the number of user activities. Moreover, we investigated manager *suggestions*, *comments*, and *media uploads* independently. Second, to measure the *content of community managers' contributions*, we developed a coding system that categorizes the information contained in the comments. In a first step, we generated an initial list of comment categories based on our knowledge and prior research from the transformational leadership literature (Bass, 1985; Bass & Riggio, 2006). In a second step, we merged similar categories and then developed a system of categories with higher dimensions (Gioia et al., 2012; Miles & Huberman, 1994). Our final coding system consisted of five categories of manager comments: *motivation*, *stimulation*, and *appreciation*, derived from transformational leadership theory, as well as *feedback* and *information*, as commonly observed managerial practices.

The category *motivation* contains comments relating to the community manager encouraging the crowd to participate or actively asking for help and support, thus potentially triggering the joy of helping others (Kankanhalli et al., 2005). Intellectual *stimulation* contains all the manager comments that question and challenge community members regarding generating new ideas and writing comments. The category *appreciation* contains community manager comments that show appreciation for user comments and comments the manager uses to develop a positive relationship with the crowd. If the community manager attempts to clarify suggestions or comments by users or poses a comprehension question, we code these comments in the category of *feedback*. If the community manager gives the crowd new information about the product or other product descriptions, we code these comments in the category of *information*. Table A1 in the Appendix provides a detailed overview of the categories, including examples.

To ensure that our coding system was reliable and coherent, we created detailed explanations for each category. Then, an external researcher not involved in the project initially coded 20% of the activities; this allowed us to ensure that the coding categories were exhaustive and that they had a high degree of objectivity. The interrater reliability using Cohen's kappa indicated good agreement between our coding and that of the external researcher (Fleiss et al., 2003; Landis & Koch, 1977). To achieve even greater consistency in the coding, we discussed the coding system with the external researcher and adapted it when necessary. Afterward, we again coded all 100 suggestions and 2,241 comments and conducted another interrater reliability analysis to ensure coding consistency. Cohen's kappa was 0.832, indicating good to excellent agreement between our coding and that of the external researcher. Finally, we decided to qualify comments that were in line with the respective category only if all researchers agreed that a comment belonged to the respective category.

4.2 Empirical Specification

To identify the effect of the community manager on community participation, we used an approach similar to Chen et al. (2012) and Dahlander and Piezunka (2014) and examined the number of community activities—suggestions, comments, and media uploads—in an online idea crowdsourcing campaign on a given day. Given that our dependent variable consisted of count data, we decided in favor of a fixed-effects Poisson model capable of exploiting the panel structure of our data and removing any unobserved, time-invariant heterogeneity for a particular idea crowdsourcing project. For example, the project initiator, the project purpose, potential rewards, and the personal characteristics of the community manager would all be differenced out in this model. In our baseline specification, we estimated the following fixed-effects Poisson regression model:

$$\begin{aligned}\Pr(y_{i1}, y_{i2}, \ldots, y_{iT}) = F\big(&Manager\ activities_{it} \\ &+ Manager\ activities_{i,t-1} \\ &+ Manager\ activities_{i,t-2} \\ &+ User\ activities_{i,t-1} \\ &+ User\ activities_{i,t-2} + \boldsymbol{DoW}_t \\ &+ \boldsymbol{DoPL}_t + \boldsymbol{SP}_t\big),\end{aligned}$$

where y is the number of user activities in project i on day t. $F(.)$ represents the Poisson distribution presented in Wooldridge (1999). $\boldsymbol{DoW}$ is a vector of dummies that indicates the day of the week. $\boldsymbol{DoPL}$ is a vector of dummies for deciles of total project length, and $\boldsymbol{SP}$ is a vector of dummies that indicates the current suggestion phase.

Jeppesen and Frederiksen (2006) provided the initial evidence that peer recognition is less important while firm recognition matters most. Chen et al.'s (2012)

more recent study found that prior levels of peer feedback have a positive effect on idea submission rates because participants who receive more feedback appreciate the gain in reputation and a higher level of popularity. That is, firm recognition already encompasses peer recognition to some extent, in that firm recognition is made openly in front of the community. Receiving feedback can also be considered a positive signal by individuals posting suggestions and thus encourages them to participate further. Finally, because community members can respond to other contributions and given the potential herding behavior of the crowd in other domains such as crowdfunding (Kuppuswamy & Bayus, 2018), it seems reasonable to take the previous activity of the community into account by controlling for both user and manager activities at *t*-1 and *t*-2. The inclusion of the lagged number of contributions as a control variable resulted in the loss of 84 observations.[6]

In addition, we considered dummies for weekdays, as the crowd might have more time and be more motivated to support a project on the weekend. We also included dummy variables for each decile of the total project length, separated for three different types of projects (projects up to one month, up to two months, and longer than two months). This approach is in line with Hornuf and Schwienbacher (2018) and Kuppuswamy and Bayus (2018), who included a vector of dummies indicating the first and last seven days of the campaign cycle to capture differences in contribution behavior across the project cycle. Similarly, we also included a vector of dummies that indicates which suggestion phase (out of a maximum of four phases) the project is in currently.

5 Results

5.1 Descriptive Statistics

The 22 projects in our study covered 910 days of suggestion phases.[7] The project length varied between 16 to 127 days, and its average was 72.04 days (SD = 31.53). The number of active users (i.e., those who wrote suggestions and comments or uploaded media) varied from 16 users to 873 users per project. In 72.7% of the projects, there were at least two suggestion phases, each followed by a voting phase. The average length of a suggestion phase was 19.17 days.

Across all projects, we observed 34,378 comments, 17,599 suggestions, and 9,412 media uploads. Similar to the project length and the number of active users, the number of user activities differed substantially between the single projects (for details, see Table A.2 in the Appendix). Community manager activities comprised 2,241 comments, 100 suggestions, and 108 media uploads. We found that community managers were inactive in 66.4% of campaign days. Conditional on being active at least once per day, the average number of community manager activities was 7.77 (SD = 12.00).

So far, research has paid relatively little attention to the dynamics of online communities (Foss et al., 2016). Figure 1 illustrates the distribution of both user and manager activities over the course of a project (in deciles of total project length) for short projects that lasted up to one month, projects of medium length (of up to two months), and long-running projects with a project period of more than two months. The first two categories show a similar pattern of user activities with rather stable but low-level contributions at the beginning of the project and an increase in activities at the end, which suggests that users accumulate experience and might better understand their role in the community over time (Chan et al., 2015). Alternatively, they might engage in some form of sniping and use their last chance to contribute to the project. However, the opposite is true for long-running projects, which is in line with earlier findings from the Dell IdeaStorm community (Chen et al., 2012). Given that users know how long a project runs, they might anticipate that they will not contribute over the whole time horizon and exert their efforts only at the beginning. These different patterns make it necessary to control for each decile of each of the three categories in our econometric analysis.

Dahlander and Piezunka (2014) conjecture that the more suggestions are submitted over time, the more self-sustainable the communication among community members becomes and the more the effectiveness of sponsor contributions diminishes. Comparing the campaign patterns of users and managers, the descriptive statistics suggest that active community managers do not induce more user contributions. However, we found that the average number of user activities was 30.54 per day if no manager was active, whereas this number rises to 116.43 user contributions if the manager was active at least once during that day. Thus, given the limited number of manager activities per day, the data suggest a nonlinear relationship between manager and user activities, which we investigate further in the following subsection.

[6] As a robustness check, we substituted the lagged missing values with a value of 0. The reported results remain qualitatively and quantitatively the same.

[7] Although users are still allowed to suggest, comment, and upload media during voting phases, we observed only 1,641 activities in such phases, which is less than 3% of the overall user activities. These numbers show that the main idea of a voting phase is indeed to vote. Thus, we excluded voting phases from our analysis.

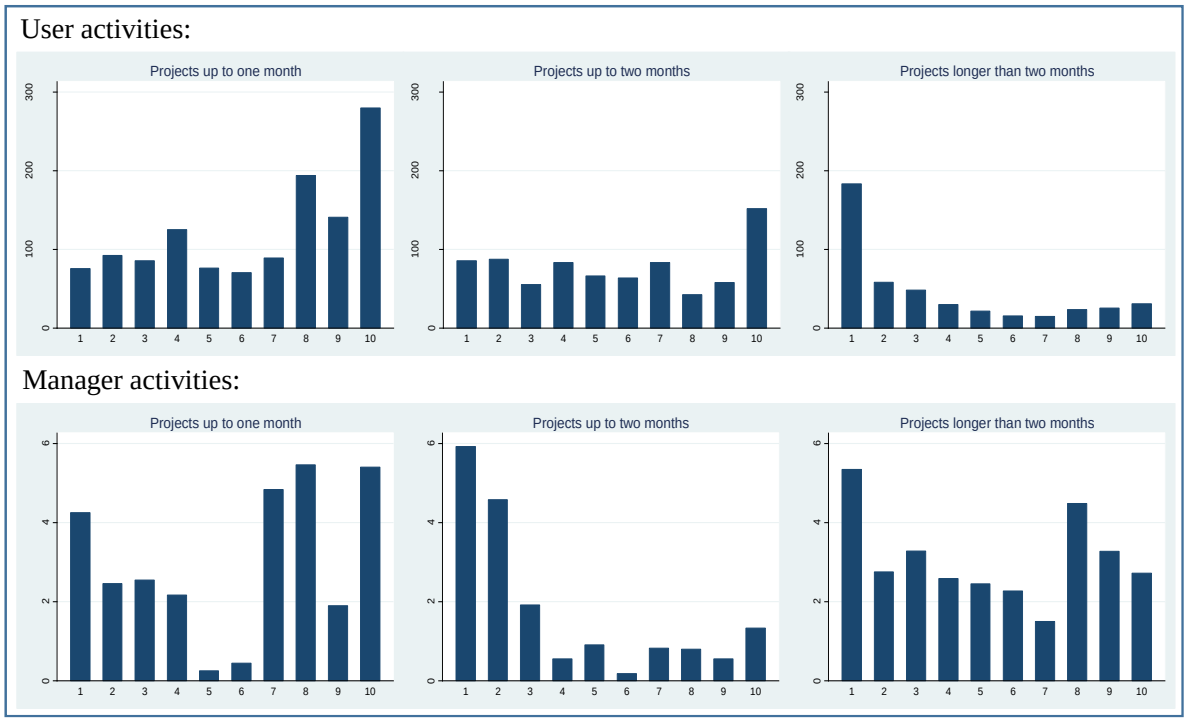


Figure 1. Distribution of Activities by Project Length

5.2 Community Manager Impact on User Contributions

Table 2 reports incidence rate ratios (IRRs) obtained from regression analyses that reveal the impact of community managers on user activities. In Specification (1), one additional manager activity on a given day is associated with a 1.6% increase in overall user activities. Taking into account that user activities might also be a response to manager activities on the previous days, or other users' activities, we include lags of these variables in Specification (2). Indeed, the point estimate for the number of manager activities on the focal day shrinks to 1.2% but remains highly significant. [8] The point estimates for the lagged manager activities are around half the size, which suggests that active community managers have a lasting impact on user contributions.[9]

In line with Nambisan and Baron (2010) and Wasko and Faraj (2005), we found that past participation triggers future participation. User activities are positively associated with the number of user contributions on the previous day, but this relationship vanishes when considering user activities the day before the previous day. Furthermore, it could be argued that the community manager's impact depends on the number of suggestion phases of a project; during the third or fourth suggestion phase, for example, users could be less motivated. Manager activities might then even be more important to motivate users to exert effort. Adding interaction terms between the project phase and manager activities in Specification (3), however, does not support the conjecture that manager activities have a differential impact on community activities over time. There is no statistically significant difference in the managers' impact between the four possible suggestion phases.

Given that a suggestion might be more valuable than a comment for the innovation process, we reestimated Specifications (1) to (3) separately for users' suggestions, comments, and media uploads (with some limitations for the latter due to a smaller sample size because some projects do not contain any media uploads). Table 2 reports these results as Specifications (4) - (11). For suggestions only, the point estimate for managers' activities is at least as high as in the previous specifications, although lagged manager activities no longer have a significant effect on community activities. In contrast with the previous results, Specification (6) suggests that a manager's impact indeed increases in later suggestion phases.

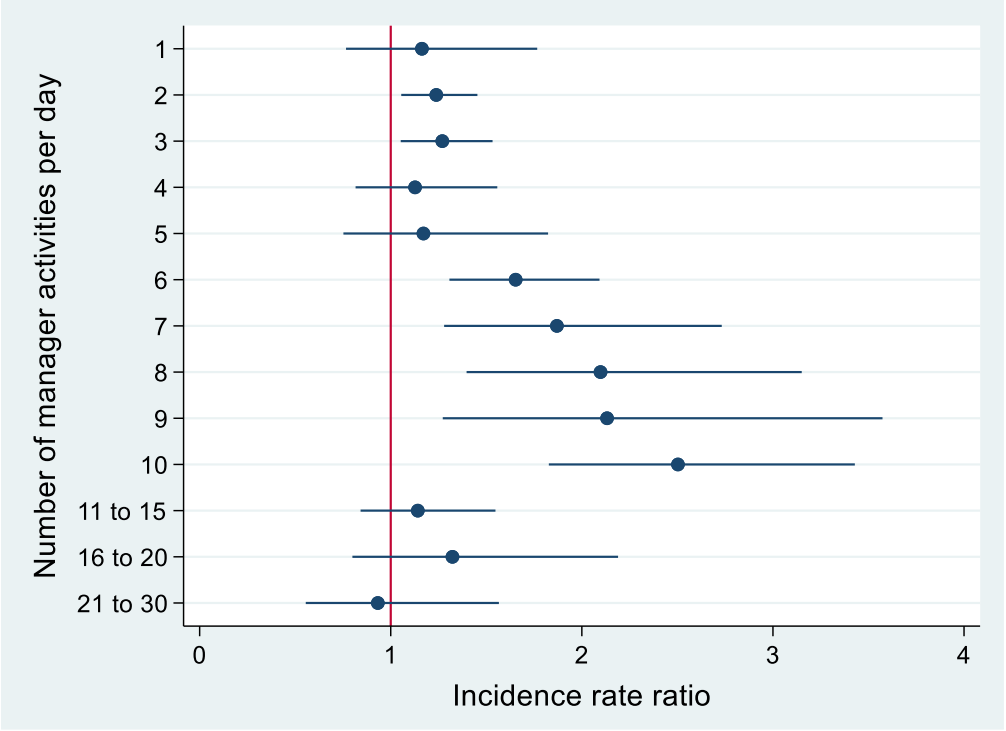
[8] This finding is not driven by the reduced sample size (due to the inclusion of lagged variables); reestimating specification (1) with this reduced sample results in almost the same point estimate.

[9] When adding a third lag of user and manager activities, the model no longer converges.

Table 2. Main Regression Results

Dependent variable	**All user activities**			**Suggestions only**			**Comments only**			**Media only**	
	Sp. (1)	**Sp. (2)**	**Sp. (3)**	**Sp. (4)**	**Sp. (5)**	**Sp. (6)**	**Sp. (7)**	**Sp. (8)**	**Sp. (9)**	**Sp. (10)**	**Sp. (11)**
Manager activities *t*	1.016*** (0.004)	1.012*** (0.002)	1.012*** (0.002)	1.018*** (0.005)	1.014*** (0.003)	1.012*** (0.005)	1.015*** (0.004)	1.013*** (0.002)	1.013*** (0.002)	1.001 (0.004)	1.002 (0.003)
Manager activities (*t*-1)	--	1.006** (0.002)	1.006** (0.002)	--	1.008 (0.005)	1.008* (0.005)	--	1.005** (0.002)	1.005** (0.002)	--	1.000 (0.007)
Manager activities (*t*-2)	--	1.006*** (0.002)	1.006*** (0.002)	--	1.007 (0.004)	1.008* (0.004)	--	1.007*** (0.002)	1.007*** (0.002)	--	--
User activities (*t*-1)	--	1.001*** (0.0003)	1.001*** (0.0003)	--	1.001** (0.0003)	1.001** (0.0004)	--	1.002*** (0.0002)	1.002*** (0.0002)	--	1.001* (0.001)
User activities (*t*-2)	--	1.0002 (0.0002)	1.0001 (0.0002)	--	1.00003 (0.0002)	1.0009 (0.0002)	--	1.0001 (0.0003)	1.0001 (0.0003)	--	--
Manager activitiest × 2nd suggestion phase	--	--	0.997 (0.009)	--	--	0.981 (0.012)	--	--	1.004 (0.009)	--	--
Manager activitiest × 3rd suggestion phase	--	--	1.010 (0.010)	--	--	1.028*** (0.011)	--	--	0.994 (0.013)	--	--
Manager activitiest × 4th suggestion phase	--	--	0.994 (0.007)	--	--	1.019 (0.012)	--	--	0.982*** (0.007)	--	--
Additional controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	910	826	826	910	826	826	910	826	826	747	715
Wald χ^2	1482.68	44638.44	44208.79	6449.92	2047.01	650.84	12573.76	24068.18	46815.10	1.19e+06	17.426.95
Prob > χ^2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note: The table reports IRRs obtained from fixed-effects Poisson regressions (robust standard errors in parentheses). Control variables include dummies for the day of the week, deciles of the total project length for three different types of projects (i.e., projects up to one month, up to two months, and longer than two months), and the suggestion phase (i.e., one to four). Significance levels are denoted as follows: *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. For media uploads as the dependent variable, groups are dropped because of all zero outcomes. Sp. = specification.



Note: The estimates are based on Specification (2) from Table 2. Given low numbers of observations, we clustered days with 11 to 15, 16 to 20, and 21 to 30 manager activities on a given day. Observations with more than 30 manager activities per day were dropped (i.e., nine observations).

Figure 2. Impact of Additional Manager Activities on User Activities

Although only Suggestion Phase 3 is significantly different from the reference category (i.e., Suggestion Phase 1), the point estimate for Suggestion Phase 4 is also positive, and the nonsignificance might be explained by a lack in statistical power, as only two of the 22 projects have a fourth suggestion phase. However, this point estimate should be considered with caution, as only two campaigns in our data set actually went through four phases. This also applies to managers' impact on users' commenting activities, where the interaction term with Phase 4 is significantly negative. Overall, including the interaction terms yields a robust positive relationship between manager and user activities over the course of a project, regardless of its length. For media uploads, we did not find any statistically significant relationship to the number of manager activities on a given day, but similar to all other specifications, the number of media uploads slightly increased with the number of user activities on the previous day.

While it is impossible to judge the quality of each contribution, in general, the longer a comment or suggestion is, the more elaborated the user's thoughts will be. To investigate whether the increasing quantity of contributions is not at the expense of their quality, we considered the total length of suggestions and comments. Following Dahlander and Piezunka (2014), we used the number of words as a proxy for the elaborateness of user activities. The resulting IRRs are nearly identical to the results obtained using the number of contributions as the dependent variable (see Table A3 in the Appendix). Thus, the data strongly support Hypothesis 1a, indicating that the community manager fosters community activities.

The 1.2% increase in user activities from Table 2 seems small when compared with the IRRs obtained when substituting the number of manager activities with a dummy variable for whether a manager was active on a given day or not. We found that when a community manager was active at least once per day, the total number of user activities increased by approximately 42% (p = 0.005) compared with days without any manager activities (for details, see Table A4 in the Appendix). In contrast with the previous results, we also observed a statistically significant impact on community media uploads of slightly more than 24% (p = 0.005). Thus, we estimated IRRs separately for different numbers of manager activities per day to check the possibility of a nonlinear relationship between the number of manager and user activities. Figure 2 depicts the results.

Although two and three manager activities per day were statistically significant, Figure 2 shows that a slightly larger number of activities (i.e., six to 10) had a considerably stronger effect. Notably, more than 10 manager activities per day no longer seemed to have an effect. Some users might not have found a benefit in contributing to the community if the manager was already "doing their job." Another explanation could be found in our data set: we only had 41 observations that covered 11 to 30 manager activities per day. Thus, these results should be considered with care, as we might lack the statistical power to identify a significant relationship, if existent. To further verify this nonlinear relationship, we reestimated the previous specification with the total number of manager activities per day and its squared term. The resulting point estimates are 0.073 and -0.004 (both $p < 0.001$), respectively, suggesting that the optimum number of manager activities per day is 10. Therefore, it seems reasonable to conclude that it is important for community managers to be active on as many days during the campaign as possible with a moderate activity level, rather than being active on only a few days with a rather high activity level, in support of Hypothesis 1b.

5.3 Impact of Community Manager Communication Mode and Content on User Activities

After establishing a strong and robust impact of community manager contributions on user activities in general, we investigated whether the type of contribution and the concrete content of suggestions and comments played a role in user activities. As Section 4.1 outlines, both managers and users could contribute suggestions, comments, and media uploads. Given that uploading media might have generated more attention in the community than posting a comment, the different categories could have had a differential impact on user activities. Therefore, we repeated the previous analyses but split managers' activities into the three different forms of communication. Given the nonlinear relationship between manager and user activities and the low variation in manager suggestions and media, we used binary variables for the managers' activities only. Table 3 presents the results.

Manager comments are consistently estimated to have a positive impact on all types of user activities, with the largest point estimate for suggestions. The low numbers of manager suggestions and media uploads mean that the remaining results should be interpreted with some care but, notably, manager suggestions seem to be followed by user suggestions and media uploads (compared with user suggestions, the IRR is similar in size but nonsignificant), whereas the point estimate in case of user comments is much lower. A possible explanation for this finding is that although users might hesitate to comment on a manager's suggestions, these suggestions raise the motivation of the community to come up with a similarly good or even better idea than the manager's. Furthermore, we found that managers' media uploads are strongly associated with user comments and suggestions. However, media uploads do not seem to motivate users to upload media themselves—which might be in line with the conjecture that users do not exert effort if the manager has already done the job.

Table 3. Differences among Suggestions, Comments, and Media Uploads

Dependent variable	(1) All user activities	(2) suggestions only	(3) comments only	(4) Media only
Manager suggestionst (yes/no)	1.436** (0.226)	1.925*** (0.186)	1.253 (0.226)	2.009 (1.184)
Manager commentst (yes/no)	1.302** (0.136)	1.435** (0.218)	1.241** (0.128)	1.223** (0.112)
Manager media uploadt (yes/no)	2.059*** (0.541)	2.099** (0.779)	2.323*** (0.389)	1.045 (0.229)
Observations	871	871	871	715
Wald χ^2	14641.81	883.93	10545.61	125153.51
Prob > χ^2	0.000	0.000	0.000	0.000

Note: The table reports IRRs obtained from fixed-effects Poisson regressions (robust standard errors in parentheses). Additional controls are identical to Specifications (2), (5), (8), and (11) in Table 2. However, we refrain from controlling for user and manager activities at *t*-2 because a substantial fraction of community manager suggestions and media uploads are observed at the beginning of a suggestion phase. Significance levels are denoted as follows: *p < 0.10, **p < 0.05, ***p < 0.01.

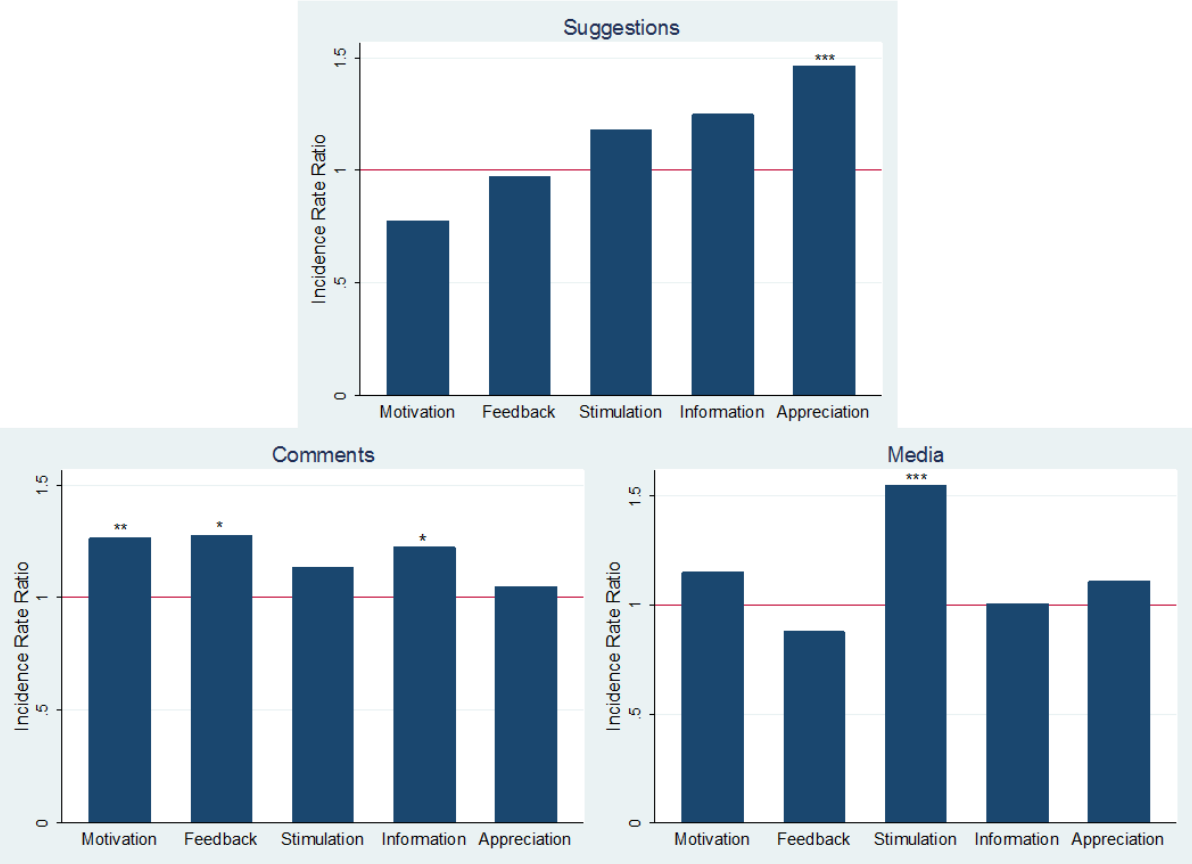
Next, we analyzed the content of managers' suggestions and comments as outlined in Section 4.1. We observed that managers informed community members about the latest developments of the project or the product itself in 78.1% of all project days on which the manager was active. Community managers were similarly active in showing appreciation for user suggestions and comments (75.6%) and were only slightly less active in stimulating suggestions and comments (68.3%). Suggestions and comments coded in the categories feedback and motivation appeared infrequently (13.3% and 15.6%, respectively).

When using overall community participation as the dependent variable, we found only a marginally significant, positive impact of appreciation (p = 0.067). Figure 3, however, shows significantly different patterns for the three types of user activities. Strikingly, only managers' appreciation seems to be related to the number of community suggestions. Given that participation in these communities is not paid for, our results suggest that users' primary incentive to participate might be to receive some sort of appreciation from the community manager, which could also indirectly enhance their status within the community. Regarding community comments, we found a positive association with community manager motivation, feedback, and information, even though the latter two are only marginally significant. For community media uploads, which probably require the most creativity, we found manager stimulation to be important. Thus, while managers should certainly offer users appreciation and intellectual stimulation and engage in motivational activities, they should also consider giving feedback and providing users with information. Therefore, which of these five categories work best to stimulate community activities depends on what form of participation managers wish to encourage. Taken together, our results provide partial support for Hypotheses 2a, 2b, and 2c, in that community managers' inspirational motivation, intellectual stimulation, and appreciation are positively associated with certain activities of the community, but not with overall community participation. Moreover, we find that manager feedback and information should also not be neglected.

5.4 Causality

Given the observational nature of our data, it could be argued that our results may suffer from reverse causality and that the positive relationship between the community manager and user activities may be due to managers responding to the activities of the crowd, not vice versa. Although we cannot rule out this possibility completely, the following findings suggest the opposite. First, with the exception of Specifications (1), (4), (7), and (10), all specifications in Table 2 include lagged variables for manager activities on the previous day. Because user contributions on the current day cannot influence manager engagement from the previous day and we still find highly significant IRRs for these lagged variables in the majority of specifications, the positive relationship between manager and user contributions cannot entirely be driven by user activities causing the manager to respond. Second, the positive relationship between manager appreciation and user suggestions might speak in favor of reverse causality, as a more active crowd generates more opportunities for managers to recognize users' contributions, but this line of argument is not true for manager stimulation and users' media uploads: if there are already quite a few uploads, there is less need for managers to stimulate the crowd.

Furthermore, we restricted our analysis to a sample that is highly unlikely to suffer from reverse causality. This sample covers only seven of the 22 projects, but these are special because the average time of day of manager activities is at least one hour earlier than the average time of day of user activities. Moreover, we dropped days with a high number of user activities on the previous day (more than 10 user activities) so that early manager activities were unlikely to be a response to user activities on the previous day.



Note: Estimations are based on the same specifications as depicted in Table 3, but instead of splitting manager activities into suggestions, comments, and media uploads, we split them into the five content categories. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

Figure 3. Content of Manager Activities

In this analysis, we ended up with 118 days of observations and an estimated IRR of 1.011 ($p = 0.006$) for the total number of manager activities and an estimated IRR of 1.524 ($p = 0.034$) for a manager being active at least once per day.[10] Some manager activities were clearly a response to users' activities, and we cannot guarantee that these triggered user activity; however, if the conjecture were true that manager activities are *only* a response to user activities, the estimated IRRs for this specific sample would be significantly lower than the IRRs for the overall sample, which is not the case.

Finally, we also used propensity score matching to test for the robustness of our results. Based on the idea that a high number of community activities on the previous day would increase the likelihood of a manager being active, we only compared days on which managers had the same likelihood of being active by matching one observation from our artificial treatment group (i.e., a day on which a manager was active) with one control group observation when no manager was active that day. Following Rosenbaum and Rubin (1983), we considered the observation with the closest propensity score only. In addition, the propensity scores of two matched observations were required to be below the predefined caliper of 0.01. In this simple model in which we matched the number of user and manager activities on the previous day only (Model 1), the sample size shrank to 470 days of observation, but the density distributions of propensity scores and the biases before and after matching (see Appendix, Figure A.1) showed almost perfect alignment of these two covariates. In Model 2, we also differentiated among suggestions, comments, and media uploads. In Model 3, which is the most extensive model, we matched on the covariates used in our baseline regression, again with the exception of the deciles of project length due to the low sample size. Although the alignment of covariates is not perfect, especially in comparison with the other two models, none of the covariates continued to differ significantly between our control and treatment observations.

[10] Compared with our baseline regressions, we refrained from controlling for the deciles of total project length because of the low sample size.

Table 4. PSM Results

Model	Average user activities: Control	Average user activities: Treatment	*p*-value	Estimated IRR	*N*
1	51.68	76.83	0.002	1.487***	470
2	54.00	71.58	0.002	1.325***	458
3	59.92	80.44	0.049	1.345***	416

Note: Matching procedure is based on the following variables:
Model 1: User and manager activities (*t*-1).
Model 2: User and manager suggestions, comments, and media uploads (*t*-1).
Model 3: User and manager activities (*t*-1 and *t*-2), day of the week, and suggestion phase.

Table 4 summarizes the results obtained from all three models. Compared with the pure descriptive statistics, which suggest a considerable impact of a manager being active at least once per day (30.54 vs. 116.43 user activities), the differences between the control and artificial treatment observations are somewhat smaller but still sizable and statistically significant. Taken together, we conclude that our findings are unlikely to be due to reverse causality.

6 Discussion

6.1 Contributions to Theory and Research

In this research, we investigated the role of the community manager in increasing the community's participation in online idea crowdsourcing, which is a more permeable form of innovation creation than traditional forms of innovation management. Our empirical analysis extends previous research on crowdsourced innovation in three ways. First, by drawing on the actually observed behavior of 22 large-scale online communities, our research increases the external validity of studies that also highlight the importance of the community manager but are based on either anecdotal evidence (Chen et al., 2012) or a single case study (Nuhutlu et al., 2021).

Second, owing to the richness of our data set, we also were able to analyze the variation in community managers' daily activities. The observation that managers should be present on a regular basis but not to the maximum extent, supports Ye et al.'s (2015) findings stressing users' perceived managerial presence as a prerequisite for perceived manager support, which in turn is an important determinant of users' knowledge contribution in online knowledge sharing communities.

Third, Jeppesen and Frederiksen (2006, p. 57) conclude that participation and innovation in online communities "are related to the wish of being recognized by the firm hosting the user community." However, not all forms of recognition work equally well. For the platform NASA@WORK, Gallus et al. (2020) show that peer and platform recognition is not effective, while management recognition is. We expand these insights with reference to transformational leadership theory and investigate whether the techniques proven to be successful in countless studies but mostly tested in traditional work environments (Wang et al., 2011) also work in online communities when managers approach the community to elicit activities. We found that recognition is positively associated with user suggestions but not with other forms of user activities. In general, our data suggest that community managers play an essential role in fostering community participation and that the management of communities is, in many ways, similar to the management of teams in hierarchically structured firms. This is a notable finding given that, the importance of appreciation for work motivation (Bradler & Neckermann, 2016; Kirchler & Palan, 2018), for example, involves a direct employer-employee relationship, which is mostly absent in large online communities.

6.2 Managerial Implications

Successful value creation in online communities requires active engagement by participants (Barrett et al., 2016; Bauer et al., 2016). Raban et al. (2010) provide empirical evidence that projects can fail if they cannot attract the critical mass of users and user activities for the community to become self-sustaining. A key challenge for crowdsourcing sponsors is to foster creative ideas without extrinsic and, in particular, monetary incentives, to motivate individuals to participate and cooperate within the community. Fredberg and Piller (2011) find that even users with strong ties to the firm are not willing to contribute to innovation activities per se. As a result, firms have created new service centers to handle conversations with customers. If the project initiator is neither able nor willing to communicate with the community (von Briel & Recker, 2017), project initiators need to resort to requesting help from the market. As in our case, software vendors hosting the communities may be willing to provide a professional community manager; alternatively, an experienced community manager could be hired from another platform. Our results indicate that the community manager can also come from outside the firm to handle the community effectively.

Our discussion with the software vendor that provided the data for this study revealed that the recruiting of a community manager is often ad hoc and that the effectiveness of this manager in eliciting innovative ideas is well understood by neither the software vendor nor the project initiator. To put our findings into practice, a necessary prerequisite for the operators of the platform would be to decide on a process through which community managers can be recruited. Community managers coming from the respective project initiator may be able to better contribute expert knowledge about the respective product or service; however, our results and those of Gallus et al. (2020) show that the provision of information is not the most critical resource to encourage the community to participate. Thus, the operators of the platform might be better off engaging and training community managers who are consistently active on a platform. These community managers could then develop their management and leadership skills, which appear to be more important when eliciting contributions from the crowd. To be more concrete, we recommend that managers stimulate community members intellectually, show appreciation for their suggestions, and engage in motivational activities. Even managers' own suggestions have a positive impact on user suggestions because they raise the motivation of the community to come up with a similarly good or even better idea than that of the manager.

However, not all platform operators have the scope and professional sophistication to hire and train their own community managers, especially if software vendors and project initiators are still in the start-up phase. In these cases, it is important that middle management installs a good support process and provides the community manager with information on how an online idea crowdsourcing community can be motivated. Software vendors and project initiators could then develop best-practice handbooks that outline how to handle communities effectively. Community managers could even receive real-time feedback from the respective software on which the platform is run. Using natural language processing, the software could, for example, communicate that showing appreciation is better used to elicit suggestions from the crowd than to elicit the upload of media content. In other cases, such as when the community discusses a graphic representation of an idea, it might be better to use intellectual stimulation.

6.3 Limitations

In contrast with many related studies (e.g., Chen et al., 2012; Nuhutlu et al., 2021), our analysis does not rely on a single community or project. Thus, our empirical analysis offers greater external validity. Still, our results might not be generalizable to other types of communities, such as crowd complementors or crowd labor markets. Moreover, while our study is broad in terms of the projects we consider, we clearly lack detail on the individuals we analyze. Although this does not invalidate our conclusions, knowing more about the individuals who manage communities would be useful. For example, do characteristics such as gender, age, or technical competence matter when choosing community managers? We include campaign-fixed effects for this lack of data and to account for time-invariant characteristics of the community managers, such as their age, gender, education, and current ability to manage the community. Furthermore, we also lack information on the personality of individuals who are part of the communities and do not understand the role that shared values and mutual trust might play. More information on community members would be valuable with respect to determining who is more responsive to which type of feedback. Having more information about users would also enable managers to target suggestions and comments more specifically to their needs and wishes.

Our study is obviously limited to users who decided to participate in crowdsourced innovation activities. Thus, our results might not generalize to communities in which managers actively integrate particular employees or customers who would otherwise not have decided to join the community. Furthermore, while our analysis highlights the importance of active community managers, we did not conduct a cost-benefit calculation of such activities. However, given that setting up a community is costly and the innovation development process took an average of 10 weeks in our sample, a back-of-the-envelope calculation would most likely indicate that the benefits still outweigh the costs. However, the larger and more intense and valuable the community is, the more active managers need to be and the higher the administrative costs will be.

6.4 Future Research

The observed patterns regarding the content of managers' activities raise important questions for future research. First, the data suggest that in the communities we studied, media uploads by managers had the strongest effect on user suggestions and comments. One interpretation of this result is that users value the effort that managers invested in the creation of media files by contributing more actively afterward. However, a media file might also be more visible than a single comment and more effective in the idea-generating process. If more users are aware of a manager's activity, they may also respond to it. Future research could investigate why media uploads by community managers have a stronger impact on community activities than suggestions and comments. Second, we question how the known positive impact of managers' appreciation in a typical workplace

transfers to an online setting, whether it depends on the size of the community, and what role privacy preferences of users and managers play. With larger data sets, it will become feasible to provide answers to these questions. Third, future research might also investigate why community managers behave as they do. For example, von Briel and Recker (2017, p. 41) note that product managers "could still easily process all suggestions [by the community] even if they let them accumulate over time." However, in some cases, managers reply to community suggestions via private messages, which may not only create the impression among users that the firm is not paying attention to them but may also deprive the focal user of peer recognition in the form of public acknowledgment from the project initiator. Future research could thus analyze the incentive structure of community managers to better explain their behavior.

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Appendix

Table A1. Definition and Examples of Comment Coding

Coding of comments	Examples
***Appreciation*:** The community manager makes comments that value user suggestions and comments. The community manager attempts to develop a positive relationship with the crowd and highlights the relevance of the comments.	1. "True! We can learn a lot from the thin thermos-materials." 2. "Nice pictures :) Thank you for your feedback." 3. "Very nice idea, take a picture of the colors with illumination level z!"
***Feedback*:** The community manager attempts to clarify users' suggestions and comments or poses a comprehension question.	1. "You would like to have a tighter, more fitted jacket, if I understand you correctly? What precisely was not right with the fit of the jacket especially at the back part? Can you describe that more precisely?" 2. "Dear co-developers! Unfortunately, we must tell you that a two-phase shower cannot be realized till autumn."
***Information*:** The community manager gives the crowd new information about the product or provides product descriptions. The community manager postpones the comment until a later stage of the project.	1. "Hi Monika! You have a great point here. Unfortunately, we only need the concrete theme. On the top left you also see the project overview. Cordially, Moritz" 2. "That might be feasibly even without a sliding door. It might be important that the seat at least slightly turn to the outside. Many people move first with their but in the seat and then turn inside the car."
***Motivation*:** The community manager encourages the crowd to participate or actively asks for help.	1. "If you have X-BIONIC clothes at home that you can compare with the tester feedback or if you have questions you may want to ask the testers you can join in on the discussion even if you are not a tester. We would be happy to see you around!" 2. "If you have templates that we can upload for you, you can also send them via e-mail to ■■■■■■■@plattform.de."
Intellectual stimulation: The community manager comments by questioning and challenging community members to generate new ideas and write comments. The community manager poses questions about the product development, product name, usage, marketing, and added value of the product.	1. "What kind of chest pocket would you prefer? e.g., size, positioning, zipper etc." 2. "Do you have other ideas or needs as to how the jacket could be improved to fit underneath a hard-shell besides the chest pocket?"

Table A2. Descriptives by Project

Project	Length (in weeks)	Suggestion phases	Contributing users	User				Manager			
				Suggestions	Comments	Media	Votes	Suggestions	Comments	Media	Votes
1	2	1	16	36	36	6	76	0	1	0	7
2	19	3	316	620	927	10	898	4	321	0	122
3	9	3	29	173	1699	1	344	3	30	0	59
4	8	2	51	160	101	0	392	0	130	0	19
5	12	3	404	572	1267	10	539	0	1	0	16
6	9	2	66	368	2136	474	985	0	1	0	8
7	12	3	264	290	362	0	281	1	197	0	21
8	10	2	151	241	281	0	600	10	58	0	18
9	10	2	74	261	1911	727	611	0	140	0	2
10	9	3	364	554	1008	17	608	3	114	0	6
11	10	3	46	141	127	139	143	8	151	0	0
12	3	1	188	214	564	1	167	0	121	0	3
13	6	2	18	32	31	33	0	1	0	0	2
14	11	2	142	405	887	780	488	1	251	0	0
15	7	1	64	280	2139	346	183	0	3	0	3
16	7	4	873	2002	4569	0	4838	17	88	0	235
17	23	4	375	860	6216	1508	5947	25	129	47	318
18	3	1	146	150	125	170	793	1	11	5	81
19	2	1	119	210	114	6	161	3	55	12	62
20	17	2	353	1190	3991	1117	3970	4	284	28	276
21	17	2	681	5186	1946	42	13178	10	5	2	305
22	12	1	401	3654	3941	4019	7981	9	150	14	196

Table A3. Contribution Length as a Signal of Quality

Dependent variable	Total number of words	Number of words, only suggestions	Number of words, only comments
	(1)	(2)	(3)
Manager activitiest	1.015*** (0.003)	1.014*** (0.005)	1.012*** (0.002)
Manager activities(t-1)	1.007*** (0.002)	1.005** (0.002)	1.009*** (0.002)
Manager activities(t-2)	1.008*** (0.002)	1.006** (0.003)	--
User activities(t-1)	1.002*** (0.000)	1.001*** (0.000)	1.001*** (0.001)
User activities(t-2)	1.000 (0.000)	1.000 (0.000)	--
Additional controls	Yes	Yes	Yes
Observations	826	826	871
Wald χ^2	17065.88	2066.59	5392.29
Prob > χ^2	0.000	0.000	0.000

Note: The table reports IRRs obtained from fixed-effects Poisson regressions (robust standard errors in parentheses). Control variables include dummies for the day of the week, deciles of the total project length for three different types of projects (i.e., projects up to one month, up to two months, and longer than two months), and the suggestion phase (i.e., one to four). Significance levels are denoted as follows: *p < 0.10, **p < 0.05, ***p < 0.01. Activities(t-2) were excluded from Specification (3) because the model no longer converged.

Table A4. Manager Active at Least Once a Day

Dependent variable	All user activities	Suggestions only	Comments only	Media only
	(1)	(2)	(3)	(4)
Manager active t	1.421*** (0.178)	1.683** (0.346)	1.372** (0.172)	1.242** (0.117)
Manager active (t-1)	1.229** (0.120)	1.253 (0.225)	1.235** (0.105)	0.995 (0.139)
Manager active (t-2)	1.157 (0.124)	1.156 (0.193)	1.123 (0.104)	--
User activities (t-1)	1.001*** (0.000)	1.001** (0.000)	1.002*** (0.000)	1.001** (0.000)
User activities (t-2)	1.000 (0.000)	1.000 (0.000)	1.000 (0.000)	--
Additional controls	Yes	Yes	Yes	Yes
Observations	826	826	826	715
Wald χ^2	72630.48	794.55	917375.20	127035.70
Prob > χ^2	0.000	0.000	0.000	0.000

Note: The table reports IRRs obtained from fixed-effects Poisson regressions (robust standard errors in parentheses). Control variables include dummies for the day of the week, deciles of the total project length for three different types of projects (i.e., projects up to one month, up to two months, and longer than two months), and the suggestion phase (i.e., one to four). Significance levels are denoted as follows: *p < 0.10, **p < 0.05, ***p < 0.01.

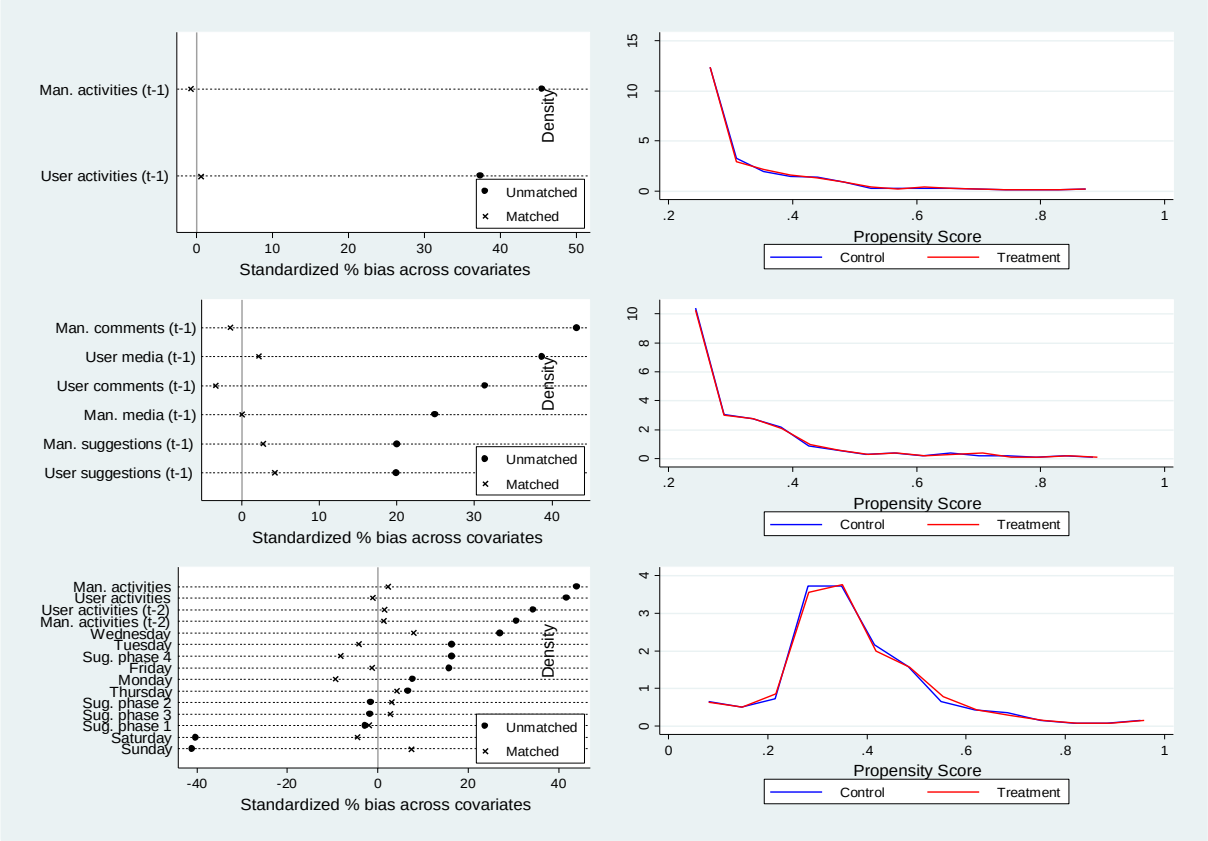

Figure A1. PSM Matching Procedure

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