Journal of the Academy of Marketing Science (2025) 53:150–171
https://doi.org/10.1007/s11747-024-01045-6

ORIGINAL EMPIRICAL RESEARCH

The idea marketplace: Diversity, social capital, and innovation

Andreas H. Heusler[1] · Natasha Z. Foutz[2] · Martin Spann[1] · Lucas Stich[3]

Received: 13 January 2023 / Accepted: 20 July 2024 / Published online: 10 September 2024

Abstract
Firms increasingly leverage idea markets, where participants (such as employees) generate, improve, and evaluate ideas on a collaborative digital platform. Different participants contribute differently to the ideation process, some generating high quality ideas while others initiating discussion threads and commenting on the ideas to further enhance the ideas' quality. Such diverse contributions may be importantly influenced by the participants' diverse social capital—*resource access* and *status*—in their pre-existing network. We theorize this relationship and further test our hypotheses by conducting two idea market studies, one involving only a firm's employees (Study 1: closed innovation) and the other further incorporating non-employees (Study 2: open innovation). We show that the *higher quality ideas* are generated by the participants with greater *resource access*, whereas *continued engagement*, including contributing larger quantities of ideas, discussion threads, and comments, stems from those with higher *status*. These findings have important implications for ideator recruitment and idea market design.

Keywords Ideators · Idea market · Social capital theory · Social network analysis · Open innovation

Introduction

Innovation is one of the most important and challenging marketing activities. Ideation at the early stage of new product development (NPD), encompassing both idea sourcing and idea evaluation, critically determines resource allocation and innovation success (Kornish & Ulrich, 2014; Reid & Brentani, 2004). A lack of idea creativity, or misjudgment of an idea's commercial potential, frequently results in product failures (Thomke & Fujimoto, 2000). Firms thus emphasize the importance of these steps before any idea receives full commitment (Kim & Wilemon, 2002).

While a variety of ideation methods, including the survey, focus group, and ideation contest, have been used for decades, firms, from HP to Google, are increasingly enlisting idea markets (Soukhoroukova et al., 2012). Over a span of several days, the market participants first propose ideas. The ideas are then turned into virtual stocks and traded by the participants with endowed virtual cash. The participants may further discuss and enhance ideas. An idea's virtual stock price reflects the participants' collective evaluation of the idea's commercial potential (e.g., \$10/share = 10% predicted market share if commercialized). The ideas with the highest liquidation prices at the end of the idea market are selected for the next stages of NPD.

An idea market commonly draws its participants from a *pre-existing social network*, such as employees of a firm, or customers from a brand community. Upon joining the idea market, these networked participants continue to work collectively. According to the Social Capital Theory, the pre-existing network provides resource access and social support, such as colleagues' expertise or fellow consumers' data, essential to ideation (Bourdieu, 1986; Coleman, 1988).

Stefan Wuyts served as Area Editor for this article.

All authors contributed equally to this paper.

✉ Martin Spann
spann@lmu.de

Andreas H. Heusler
aheusler@gmail.com

Natasha Z. Foutz
nfoutz@virginia.edu

Lucas Stich
lucas.stich@uni-wuerzburg.de

[1] LMU Munich School of Management, Ludwig-Maximilians-Universität München, Geschwister-Scholl-Platz 1, München 80539, Germany

[2] University of Virginia, PO Box 400173, Charlottesville, VA 22904, USA

[3] Julius-Maximilians-Universität Würzburg, Sanderring 2, Würzburg 97070, Germany

Also, these participants voluntarily perform a multitude of idea sourcing and idea evaluation tasks, thus making *diverse contributions*.

These contributions encompass (1) generating high quality ideas, and (2) engaging with the market over time by contributing greater quantities of (2a) ideas, (2b) discussion threads (each on a specific theme, e.g., how to improve an idea), or (2c) comments on others' ideas or discussions. Such continued engagement, beyond merely generating ideas, is essential for boosting idea quality and accomplishing the ultimate goal of an idea market—producing high quality ideas. For instance, generating a larger pool of candidate ideas increases the likelihood that appealing ideas will emerge (Diehl & Stroebe, 1987; Simonton, 1999). Producing a greater volume of discussions and comments invites diverse perspectives and iterative refinement of the ideas, resulting in higher quality ideas (Avolio & Gardner, 2005; Hülsheger et al., 2009). Our subsequent discovery of the connection between the volume of the discussion threads and the idea ranking (Table 4) also testifies the importance of diverse contributions, specifically continued engagement, beyond merely generating ideas, to producing high-quality ideas.

An insightful understanding of which participant, with which network characteristics, makes which contribution to an idea market will guide the firm to examine the pre-existing (e.g., employee) network and select the right mix of participants, some generating ideas while others evaluating and improving ideas. The firm may further send target emails to invite and motivate these participants to join the idea market. It could also nudge or incentivize, with attractive rewards, the participants with the target network characteristics, to make the desired contributions. Overall, such knowledge of who makes which contribution could importantly facilitate the firm's strategic selection and management of its ideators.

Nonetheless, the ideation literature (Table 1) has focused on either *characterizing high quality ideas* (Soukhoroukova et al., 2012) or *improving the ideation process* (Kornish & Jones, 2021; Kornish & Ulrich, 2014; Toubia & Netzer, 2017). Research on the core driver of quality ideas—the *ideators* (i.e., participants of an ideation process) and their behavior–just starts to emerge. These ideators stand as the cornerstone of the ideation ecosystem and as a source of quality ideas. For instance, in an idea market, the participants' ability to consolidate network resources for ideation and continued engagement with the market over time (proposing one idea after another, iteratively improving and evaluating others' ideas) critically determines the quality of the ideas being produced and selected (Woolley et al., 2010).

Our research aims to extend this emerging literature on ideators along two important dimensions. First, this literature emphasizes a *single contribution*—idea generation (Bayus, 2013; Camacho et al., 2019; Huang et al., 2014). While this is arguably the most prominent contribution, ideation demands, and is characterized by, multifaceted contributions. For instance, idea sourcing and idea evaluation cohesively contribute to high quality ideas as the outcomes of idea markets. Thus, our research extends the investigation to multiple *diverse contributions* and how they affect the success of idea markets (i.e., generating high quality ideas). For example, a participant in an idea market may not have generated any idea, but may have contributed to many discussions to help evaluate the commercial potential of others' ideas. Second, and more importantly, we further explore the critical unanswered question of how these *diverse contributions* may be related to the *diverse social capital* of the networked participants. For example, one person with greater access to network resources may be better at generating innovative ideas, while another with higher social status may be better at evaluating others' ideas.

Specifically, Social Capital Theory posits that social networks provide individuals with resource access and social support that they would not have access to on their own (Bourdieu, 1986; Coleman, 1988). It emphasizes the importance of social networks in generating economic and social value. For instance, social networks facilitate the generation, dissemination, and adoption of innovative ideas and products. Relatedly, social capital refers to the value that arises from social relationships and networks that enable individuals to coordinate actions to achieve desired goals. Its importance has been demonstrated in numerous applications, including innovation, where two types of social capital emerge as quintessential: access to network resources, such as knowledge and tools, and social prestige from network status (Adler & Kwon, 2002; Granovetter, 1973; Lin, 2001).

Resource access alludes to the extent to which individuals may tap into the resources available in their social networks, including human, financial, and technological resources. These resources are essential to innovation and ideation (Dougherty, 1996). Social Capital Theory suggests that social networks serve as conduits for accessing resources; and individuals may leverage their networks for resource access, for instance, by mobilizing support, gathering information, or forging partnerships. Such resource access enhances various endeavors, including NPD, entrepreneurship, and innovation performance (Bourdieu, 1986; Coleman, 1988; Muller & Peres, 2019; Salter et al., 2015; Stephen et al., 2016).

Meanwhile, *network status* refers to an individual's position within a social network in terms of perceived influence and prominence. According to Social Capital Theory, individuals who cultivate strong social ties, maintain trust-based relationships, and actively participate in network activities attain high network status. Status in turn offers powerful motivation for them to further engage in

Table 1 Literature review

Study	Ideation Method	Focus	Participant Contributions (if focusing on participants)	Participant Network Positions	Key Finding
Kornish and Ulrich (2014)	Contest	Idea			Raw ideas judged better enjoy greater commercial success
Toubia and Netzer (2017)	Survey	Idea			Ideas with semantic subnetworks that have a more prototypical edge weight distribution are judged as more creative
Kornish and Jones (2021)	Survey	Idea			Ideas expressed in more words are rated higher
Goldenberg et al. (1999)	Experiment	Process			Using product templates that characterize product versions to guide ideation process improves originality of ideas
Dahl and Moreau (2002)	Experiment	Process			More analogical thinking increases idea originality but qualified by the presence of external prime
Toubia (2006)	Experiment	Process			Well-designed ideation incentives can improve idea creativity
Terwiesch and Xu (2008)	Analytic model	Process			Including more ideators and changing award structure mitigate underinvestment of each ideator
Girotra et al. (2010)	Experiment	Process			Individual-then-teamwork generates better and more ideas, and better discern idea quality
Boudreau et al. (2011)	Contest	Process			Large number of participants reduce incentives, esp. for less uncertain problems, but increases chance for solution for more uncertain problems
Franke et al. (2014)	Experiment	Process			Allowing participants from analogous (not target) market increases idea novelty
Luo and Toubia (2015)	Experiment	Process			Stimulus problems benefit low knowledge participants whereas problem decomposition better suits high knowledge participants
Stephen et al. (2016)	Experiment	Process		Degree centrality, clustering (as moderator)	Allowing participants to see others' ideas, particularly in higher clustering network reduces idea innovativeness
Hofstetter et al. (2021)	Contest, Experiments	Process			Exposure to more prior ideas harms creativity
Koh and Cheung (2022)	Contest	Process			Showing seeker exemplars impair idea quality
Bayus (2013)	Contest	Participants	Idea generation		Participants' past success reduces future success and future idea diversity

Table 1 (continued)

Study	Ideation Method	Focus	Participant Contributions (if focusing on participants)	Participant Network Positions	Key Finding
Huang et al. (2014)	Contest	Participants	Idea generation		Participants learn about own ability quickly but not firm cost structure
Camacho et al. (2019)	Contest	Participants	Idea generation	Degree, betweenness, clustering (as controls)	Negative feedback from moderator stimulates participation intensity (visiting or updating own ideas) and idea quality
Aggarwal et al. (2021)	Contest	Participants	Idea generation, Comments		Ideation failures motivates learning
Gamber et al. (2022)	Contest	Participants	Idea generation, Idea elaboration, Idea championing		Effort into idea generation (such as more submissions) may hurt idea success, but effort into idea championing increases idea success
Soukhoroukova et al. (2012)	Idea market	Process			Idea markets is a feasible and promising method
Our study	Idea market	Participants (in pre-existing network)	Idea generation, Idea generation; Discussion threads; Comments	Closeness centrality (resource access); Eigenvector centrality (prestige)	Higher quality ideas are generated by participants with greater resource access (closeness centrality), whereas those with higher status (eigenvector centrality) exhibit stronger engagement, producing larger number of ideas, discussion threads, and comments

network activities, such as proposing, improving, and commenting on others' ideas, reinforcing status and continued influence in the network.

In summary, the participants make diverse contributions that collectively contribute to the quality of the ideas generated and selected, and such diverse contributions may arise from the participants' diverse resource access and status. Nonetheless, the lack of research on idea market participants (and ideators in general) has left fundamental questions unanswered, such as *which participant* makes *which contribution* and *why*? We hence aim to bridge these crucial gaps in the literature and shed light on the strategic selection and management of ideators. Specifically, we intend to address the following research questions:

RQ1 Which type of ideators, those with greater resource access or higher status, are more likely to generate higher quality ideas?

RQ2 Which type of ideators, those with greater resource access or higher status, is more likely to continuously engage by generating higher quantities of ideas, discussion threads, or comments?

To accomplish this, we develop a set of theory-driven hypotheses to explore the potential relationship between the participants' diverse contributions and diverse social capital. We test these hypotheses by conducting two idea markets in collaboration with a leading media firm. The first market is administered with the firm's employees, while the second further includes non-employees. Following the literature, we measure resource access with a participant's closeness centrality in the network, and status by eigenvector centrality (details in section Models and measures). We find that higher quality ideas tend to be generated by those with greater resource access, whereas greater engagement (i.e., larger quantities of ideas, discussion threads, and comments) tends to stem from those of higher status. Also interestingly, while both employees and non-employees remain equally engaged, non-employees generate higher quality ideas, demonstrating the value of open innovation.

Our research makes two distinct contributions to the growing literature on ideators. First, while this literature has focused on a single task of idea generation, we study multiple *diverse contributions* common in ideation, including idea generation and an array of engagement activities that also critically boost the potential for ideation success. Most importantly, we show that these diverse contributions are related to the participants' diverse social capital – *resource access* and *status*. These findings hold important implications for efficient management of NPD personnel and pertinent strategies of targeting, selecting, and cultivating the right mix of ideators in order to produce and select the ideas with the greatest commercial potential.

In the remainder of the paper, we first review the relevant literature and motivate our hypotheses with theories, before describing the empirical studies. After introducing the models and measures, we present model-free evidence, estimation results, and key findings. We conclude with a general discussion of the theoretical and managerial implication, as well as limitations and avenues for future research.

Theories and hypotheses

We contrast our research with the ideation literature in Table 1 along four key dimensions of differentiation: ideation method, focus on ideas, process or participants, participants' contribution types, and participants' social network positions. We further incorporate relevant behavioral and network theories to hypothesize the relationship between the participants' diverse contributions and their resource access and status.

Ideation and networked ideators

The ideation literature has explored a variety of *ideation methods*, such as the survey, experiment, contest, and idea market (Table 1). Among these, the idea market exhibits several advantages. It is network or community driven, instead of isolated intelligence, hence leveraging the network's social capital and wisdom of the crowd. It continuously incorporates new information (Soukhoroukova et al., 2012), and aggregates information by lending higher weights to the opinions of the more knowledgeable (Forsythe et al., 1992). It is also incentive compatible, and rewards truthful revelation of private information (Guo et al., 2006; Slamka et al., 2012; Spann & Skiera, 2003). Moreover, it requires only few participants, instead of a large representative sample, to attain a high predictive accuracy (Forsythe et al., 1999; Spann & Skiera, 2003). It is further scalable to accommodate a great number of new product features or ideas (Dahan et al., 2010).

The ideation literature has further examined the characteristics and success potential of the generated *ideas* (Kornish & Jones, 2021; Kornish & Ulrich, 2014; Toubia & Netzer, 2017). It has also explored the *ideation process*, such as whether individual-then-teamwork or teamwork-only should be used during ideation (Girotra et al., 2010), or whether exposure to others' ideas helps or hurts creativity (Hofstetter et al., 2021; Koh & Cheung, 2022; Stephen et al., 2016).

This literature is rapidly expanding to the study of the human factor – the *ideators*. While it has emphasized a *single task* of idea generation (Bayus, 2013; Camacho et al., 2019; Huang et al., 2014), ideators make *diverse contributions*

in an idea market (or other ideation methods/platforms). For instance, they may persistently generate one idea after another, or evaluate, discuss, or comment on others' ideas over time. Such continued engagement with the ideation process, beyond idea generation, is critical for ideation success. It helps maintain the innovation momentum, sustaining the energy and enthusiasm of all participants over an extended period of time. It also helps the participants share feedback to the ideas, iteratively refine the ideas, and evaluate the ideas in light of emerging information or insights. This iterative process leads to continuous improvement and evolution of the ideas, making the ideas more robust, relevant, and impactful. In particular, generating a larger pool of candidate ideas increases the likelihood that promising concepts will emerge, stimulates creativity and inspiration, and mitigates risks by spreading investment across multiple viable ideas (Diehl & Stroebe, 1987; Simonton, 1999). Meanwhile, generating a larger volume of discussions and comments invites diverse perspectives and unique insights, supports iterative refinement of the ideas, encourages critical evaluation of the ideas, and catalyzes productive collaboration among the participants (Avolio & Gardner, 2005; Hülsheger et al., 2009).

Besides *diverse contributions* largely overlooked by the ideator literature, our research unveils an unexplored connection between these *diverse contributions* and the social capital – *resource access and status* – of the networked ideators. These ideators are not isolated individuals, but networked innovators entrenched in a pre-existing social network, such as a company's employee network. Also, innovation is not a result of individual genius or isolated moments of inspiration, but a product of complex ecosystems and networks (Johnson, 2011). Drawing on Social Capital Theory (Bourdieu, 1986; Coleman, 1988), we link the *diverse contributions* of idea market participants to their diverse *network resources* and *status*, thus importantly enriching the ideator literature and illuminating strategic assembly of ideators.

Resources access and status

As discussed, both resource access and status could influence diverse contributions, but their relative importance may vary across contributions. For instance, generating high quality ideas might demand greater resource access than motivation to sustain status (Cattani & Ferriani, 2008; Chung et al., 2021; Delmestri et al., 2005; Grewal et al., 2006; Mallapragada et al., 2012; Packard et al., 2016), whereas commenting on others' ideas draws on stronger motivation to sustain status than greater resource access (Toubia & Stephen, 2013). In fact, higher status may not lead to higher quality ideas due to status quo bias (hence diminished risk-taking) or reduced connections to diverse regions of the network (hence less exposure to unconventional inspirations) (Ballinger et al., 2016; Samuelson & Zeckhauser, 1988).

It is important to note that we do not explore how the participants have attained their present levels of resource access and status in their *pre-existing* network via prior innovation-related or unrelated activities. We also save the intriguing, yet potentially complex, evolution of resource access and status *during* the idea market for future research. In this research, we simply treat resource access and status as personal traits at the inception of the idea market, and link them to the participants' diverse contributions to the idea market.

In summary, building on the Social Capital Theory and related network theories (Kornish & Hutchison-Krupat, 2016; Lu et al., 2013; Muller & Peres, 2019; Rietzschel et al., 2007), we hypothesize that participants' diverse contributions are related to their diverse social capital: those with greater *resource access* are more likely to *generate higher quality ideas* (RQ1), whereas those of higher *status* tend to *engage more*, contributing larger quantities of ideas, discussion threads, and comments (RQ2). Below, we will further motivate each hypothesis theoretically.

Resource access and idea quality

Access to resources is pivotal to generating high quality ideas (Johansson, 2004; Johnson, 2011; Rietzschel et al., 2007). In the context of an idea market, these resources include human resources (e.g., other NPD personnel's expertise, feedback, and partnership), financial resources (funding to support NPD), and technological resources (research data, tools, software, and facilities to test new ideas).

First, access to network contacts' diverse pool of expertise and knowledge allows a participant to gather relevant insights and advice about the idea challenge (Johnson, 2011). Access to specialized knowledge and expertise particularly enhances one's understanding of the market trends, technological developments, and customer preferences, enabling the development of more informed and innovative product concepts. Exposure to others' diverse expertise further stimulates creative thinking and cross-pollinates ideas.

Second, access to network contacts' information and data facilitates innovative and feasible ideation. A network serves as an important platform for monitoring research data, historical statistics, and emerging trends. Access to such information and data helps a participant better understand the unmet needs and root causes of the idea challenge, and detect market gaps and opportunities for innovation. It further helps a participant better evaluate the market potential and scalability of the ideas, make informed decisions about which candidate ideas to further pursue, and mitigate risks. Ultimately, data-driven decision-making is essential in generating not only creative, but also viable, ideas.

Third, access to network contacts' tools, software, and idea testing facilities supports a participant's creative endeavors. For example, access to idea mapping software allows prototyping and testing initial ideas (Kline et al. 1986). Forums and groups dedicated to specific topics or interests cultivate engagement of others in idea brainstorming. Collaborative document editing tools assist collective idea refinement.

Fourth, access to network contacts' partnership creates opportunities for collaboration. A participant may leverage network connections to identify strategic partners with complementary skills needed in idea generation. Collaborating with partners also shares workload, stimulates creativity, broadens perspectives, and pools resources.

Fifth, access to network contacts' funding resources helps a participant better assess the financial viability of the initial ideas, and identify potential investors or crowdfunding opportunities. Social networks foster a sense of community and support, creating a conducive environment to showcase ideas and to evaluate funding opportunities and commercial viability.

Finally, access to the network contacts' feedback to the initial ideas helps a participant secure validation, acquire previously unconsidered viewpoints, identify potential challenges or opportunities, and further refine ideas (Hargadon & Sutton, 1997). An early detection of potential issues or concerns with an idea, as well as iterative improvement of an idea, critically elevates the idea's quality and success potential.

In summary, greater access to network resources, including human, financial, and technical resources, elevates the likelihood of generating higher quality ideas. Thus, corresponding to the first research question (RQ1), we hypothesize:

H1 Participants with greater resource access generate higher quality ideas.

Status and continued engagement

As described, an idea market's success critically relies on the participants' continued engagement, contributing ideas, discussion threads, and comments over the course of the market. Sustaining status in the network offers a strong motivation for participants to stay engaged (Malek et al., 2020). We define status as the position or rank of an individual within a social hierarchy (Redhead & Power, 2022). Social Capital Theory suggests that a network facilitates the acquisition and maintenance of status and prestige – a potent social capital; and individuals strategically leverage a network to enhance status (Bourdieu, 1986; Coleman, 1988). We postulate that participants of higher status contribute a greater number of ideas, discussion threads, and comments as powerful avenues to reinforce status and visibility.

First, high-status individuals are more motivated to sustain status. Status, or prestige used to measure status, leads to recognition and esteem (Cable & Turban, 2003). Status offers a strong motivation for individuals to actively engage with innovation (van der Heijden et al., 2009). Higher-status individuals are more motivated to sustain status by enhancing apparent value to the group, such as improving ideas, and demonstrating high levels of competence, generosity, and commitment to the group (Anderson & Kilduff, 2009).

Second, high-status individuals are more apt at sustaining status. Their high credibility, authority, and visibility attract greater attention to their ideas or discussion threads. Their greater persuasive power and communication skills better drive discussions, sway opinions, and expand influence (Avolio & Gardner, 2005). Their comments also carry greater weights and receive heightened recognition from others, gratifying and reinforcing their status (Calvó-Armengol & Jackson, 2004).

Third, high-status individuals place greater focus on building and maintaining personal brand (Podolny, 2010). Generating a large number of ideas, discussion threads, and comments comprise effective strategies for personal brand building. These continued engagement activities position high-status individuals as thought leaders and bring further recognition from their colleagues and peers.

Lastly, high-status individuals, often leaders in an organization, hold stronger responsibility for innovation and greater influence on employee creativity (Gumusluoğlu & Ilsev, 2009). They view active participation in and continued engagement with innovation as a powerful path toward organizational excellence. Their peers also expect them to stay actively engaged, generating ideas and insights to shape the direction of the innovation.

Considering all above and corresponding to our RQ2, we hypothesize the relationship between the participants' continued engagement and their status:

H2a Participants of higher status generate more ideas.

H2b Participants of higher status initiate more discussion threads.

H2c Participants of higher status contribute more comments.

We summarize both hypotheses in Table 2 and link them to our research questions (RQ1, RQ2), models, and key findings. In the upcoming Models and measures section, we will describe how we measure *resource access* and *status*, respectively, using two essential network metrics, *closeness centrality* and *eigenvector centrality*.

Table 2 Overview of research questions and hypotheses

Participant Contribution	Research Question	Hypothesis	Equation	Finding
(1) generating ideas of high quality	RQ1	H1	(1), (2)	Participants with higher closeness centrality are more likely to generate ideas of higher quality
(2) generating ideas in large quantities	RQ2	H2a	(3), (4)	Participants with higher eigenvector centrality are more likely to generate a greater number of ideas
(3) initiating discussion threads in large quantities	RQ2	H2b	(3), (4)	Participants with higher eigenvector centrality are more likely to initiate discussion threads
(4) commenting in large quantities	RQ2	H2c	(3), (4)	Participants with higher eigenvector centrality are more likely to comment

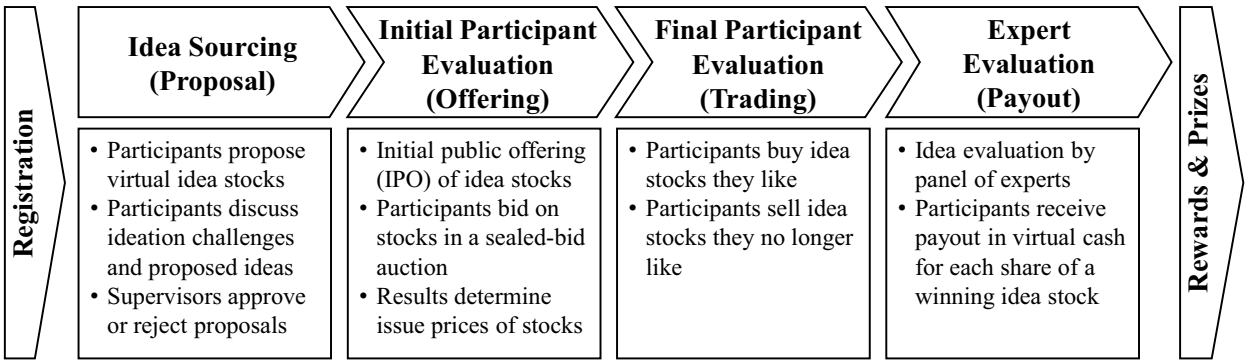

Fig. 1 Study procedure

Empirical studies

To test the hypotheses, we collect data via two idea market studies in collaboration with a leading global media firm whose major clients are interested in using idea markets. Study 1 is conducted among the firm's employees. The idea challenge is to develop a new home-use device for children's healthcare. In Study 2, the idea challenge is to design a new in-store service for a top U.S. retailer. Both the media firm's employees and non-employees participated in Study 2. The non-employees come from the firm's research panel, some of whom have known one another and the firm's employees from prior research collaborations. Further details about the collaborating firm and the idea challenges are omitted here due to the confidentiality agreement. Since the two studies follow identical procedures, we will describe them jointly below.

To administer the two studies, we develop an idea market platform (see Web Appendix 1 for further details on the idea market platform). For idea sourcing, the platform uses a content management system to describe the idea challenge, display the generated ideas, and host a discussion board. For idea evaluation, the platform creates a virtual stock trading platform. The platform also offers a tutorial on idea sourcing, trading, and a contribution point system to track each participant's various contributions to the idea market. The participants with the highest contribution points accrued from generating ideas, initiating discussions threads, and commenting are dynamically featured on a leaderboard. A leaderboard that ranks and displays participants' performance can affect their status and increase their motivation to engage more actively (Spann & Skiera, 2003). Participants are also offered various rewards, such as Amazon gift cards or lunches with the firm's CEO, upon the completion of each market. In a nutshell, the markets provide meaningful incentives to the participants.

Each study involves four consecutive stages over a span of 18 days: proposal, offering, trading, and payout (Fig. 1). Idea sourcing occurs at the proposal stage, and idea evaluation over the remaining stages. The first and second evaluation stages are based on the participants' evaluation, and the third stage is based on the experts' evaluation. Please note that in each evaluation stage, new information about the ideas can emerge, such as via discussions or additional research by the participants. Such new information can change the ideas' ranking.

Before each study, an invitation to participate, along with a brief explanation of the idea challenge, rewards, and a hyperlink to the online platform, is e-mailed to the

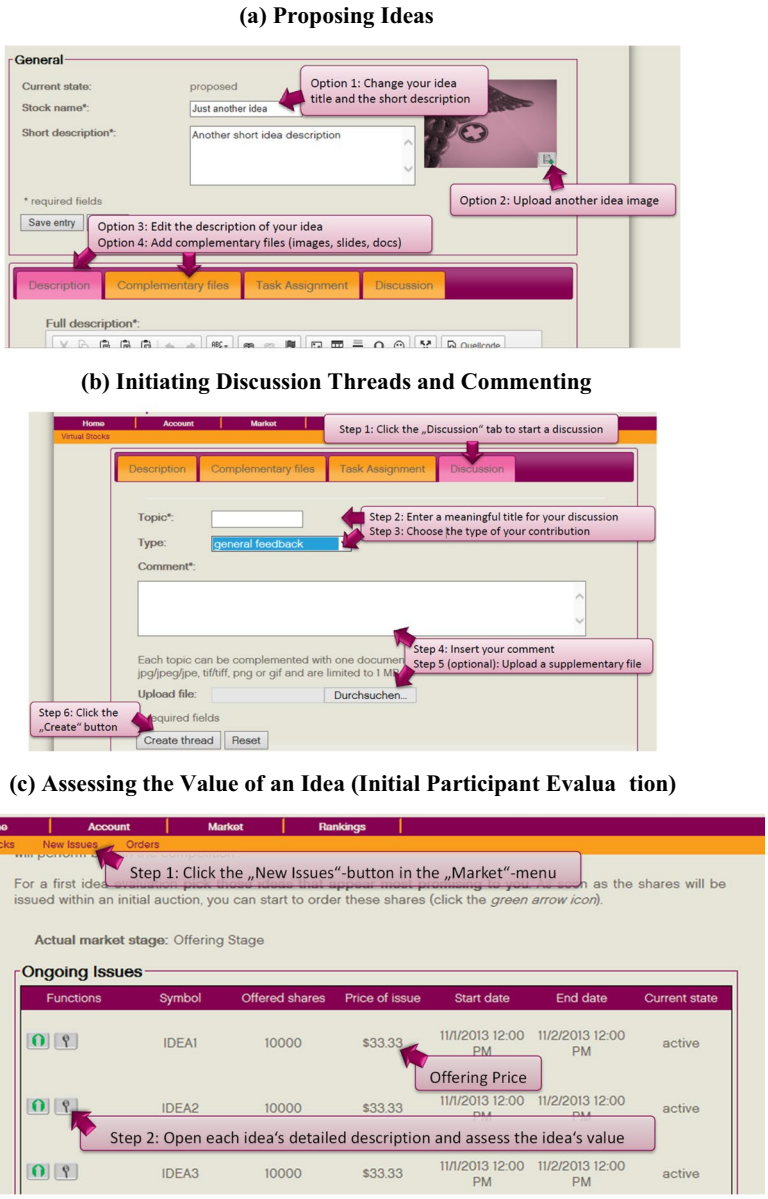

Fig. 2 Screenshots of the idea market. (2a) Proposing Ideas. (2b) Initiating Discussion Threads and Commenting. (2c) Assessing the Value of an Idea (Initial Participant Evaluation)

potential participants. After accepting the invitation, the participants use their real names to register on the platform, review the tutorial, and complete a pre-study survey about if they are employees of the firm, their knowledge of the real stock market, and most importantly, their pre-existing social network. Specifically, participants select the individuals they know from a provided list and rate the familiarity with each using a 7-point scale. A connection between two participants is established if both report familiarity greater than 1.[1]

[1] We do not separate professional and personal networks to simplify the survey, reduce measurement errors, and succinctly capture each participant's network position in a unified network.

Idea sourcing stage (Proposal: 8 days)

At this stage, participants may freely generate and propose ideas to address the idea challenge. The firm initially offers a few exemplary ideas to stimulate interest. An idea is accepted if it has not been developed or sold as a real product. Each idea contains a caption, a textual description, and may be augmented by images (Fig. 2—panel 2a). The idea generators may revise their own ideas any time at this stage. No additional ideas or idea revisions are accepted after this stage. Besides generating ideas, the participants may also initiate discussion threads to improve own or others' ideas, or comment on others' ideas or discussions (Fig. 2—panel 2b). For each idea, one or more discussion threads may be initiated by one or more participants. Each thread centers on

a new topic (or theme) about the idea. For example, a thread may pertain to which aspects of an idea that the participants like, which commercial applications of the idea that the participants may envision, which limitations that the idea suffers from, or how to improve on an idea. Then, within each discussion thread, any participant may add any comments on this thread's theme or on other comments belonging to this thread. Participants may also continue to initiate threads and add comments until the end of the subsequent trading stage.

Initial participant evaluation stage (Offering: 1 day)

At this stage, each idea is represented as a virtual stock (Fig. 2—panel 2c). All idea stocks are offered via a single-day sealed-bid auction to minimize herding, since all bids are hidden until the auction ends. Each stock's initial price per share is determined by an easy-to-understand, fixed pricing of V$100 virtual cash divided by the number of idea stocks in the market.[2] Each participant is given V$10,000 virtual cash to be able to bid on any stock predicted to have the greatest market share in its first year since launch if launched, and to buy any stocks at the trading stage. Virtual cash is commonly used in prediction markets and shown to be comparable to real cash in predictive accuracy (Foutz & Jank, 2010; Servan-Schreiber et al., 2004; Spann & Skiera, 2003). The more participants value an idea stock, the more shares they order. Therefore, each stock's price reflects the participants' collective assessment of an idea's market potential. This price, together with the aggregate demand for each stock, is revealed at the end of this stage.

Final participant evaluation stage (Trading: 7 days)

Each participant may grow their net worth by buying any idea stock if their prediction of the idea's market share (e.g., 25%, equivalent to V$25/share) is higher than the current stock price (e.g., V$20/share), or by selling if the opposite. For instance, if the person buys 100 shares of an idea stock at V$20/share and sells it later when it rises to V$25/share, then the person earns $100 \times (V\$25 - V\$20) = V\$500$. The platform serves as a mediator between the buyers and sellers by implementing an automated market maker algorithm. This algorithm uses Hanson's logarithmic market scoring rules for immediate order executions and permanent market liquidity (Hanson, 2003; Slamka et al., 2013). At this stage, the participants may also continue to discuss any ideas or seek any external information. At the end of this stage, trading is terminated, and all idea stocks delisted.

[2] Alternative auction mechanisms of an initial public offering (IPO) may include a discriminatory or uniform price auction. Interested readers may refer to Bower and Bunn (2001).

Expert evaluation stage (Payout: 2 days)

At this stage, the idea stocks are liquidated and paid out to the participants based on the liquidation prices determined by a team of third-party experts invited by the firm. There are five experts from the healthcare industry (Study 1) and seven experts from the retail industry (Study 2). These experts' average prediction of an idea's market share in each study serves as the liquidation price of the corresponding stock. For instance, if a stock's liquidation price is V$35, then a participant holding 100 shares of the stock would be paid out $V\$35 \times 100 = V\$3{,}500$. Consistent with the literature, the experts are enlisted since it may take years to observe the ideas' actual market success, whereas the expert approach is simpler to implement. Moreover, as the experts' identities are concealed from the participants, the participants cannot intentionally appeal to the experts' preferences, thus minimizing herding (e.g., Soukhoroukova et al., 2012).[3]

At the end of the idea markets, all participants and fifteen executives from the firm complete a post-study survey. The survey displays the top three ideas based on the experts' average evaluation, and further solicits the survey respondents' perceptions of the ideas' qualities and the idea markets' extent of success.

Models and measures

Models

To capture participants' resource access and status measured by their network positions, we leverage social network analysis (Wasserman & Faust, 1994). Corresponding to the participants' four diverse contributions, we leverage four contribution metrics: (1) the quality of a generated idea, measured by the price per share of the idea's stock at the end of the offering stage (i.e., the initial evaluation by the participants), trading stage (final evaluation by the participants), and most importantly, payout stage (final evaluation by the independent experts), respectively; (2) the

[3] Alternative approaches used to determine the payout prices include delaying payouts until the market outcomes are revealed (e.g., Foresight Exchange), using the last trading price (Dahan et al., 2011), or the volume-weighted average trading price (LaComb et al., 2007). Nevertheless, herding or self-fulfilling prophecy (Smith et al., 1988) may incur concerns without externally determined the payout prices. Various proxies, such as the number of hits on search engines or quotes in bibliographic databases, have also been used (Daim et al., 2006; Mangold et al., 2005). However, other concerns would arise, for instance, such proxies may not exist for new products, the quality of the proxies remains uncertain, or the participants may have access to the proxies.

number of ideas generated; (3) the number of discussion threads initiated; and (4) the number of comments. Recall that idea sourcing occurs at the proposal stage, and idea evaluation over the remaining stages. The first and second evaluation stages are based on the participants' evaluation, and the third stage is based on the experts' evaluation. In each evaluation stage, new information about the ideas may have emerged, such as via discussions or additional research by the participants. Such new information can change the ideas' ranking. For each contribution metric, we determine a rank order and implement an Ordered Probit Model to link the metric to the participants' network positions, while controlling for a set of idea factors and additional participant factors. We use the rankings to make the idea quality comparable across different stages of the idea market, to reflect the relative performance across participants, and to capture the information received and leveraged by the participants, which is the ranking on the leaderboard, based on which the rewards are offered.

Idea quality rankings

Specifically, an idea i's ranking in price per share at the end of the offering (and similarly trading or payout) stage, IR, is driven by an underlying idea quality, IR^*:

$$IR_{ij}\begin{cases} 1 \text{ if } R^*_{ij} \le \mu_1, \\ 2 \text{ if } \mu_1 < IR^*_{ij} \le \mu_2, \\ \quad \ldots \\ N \text{ if } \mu_{N-1} < IR^*_{ij}, \end{cases} \tag{1}$$

where IR^*_{ij} is captured by

$$IR^*_{ij} = \alpha_0 + \alpha_1 E_j + \alpha_2 C_j + \alpha_3 I_i + \alpha_4 Z_j + \varepsilon_{ij} \tag{2}$$

Here, ij stands for idea i generated by participant j. E_j and C_j are two key measures of participant j's network position: *eigenvector centrality* and *closeness centrality*, which we will detail below. Note that this dependent variable, idea ranking, is aligned with the literature's focus on idea quality.

Engagement ranking

Similarly, the rankings of participant j's other contributions, generating ideas, initiating discussion threads, and commenting, R_j, are each modeled as:

$$R_j\begin{cases} 1 \text{ if } R^*_j \le \varphi_1, \\ 2 \text{ if } \varphi_1 < R^*_j \le \varphi_2, \\ \quad \ldots \\ N \text{ if } \varphi_{N-1} < R^*_j, \end{cases} \tag{3}$$

where R^*_j is related to participant j's eigenvector centrality, E_j, and closeness centrality, C_j, while controlling for a similar set of idea factors related to participant j, I_j, and additional participant factors, Z_j, that we will describe later:

$$R^*_j = \beta_0 + \beta_1 E_j + \beta_2 C_j + \beta_3 I_j + \beta_4 Z_j + \epsilon_j \tag{4}$$

Measures

Closeness centrality

Resource access is commonly measured by *closeness centrality* (Bolander et al., 2015; Brass et al., 2004; Freeman, 1977, 1978). A core concept in network theories, closeness centrality measures how efficiently and directly resources can flow between a node (i.e., a participant in our context) and all others, highlighting a participant's resource accessibility within the network (Bavelas, 1950; Brass et al., 2004; Freeman, 1977; Friedkin, 1991). It is calculated as the inverse of the total shortest paths between a participant and every other participant (Bavelas, 1950; Web Appendix 2). A wealth of multidisciplinary literature has demonstrated the intrinsic connection between resource access and closeness centrality from various angles (Brass et al., 2004; Freeman, 1977).

First, closeness centrality gauges how quickly resources can propagate throughout, or be accessed from, a network. A participant with higher closeness centrality is positioned closer to others, with a shorter average path, hence capable of efficiently accessing resources throughout the network (Freeman, 1977), minimizing delays, and maximizing resource utilization (Opsahl et al., 2010). As a result, the participant can more promptly utilize new resources, including new techniques and others' new ideas, to generate higher quality ideas. Second, closeness centrality enhances the speed of resource flow, particularly the speed of the feedback loop. Therefore, a participant with higher closeness centrality can more rapidly receive feedback to the proposed idea, enabling timely refinement and improvement of the idea. Third, a participant with higher closeness centrality may access resources of greater varieties, as these resources arise from more diverse regions of the network. Such varieties offer diverse perspectives and boost idea creativity. Fourth, a participant with higher closeness centrality often acts as a central hub for resource exchange, communication, and collaboration among the members in the network by connecting diverse parts of the network (Burt, 1995; Ibarra & Andrews, 1993). This enables the participant to acquire a more holistic understanding of the market, organizational goal, customer needs, and industrial trends. Such comprehensive knowledge stands essential in generating new product ideas that are relevant, contemporary, and aligned with market demand. Lastly, a participant with higher closeness centrality offers

critical shortcuts between many different parts of the network, hence capable of maintaining continuity of resource access, even when one route is disrupted, such as due to an absence or departure of another employee.

Eigenvector centrality

Status is commonly measured by *eigenvector centrality* (Ballinger et al., 2016; Bonacich & Lloyd, 2001; Conti & Graham, 2020; Katz, 1953; Knoke & Burt, 1983; Wasserman & Faust, 1994). Another core concept in network theories, eigenvector centrality quantifies the importance of a node (a participant) within a network by accounting for both the *number* and *quality* of its direct connections (Bonacich, 1972; Newman, 2008; Page et al., 1998). That is, being connected to well-connected others (also of high eigenvector centrality) is more valuable than being connected to poorly-connected others. It is computed by solving a system of equations, where a node's eigenvector centrality is proportional to the sum of its neighbors' eigenvector centralities (Web Appendix 2).

The literature has shown that eigenvector centrality is closely related to the notion of status, prestige, or reputation in a network (Bolander et al., 2015). One, it considers not only the quantity of the direct connections to a participant (i.e., how many people that the participant knows), but also the quality and influence of those connected peers (i.e., whom, especially high-status others, that the participant is connected to), making it a strong indicator of a participant's status within a network. A participant with higher eigenvector centrality is connected to other highly central participants, thus gaining prestige by association with other high-status members of the network (Bonacich, 1972, 1987). Two, eigenvector centrality underscores the quality over quantity of the direct connections. In other words, a participant connected to a few influential others holds more sway in idea discussions and comments than another participant with numerous connections to those with lower influence. This mirrors the real-world concept of prestige, where a person's status is often determined by the quality and impact of their connections, rather than the sheer number (Kornish & Hutchison-Krupat, 2016; Lu et al., 2013). Lastly, eigenvector centrality creates a positive feedback loop of influence. Those with higher eigenvector centrality tend to attract more connections, attention, and opportunities, leading to an ongoing cycle of enhanced reputation. This reinforces the link between eigenvector centrality and amplification of prestige.

Control

We further control for a set of idea factors, I_i, and additional participant factors, Z_j, that may also impact an idea's ranking. Specifically, the idea factors, I_i, consist of the length of the idea's description in number of characters (Kornish & Jones, 2021), length of the abstract, whether a preview image is provided, number of supplemental images provided, how late the idea is proposed in number of hours remaining before the proposal deadline, number of participant ratings, and number of discussion threads by the end of the proposal stage. The additional participant factors, Z_j, include the number of ideas generated by j, whether j is an employee of the firm, j's prior knowledge about real-life stock markets measured on a 7-point scale.[4] Further, we include the average eigenvector and closeness centralities of the participants who have traded idea i to capture the traders' influence on prices and whether this is affected by their network position.

Results

Both studies share the same procedures, similar tasks, same participant network, and small sample size typical of idea markets. We therefore pool the data for analysis to increase the statistical power and to characterize each participant's network position more precisely. Each participant's contributions (i.e., dependent variables) are still calculated for the respective study. As a robustness check, we also perform the analyses using only the data from Study 2, which has more participants and a significantly larger number of ideas generated. The results remain consistent (Web Appendix 3).

Descriptive statistics and model-free evidence

There are 93 participants across both studies, with 4 participating in both (Table 3). Specifically, 35 employees from 14 departments of the firm participate in Study 1, and 16 employees together with 46 non-employees participate in Study 2. The literature has shown that one key advantage of idea markets is that a small number of participants, comparable to or smaller than the size of our Study 1 or Study 2, are sufficient to generate quality ideas and reliable idea evaluations (Dahan et al., 2010; van Bruggen et al., 2010; Wolfers & Zitzewitz, 2004).

The participants' rankings of the ideas at the end of offering and trading stages show a strong positive correlation (0.961 and 0.971, both with $p < 0.01$). The participants' and experts' rankings of the ideas exhibit a stronger correlation in Study 1 (0.595, $p < 0.05$) than in Study 2 (0.143, $p > 0.1$),

[4] We also collect each participating employee's job profile, such as current position and tenure with the firm. But we cannot include these in the model because the non-employee participants do not have these variables.

Table 3 Descriptive statistics

	Total	Study 1	Study 2
Number of distinct participants	93	35	62
Number of distinct participants who generated ideas	28	11	18
Number of ideas generated[a)]	86	13	73
Number of ideas evaluated[b)]	84	13	71
Number of discussions threads	202	47	155
Number of comments	282	77	205
Number of user ratings	129	55	74
Average idea description length (characters)	675.4	1136.7	593.2
Average abstract length (characters)	118.3	112.5	119.4
Number of orders	385	221	164
Number of traded shares	50,039	21,117	28,922
Total order volume (in virtual dollars)	293,749.8	171,291.8	122,458.0
Number of distinct traders	27	15	12

[a]Additionally, the studies included six exemplary ideas, which were initially generated by a market supervisor. These exemplary ideas were filtered out in all subsequent analytical models and figures

[b]After the proposal stage, two ideas are filtered out as duplicates. These two ideas were not included in any of the ensuing stages

suggesting that the non-employees' participation might have added new perspectives about the ideas' quality.

In Study 1 (Study 2), 11 (18) participants have generated 13 (73) ideas (histogram in Web Appendix 4). Although most idea generators submit a single idea, some submit up to 18 ideas. Each idea includes a short abstract with an average of 112.5 (119.4) characters and a full description with 1,137 (593) characters on average. Among these ideas, 61.5% (27.4%) include preview images; 46.2% (32.9%) are optimized by participants via description edits or image supplements. Participants also generate 47 (155) discussion threads and 77 (205) comments. Those more engaged with generating ideas are also more engaged with initiating discussion threads ($r = 0.730$, $p < 0.01$).

Figure 3 displays the participants' pre-existing network, including the employees and non-employees in the network across both studies. The names are pseudonyms, although the participants' real names are used in the idea markets. Several participants, such as Svea, Cleo, or Flame, are not only connected to those well-connected others, but also connected to others via the shortest paths, thus having both high eigenvector centrality and high closeness centrality. Some participants, such as Barb and Fina, each hold a relatively high eigenvector centrality but low closeness centrality. In other words, they are connected to others with high eigenvector centrality, such as Svea, Cleo, and Flame, respectively, yet take longer paths to reach others in the network. Other participants, such as Kai and Joyce, have relatively low closeness centrality but high eigenvector centrality. These people have overall less efficient access to the rest of the network but are connected to some with high eigenvector centralities. Also, compared to the non-employees, employees are more densely connected and thus exhibit higher eigenvector centralities. Overall, heterogeneity prevails among the participants in their centralities.

The participants' eigenvector centralities range from 0 to 0.204 ($M = 0.059$, $SD = 0.068$) and closeness centralities from 0 to 0.269 ($M = 0.148$, $SD = 0.095$). Figure 4 displays the two-mode network linking the participants from both studies to the ideas generated. Those with higher closeness centralities, such as Cleo, Flame, or Glynn, are denoted with larger circle sizes. A cursory inspection suggests that the more highly ranked ideas (i.e., with larger squares) tend to be generated by the participants with higher closeness centralities. Moreover, the employees and non-employees differ in both the quality and quantity of the ideas generated. For instance, only one employee (Marta) submits more than two ideas, whereas six non-employees (Joan, Maude, Mona, Liz, Liah, and Lane) have done so with a total of 53 ideas.

Similar to Fig. 4, Fig. 5 displays the two-mode network of the participants and ideas generated. A larger circle size corresponds to a higher eigenvector centrality. No obvious relationship between the idea quality and eigenvector centrality is observed. The majority of ideas are again generated by non-employees.

The post-market survey shows that 72.2% of the respondents would be interested in participating in a future idea market ($M = 5.06$ on a 7-point scale; $SD = 1.82$). What participants like the most is how the idea market stimulates them to think more deeply about new ideas, suggest new ideas, and become more interested in NPD. The top motivations to generate ideas include contributing to the firm (66.7%), sharing creativity (57.1%), winning prizes (52.4%), having fun (47.6%), and enjoying a sense of accomplishment (23.8%).

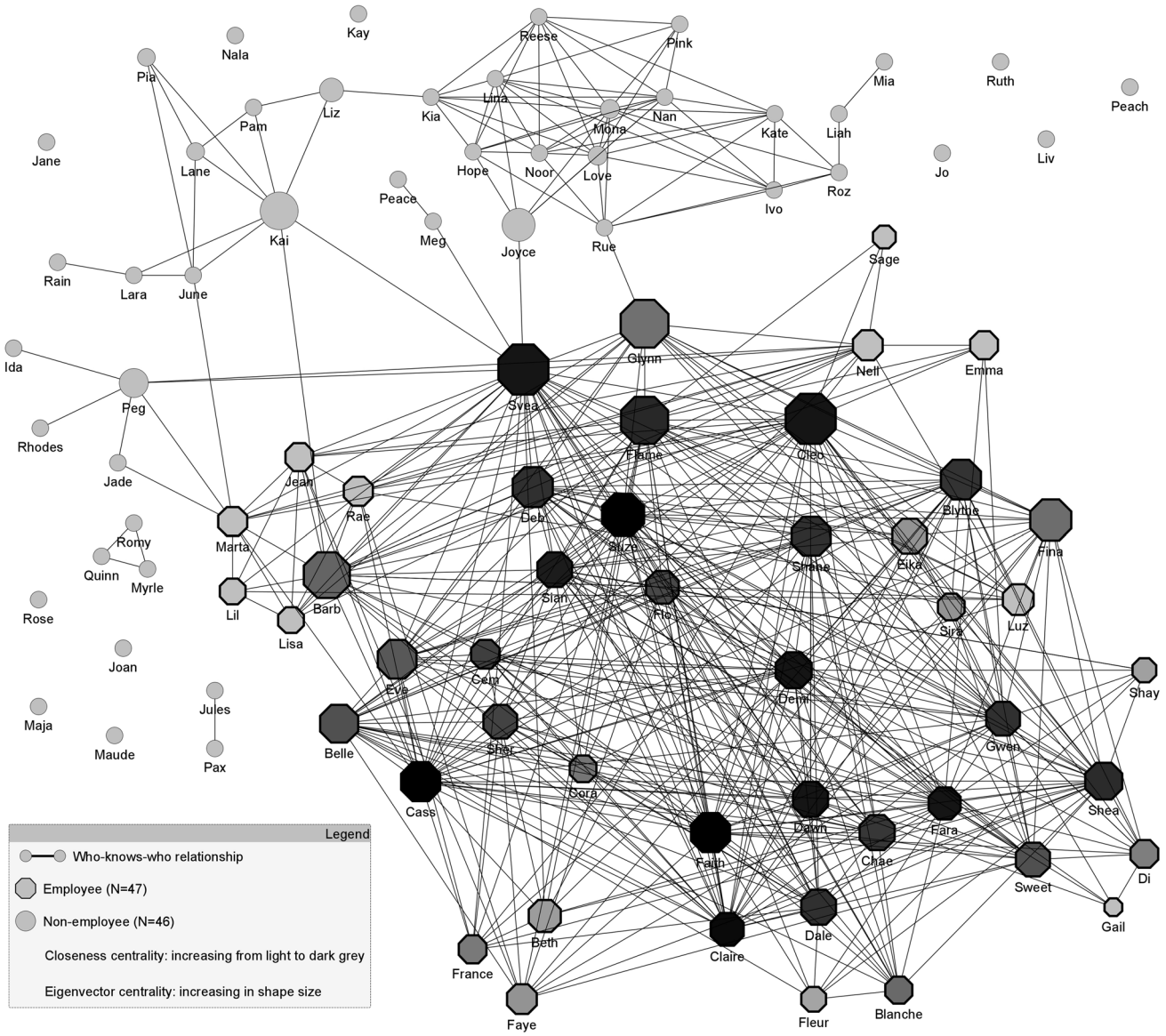

Fig. 3 Pre-existing network

These results are well aligned with prior research, which suggests that intrinsic motivation is an important reason for participating in idea markets (Griffiths-Hemans & Grover, 2006; Soukhoroukova et al., 2012).

Estimation results

Idea quality

Table 4 displays the estimation results for idea quality, measured by the idea rankings at the end of offering, trading, and payout stage, respectively. Overall, both the *Pseudo R2* and *Chi2* indicate that our model better explains the idea rankings at offering and trading than payout, potentially as payout is grounded on the experts' rather than the participants' judgment.

As for the parameter estimates, the negative coefficients are associated with higher idea rankings. Table 4 shows that, supporting H1, the ideas ranked higher at each stage are *generated* by those participants ("idea generators") with more efficient resource access (higher closeness centrality), but not by those with higher status (higher eigenvector centrality).[5] Consistent with our detailed discussions earlier, access to resources, including expertise, data, tools, partnership, funding, and feedback,

[5] Please note that eigenvector centrality of idea generators is significant at the 10 percent level in the payout stage.

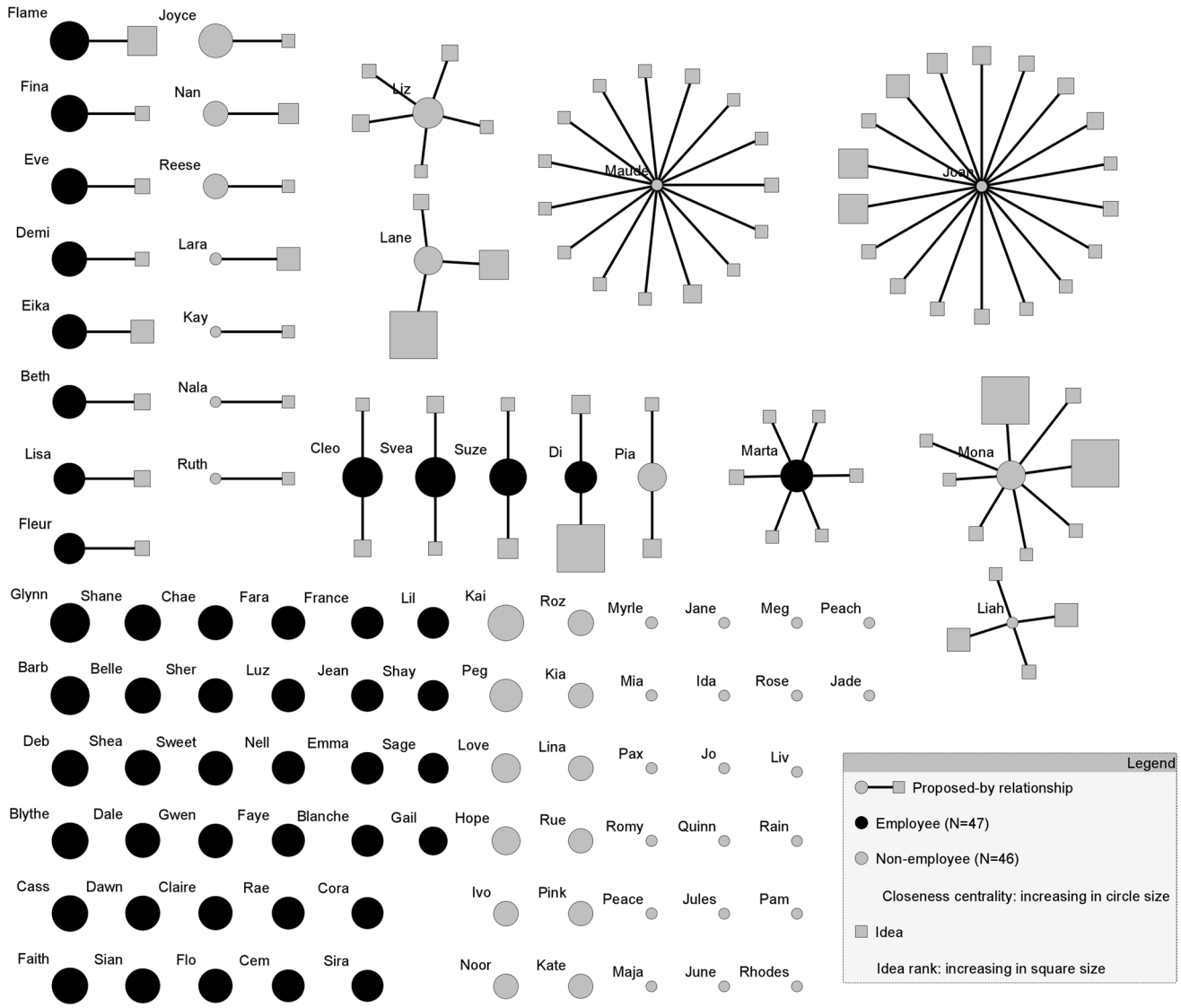

Fig. 4 Two-mode network of idea quality ranking at end of trading stage and closeness centrality

is pivotal to generating higher quality ideas (Johansson, 2004; Johnson, 2011; Rietzschel et al., 2007).

Regarding the control variables, the idea factors in general do not play a significant role in the idea rankings, suggesting that participants read the idea descriptions carefully rather than relying on heuristics, such as the lengths of the idea description or abstract, to judge the idea quality. Nevertheless, the ideas with previews enjoy higher rankings at offering and trading. Moreover, the ideas submitted later at the proposal stage display higher rankings at the subsequent stages, potentially because they are better crafted, benefit from earlier ideas, and remain fresher in the minds of the participants. The ideas with larger numbers of discussion threads at the proposal stage also enjoy higher rankings at the offering and trading stages. The ideas with higher rankings are more likely generated by those more knowledgeable about stock markets, thus with potentially stronger interests in the idea markets. Interestingly, ceteris paribus, the ideas generated by the non-employees rank higher across all stages, suggesting the value of incorporating the non-employees in idea sourcing.[6] We further include the average eigenvector and closeness centralities of the participants trading each idea, and find that a higher idea ranking is related to a higher average eigenvector centrality at the expert evaluation

[6] We estimate a series of benchmark models for the idea rankings (and other contributions made by the participants), such as with control variables only, control variables and eigenvector centrality only, as well as control variables and closeness centrality only. These benchmark models produce worse fit, although the key findings sustain. Also, to address the potential endogeneity related to self-selection on idea generation, we estimate an Ordered Probit Model with a Heckman selection stage of whether a participant has submitted any idea. The finding remains similar.

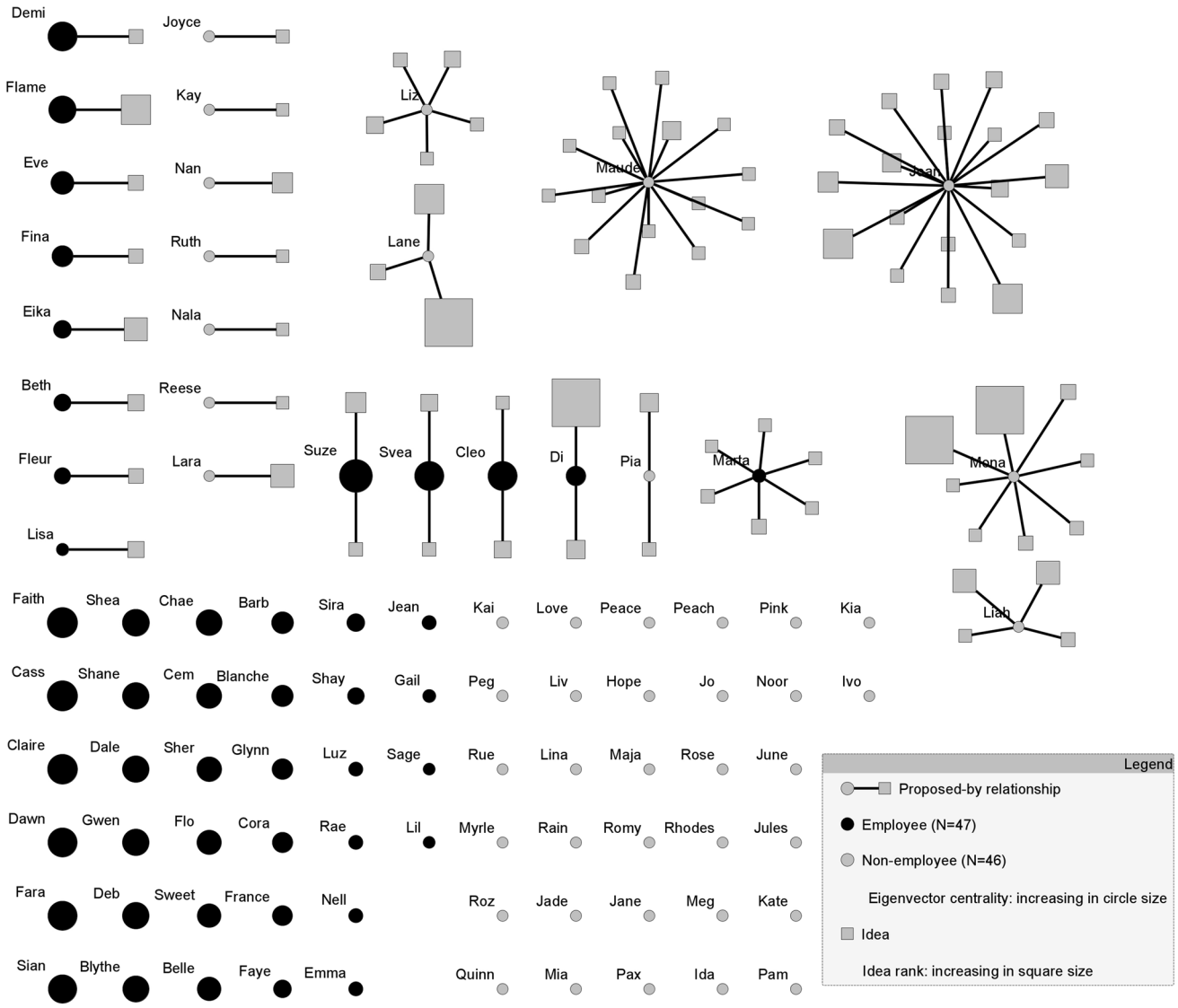

Fig. 5 Two-mode network of idea quality ranking at end of trading stage and eigenvector centrality

(payout) stage. A possible explanation is that such traders bear more resemblance to the experts. On the other hand, higher quality ideas are traded by traders with lower closeness centrality at the expert evaluation stage. This implies that higher-quality ideas (ideas of non-employees) tend to be traded by less centrally positioned traders, i.e., participants from outside the firm's boundaries.

Continued engagement

Table 5 displays the estimation results of the participants' engagement rankings related to the number of ideas, discussion threads, and comments. Again, a smaller coefficient indicates a higher ranking. The participants with higher status (higher eigenvector centrality) engage more, producing more ideas (supporting H2a), discussion threads (supporting H2b), and comments (supporting H2c). In contrast, accessing network resources (closeness centrality) does not show any significant effect. Consistent with our detailed discussions earlier, sustaining status in the network offers a strong motivation for the participants to stay engaged (Malek et al., 2020). A rich literature has shown that high-status individuals are both more motivated to reinforce their status via continued engagement with innovation, but also more capable of doing so through their visibility and leadership position in a network.

As for the controls, those composing longer idea descriptions or abstracts also tend to generate more ideas. They might be more involved in the process, care more about the idea challenge, and thus desire to generate more ideas with more detailed idea descriptions. Also,

Table 4 Idea quality rankings

	Initial Participant Evaluation: Ranking at End of Offering		Final Participant Evaluation: Ranking at End of Trading		Expert Evaluation: Ranking at End of Payout	
	Coefficient	*SE*	*Coefficient*	*SE*	*Coefficient*	*SE*
Idea Factors						
DescriptionLength	−.001	(.000)	−.001	(.000)	−.000	(.000)
AbstractLength	−.002	(.002)	−.002	(.002)	.000	(.002)
Preview	−.596**	(.299)	−.587**	(.296)	−.385	(.296)
NumImages	.249	(.265)	.349	(.268)	.164	(.263)
HoursTillDeadline	.014***	(.003)	.013***	(.003)	.006**	(.003)
NumUserRatings	.082	(.076)	−.021	(.076)	−.042	(.076)
NumDiscussionThreads	−.385***	(.118)	−.313***	(.114)	.001	(.112)
Participant Factors						
Idea Generator						
Generator_NumIdeasGenerated	−.068**	(.030)	−.054*	(.029)	−.026	(.028)
Generator_PriorKnowledge	−.373***	(.127)	−.346***	(.126)	−.187	(.123)
Generator_IsEmployee	1.636***	(.606)	1.736***	(.586)	1.274**	(.605)
Generator_Eigenvector	−4.933	(3.958)	−6.717	(4.136)	−7.179*	(3.968)
Generator_Closeness	−5.311**	(2.557)	−5.310**	(2.610)	−4.985**	(2.464)
Idea Traders						
Traders_AvgEigenvector	−6.627	(6.045)	−3.447	(5.242)	−12.175**	(6.039)
Traders_AvgCloseness	−4.003*	(2.354)	−3.410	(2.395)	4.895**	(2.388)
LR Chi2	52.722		51.237		22.254	
Pseudo R2	.108		.106		.048	

*$p<.1$, **$p<.05$, ***$p<.01$, $N=84$ ideas

Table 5 Engagement rankings

	# Ideas Generated		# Discussions Threads		# Comments	
	Coefficient	*SE*	*Coefficient*	*SE*	*Coefficient*	*SE*
Idea Factors						
DescriptionLength	−.002***	(.000)	.000	(.000)	.000	(.000)
AbstractLength	−.008***	(.002)	−.005***	(.002)	−.005**	(.002)
Preview	−.728	(.532)	−.986*	(.513)	−.811	(.505)
NumImages	−.281	(.740)	.065	(.777)	.126	(.769)
Participant Factors						
IsEmployee	−.278	(.522)	−.125	(.501)	.169	(.496)
PriorKnowledge	−.084	(.079)	−.061	(.076)	−.089	(.075)
Eigenvector	−8.574***	(3.228)	−6.894**	(3.090)	−7.359**	(3.095)
Closeness	1.694	(2.487)	.589	(2.365)	−.138	(2.311)
LR Chi2	98.286		36.768		34.893	
Pseudo R2	.327		.131		.101	

*$p<.1$, **$p<.05$, ***$p<.01$, $N=93$ participants

those drafting longer abstracts initiate more discussion threads and comments, potentially due to greater interests in the ideas and the market. Prior knowledge about stock markets does not impact the engagement rankings. Although we find earlier that higher quality ideas are more likely generated by non-employees, employees and non-employees do not differ in terms of engagement.

Robustness

Web Appendix 5 presents the correlations between the variables. As documented in the literature (Dekker et al., 2007; Wasserman & Faust, 1994), the eigenvector centrality and closeness centrality of idea generators are correlated (r=.650), and the correlation of the average centrality measures for idea

traders in our sample is even higher, r=.776. We then rerun the analyses using only a single centrality at a time. All findings remain consistent (Web Appendix 6a & 6b). We further include an eigenvector×closeness interaction term in the analyses. The interaction term is not significant, but importantly, the effect of the closeness centrality remains robust (Web Appendix 7a). However, the result for the eigenvector centrality is insignificant due to the very high correlation (r=.99) between the interaction term and eigenvector centrality (Web Appendix 7b). Finally, we test for curvilinear relationships by adding the squared terms of the two centralities and find insignificant results.

In summary, these findings suggest that the participants' diverse contributions demand diverse capabilities and motivations. Their diverse network positions, and thus diverse resource access and status, are associated with their diverse contributions to different aspects of the idea market. These aspects collectively determine a market's success. Hence, an idea market benefits from selecting the right mix of participants with desirable network characteristics.

General discussion

Firms increasingly leverage idea markets to generate and identify the most marketable new product ideas. While the ideation literature has largely focused on idea characteristics or process factors, we focus on the "human factor," the participants, that quintessentially determine the extent of ideation success. Specifically, we address a critical question of which participants contribute to which aspects of ideation, thus providing insights on ideator selection and cultivation.

To accomplish this, we conceptualize that participants possess diverse social capital, resource access and status, in their pre-existing network, thus making diverse contributions to the idea market. We then develop a customizable idea market platform to conduct two idea market studies over a span of 18 days each. The analyses reveal that the participants with greater resource access (higher closeness centrality) generate better quality ideas, whereas those with higher status (higher eigenvector centrality) engage more with larger quantities of ideas, discussion threads, and comments.

Our research hold both theoretical and managerial implications regarding open innovation, crowd sourcing, and effective management of the front end of the innovation process, as we will describe below.

Theoretical implications

First, our research demonstrates the importance of diverse contributions and distinct types of social capitals among ideators. As a result, it is critical to combine ideators with diverse social capitals. For example, while high-status individuals may be less effective in generating high quality ideas, their importance to the ideation process is manifested by their continued engagement with the ideation process, contributing greater quantities of ideas, discussion threads, and comments that support the overall ideation process. Our discovered connection between the volume of the discussion threads and the idea ranking (Table 4) also showcases the value of considering diverse contributions of the NPD personnel, beyond a single contribution of idea generation.

Second, our research offers another valuable application of Social Capital Theory in the domain of ideation: a social network provides social capital that generates economic and social value. We illustrate how this theory may offer an overarching framework to help identify different types of social capital, which are further connected to ideators' diverse contributions.

Third, our findings enrich the emerging literature on open innovation (e.g., Badir et al., 2020; Rubera et al., 2016), particularly in the early NPD stage of ideation. For instance, we find that status does not translate into idea quality. Non-employees hold lower status in the network (with lower eigenvector centrality), yet generate higher quality ideas compared to employees. In addition, despite not being part of the firm, non-employees contribute a proportionally greater number of ideas than employees to solve the firm's idea challenge, and display a similar level of continued engagement as employees. These findings suggest that ideators from outside the firm's boundary could benefit the ideation process not only by generating higher quality ideas, but also by providing a larger pool of candidate ideas, and contributing diverse perspectives to improve and evaluate the ideas. Also interestingly, we find that the ideas generated by employees are also more likely to be traded by employees during the idea evaluation process, indicating a potential inward bias at the ideation stage of open innovation, a topic worthy of future exploration.

Managerial implications

Our research unveils valuable implications for several long-lasting challenges across industries, including successful ideation and NPD personnel management (Durmuşoğlu, 2013; Packard et al., 2016).

One, our research illuminates the importance for firms to expand their conventional, sole focus on idea generation, to *other important ideation tasks*, such as idea evaluation and idea improvement. As discussed earlier, without the participants' continued engagement with these additional important activities, the ideation process remains unable to select the best ideas for the next stage of development. This expansive perspective of ideation also offers firms a holistic understanding of the ideation ecosystem and helps firms devise customized strategies toward different components of this ecosystem, such as idea generation versus idea evaluation/selection.

Two, closely related to one, our research illustrates the importance for firms to recognize *different values created by different ideators* to the ideation ecosystem, and hence strategically engage them differently to maximize their respective values. While the literature and practice have placed those who generate brilliant ideas in the limelight, our research clearly reveals that another group of distinct individuals has devoted their vital engagement to the lengthy ideation process. Those who do not generate quality ideas, or any ideas at all, may be well versed at evaluating or improving others' ideas. Hence, it is imperative for firms to optimize the mix of ideators who generate differential values to the ideation process, rather than over-accenting those who generate innovative ideas.

Three, our work validates and further highlights the importance of viewing ideators as *networked individuals* and inspecting their roles from a *social network* and *social capital* perspective. As aforementioned, ideation (or any aspect of innovation) is a product of a complex system and collaboration among a network of individuals. These ideators' social capital in the network, as manifested in their network positions, offers another important personal trait, above and beyond socio-demographics, that indicates contribution potential. As our study shows, there is an important, previously undiscovered relationship between an ideator's contribution and his/her social capital in the network. Moreover, there are network metrics readily available to firms to gauge each individual's social capital in the network.

Fourth, our study sheds important light on *which type of ideator* makes which contributions. Since those with greater access to resources produce higher quality ideas, while others with higher status produce more ideas, discussion threads, and comments, a firm should target and assemble the best possible mix of individuals from a desirable yet diverse social network to participate in ideation.

Fifth, our research offers new insights to firms regarding *ideator acquisition and retention*. For instance, a firm conducting an idea market should target and recruit those with desirable network positions by using effective market instruments, such as personalized emails or e-newsletters. The firm may also personalize rewards to differentially attract and incentivize potential participants. For instance, those of higher status may be offered bonuses based on comment quantities, whereas others of greater resource access may be rewarded based on idea ranking.

Lastly, our work supports the use of *open innovation* in the idea market. Open innovation strengthens the provision of diverse contributions. While employees may possess greater domain knowledge, non-employees bring external intelligence and diverse perspectives for idea generation and idea evaluation. Therefore, with proper management, open innovation, as exemplified by Dell IdeaStorm, My Starbucks Idea, and Threadless, will help firms produce more profitable and viable ideas.

Limitations and future research

Despite the contributions, our research has limitations that call for future research. First, we identify the participants' pre-existing social network grounded on their self-reports, due to the restricted access to the observed network, such as through the employees' email and phone records, past meetings, or other collaborative history. Future research may leverage observed networks if such confidential data become available, and further place weights on the connections of differential strengths among the participants. With richer data and larger samples, future research may also distinguish different types of social networks in appropriate contexts, such as professional versus personal networks, to explore their differential roles in the ideation process.

Second, as described earlier, our research focuses on the ideators' pre-existing network in light of its stability and long-lasting impact. Nonetheless, these participants continue to form new connections through in-market activities, such as commenting on ideas proposed by previously unconnected others. The evolution of this network (and participants' social capital) poses an intriguing yet challenging future research direction.

Third, future research may validate and finetune the present findings by replicating the results with varieties of new product challenges or customer-only samples, and by exploring additional contributions, such as idea trading, or the quality of discussion threads and comments.

Finally, future research may further explore the causal, beyond correlational, relationship between participants' network resources, status, and their diverse contributions, thus providing deeper insights into talent selection and cultivation. In summary, more research is needed to explore this essential and exciting domain of ideation.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s11747-024-01045-6.

Funding Open Access funding enabled and organized by Projekt DEAL.

Declarations

Competing interests The authors have no conflict of interest.

References

Adler, P. S., & Kwon, S.-W. (2002). Social Capital: Prospects for a New Concept. *Academy of Management Review, 27*, 17–40.

Aggarwal, V., Hwang, E. H., & Tan, Y. (2021). Learning to Be Creative: A Mutually Exciting Spatiotemporal Point Process Model for Idea Generation in Open Innovation. *Information Systems Research, 32*, 1214–1235.

Anderson, C., & Kilduff, G. J. (2009). The Pursuit of Status in Social Groups. *Current Directions in Psychological Science, 18*, 295–298.

Avolio, B. J., & Gardner, W. L. (2005). Authentic Leadership Development: Getting to the root of positive forms of leadership. *The Leadership Quarterly, 16*, 315–338.

Badir, Y. F., Frank, B., & Bogers, M. (2020). Employee-level open innovation in emerging markets: Linking internal, external, and managerial resources. *Journal of the Academy of Marketing Science, 48*, 891–913.

Ballinger, G. A., Cross, R., & Holtom, B. C. (2016). The right friends in the right places: Understanding network structure as a predictor of voluntary turnover. *Journal of Applied Psychology, 101*, 535–548.

Bavelas, A. (1950). Communication Patterns in Task-Oriented Groups. *The Journal of the Acoustical Society of America, 22*(6), 725–730.

Bayus, B. L. (2013). Crowdsourcing New Product Ideas over Time: An Analysis of the Dell IdeaStorm Community. *Management Science, 59*(1), 226–244.

Bolander, W., Satornino, C. B., Hughes, D. E., & Ferris, G. R. (2015). Social Networks within Sales Organizations: Their Development and Importance for Salesperson Performance. *Journal of Marketing, 79*, 1–16.

Bonacich, P. (1972). Factoring and weighting approaches to status scores and clique identification. *Journal of Mathematical Sociology, 2*, 113–120.

Bonacich, P. (1987). Power and Centrality: A Family of Measures. *American Journal of Sociology, 92*(5), 1170–1182.

Bonacich, P., & Lloyd, P. (2001). Eigenvector-like measures of centrality for asymmetric relations. *Social Networks, 23*(3), 191–201.

Boudreau, K. J., Lacetera, N., & Lakhani, K. R. (2011). Incentives and Problem Uncertainty in Innovation Contests: An Empirical Analysis. *Management Science, 57*, 843–863.

Bourdieu, P. (1986). The Forms of Capital. In J. G. Richardson (Ed.), *Handbook of Theory and Research for the Sociology of Education* (pp. 241–258). Greenwood Press.

Bower, J., & Bunn, D. (2001). Experimental analysis of the efficiency of uniform-price versus discriminatory auctions in the England and Wales electricity market. *Journal of Economic Dynamics and Control, 25*(3–4), 561–592.

Brass, D. J., Galaskiewicz, J., Greve, H. R., & Tsai, W. (2004). Taking Stock of Networks and Organizations: A Multilevel Perspective. *Academy of Management Journal, 47*, 795–817.

Burt, R. S. (1995). *Structural Holes: The Social Structures of Competition* (2nd ed.). Harvard University Press.

Cable, D. M., & Turban, D. B. (2003). The Value of Organizational Reputation in the Recruitment Context: A Brand-Equity Perspective. *Journal of Applied Social Psychology, 33*, 2244–2266.

Calvó-Armengol, A., & Jackson, M. O. (2004). The Effects of Social Networks on Employment and Inequality. *American Economic Review, 94*, 426–454.

Camacho, N., Nam, H., Kannan, P. K., & Stremersch, S. (2019). Tournaments to Crowdsource Innovation: The Role of Moderator Feedback and Participation Intensity. *Journal of Marketing, 83*, 138–157.

Cattani, G., & Ferriani, S. (2008). A Core/Periphery Perspective on Individual Creative Performance: Social Networks and Cinematic Achievements in the Hollywood Film Industry. *Organization Science, 19*(6), 807–922.

Chung, Y., Li, Y., & Jia, J. (2021). Exploring embeddedness, centrality, and social influence on backer behavior: The role of backer networks in crowdfunding. *Journal of the Academy of Marketing Science, 49*, 925–946.

Coleman, J. S. (1988). Social Capital in the Creation of Human Capital. *American Journal of Sociology, 94*, S95–S120.

Conti, A., & Graham, S. J. H. (2020). Valuable Choices: Prominent Venture Capitalists' Influence on Startup CEO Replacements. *Management Science, 66*, 1325–1350.

Dahan, E., Kim, A. J., Lo, A. W., Poggio, T., & Chan, N. (2011). Securities Trading of Concepts (STOC). *Journal of Marketing Research, 48*(3), 497–517.

Dahan, E., Soukhoroukova, A., & Spann, M. (2010). New Product Development 2.0: Preference Markets—How Scalable Securities Markets Identify Winning Product Concepts and Attributes. *Journal of Product Innovation Management, 27*(7), 937–954.

Dahl, D. W., & Moreau, P. (2002). The Influence and Value of Analogical Thinking during New Product Ideation. *Journal of Marketing Research, 39*, 47–60.

Daim, T. U., Rueda, G., Martin, H., & Gerdsri, P. (2006). Forecasting emerging technologies: Use of bibliometrics and patent analysis. *Technological Forecasting and Social Change, 73*(8), 981–1012.

Dekker, D., Krackhardt, D., & Snijders, T. A. B. (2007). Sensitivity of MRQAP Tests to Collinearity and Autocorrelation Conditions. *Psychometrika, 72*, 563–581.

Delmestri, G., Montanari, F., & Usai, A. (2005). Reputation and Strength of Ties in Predicting Commercial Success and Artistic Merit of Independents in the Italian Feature Film Industry. *Journal of Management Studies, 42*(5), 975–1002.

Diehl, M., & Stroebe, W. (1987). Productivity loss in brainstorming groups: Toward the solution of a riddle. *Journal of Personality and Social Psychology, 53*, 497–509.

Dougherty, D. (1996). Organizing for Innovation. In S. R. Clegg, C. Hardy, & W. R. Nord (Eds.), *Handbook of Organization Studies* (pp. 424–439). Sage.

Durmuşoğlu, S. S. (2013). Merits of Task Advice during New Product Development: Network Centrality Antecedents and New Product Outcomes of Knowledge Richness and Knowledge Quality. *Journal of Product Innovation Management, 30*(3), 487–499.

Forsythe, R., Nelson, F., Neumann, G. R., & Wright, J. (1992). Anatomy of an Experimental Political Stock Market. *American Economic Review, 82*(5), 1142–1161.

Forsythe, R., Rietz, T. A., & Ross, T. W. (1999). Wishes, expectations and actions: A survey on price formation in election stock markets. *Journal of Economic Behavior & Organization, 39*(1), 83–110.

Foutz, N. Z., & Jank, W. (2010). Prerelease Demand Forecasting for Motion Pictures Using Functional Shape Analysis of Virtual Stock Markets. *Marketing Science, 29*(3), 568–579.

Franke, N., Poetz, M. K., & Schreier, M. (2014). Integrating Problem Solvers from Analogous Markets in New Product Ideation. *Management Science, 60*, 1063–1081.

Freeman, L. C. (1977). A Set of Measures of Centrality Based on Betweenness. *Sociometry, 40*, 35.

Freeman, L. C. (1978). Centrality in social networks conceptual clarification. *Social Networks, 1*(3), 215–239.

Friedkin, N. E. (1991). Theoretical Foundations for Centrality Measures. *American Journal of Sociology, 96*(6), 1478–1504.

Gamber, M., Kruft, T., & Kock, A. (2022). Which effort pays off? Analyzing ideators' behavioral patterns on corporate ideation platforms. *Journal of Product Innovation Management, 39*, 419–444.

Girotra, K., Terwiesch, C., & Ulrich, K. T. (2010). Idea Generation and the Quality of the Best Idea. *Management Science, 56*, 591–605.

Goldenberg, J., Mazursky, D., & Solomon, S. (1999). Toward Identifying the Inventive Templates of New Products: A Channeled Ideation Approach. *Journal of Marketing Research, 36*, 200–210.

Granovetter, M. S. (1973). The Strength of Weak Ties. *American Journal of Sociology, 78*, 1360–1380.

Grewal, R., Lilien, G. L., & Mallapragada, G. (2006). Location, Location, Location: How Network Embeddedness Affects Project Success in Open Source Systems. *Management Science, 52*(7), 1043–1056.

Griffiths-Hemans, J., & Grover, R. (2006). Setting the stage for creative new products: Investigating the idea fruition process. *Journal of the Academy of Marketing Science, 34*(1), 27–39.

Gumusluoğlu, L., & Ilsev, A. (2009). Transformational Leadership and Organizational Innovation: The Roles of Internal and External Support for Innovation. *Journal of Product Innovation Management, 26*, 264–277.

Guo, Z., Fang, F., & Whinston, A. B. (2006). Supply chain information sharing in a macro prediction market. *Decision Support Systems, 42*(3), 1944–1958.

Hanson, R. (2003). Combinatorial Information Market Design. *Information Systems Frontiers, 5*(1), 107–119.

Hargadon, A., & Sutton, R. I. (1997). Technology Brokering and Innovation in a Product Development Firm. *Administrative Science Quarterly, 42*, 716.

Hofstetter, R., Dahl, D. W., Aryobsei, S., & Herrmann, A. (2021). Constraining Ideas: How Seeing Ideas of Others Harms Creativity in Open Innovation. *Journal of Marketing Research, 58*, 95–114.

Huang, Y., Vir Singh, P., & Srinivasan, K. (2014). Crowdsourcing New Product Ideas Under Consumer Learning. *Management Science, 60*, 2138–2159.

Hülsheger, U. R., Anderson, N., & Salgado, J. F. (2009). Team-level predictors of innovation at work: A comprehensive meta-analysis spanning three decades of research. *The Journal of Applied Psychology, 94*, 1128–1145.

Ibarra, H., & Andrews, S. B. (1993). Power, Social Influence, and Sense Making: Effects of Network Centrality and Proximity on Employee Perceptions. *Administrative Science Quarterly, 38*, 277.

Johansson, F. (2004). *The Medici Effect: Breakthrough Insights at the Intersection of Ideas, Concepts, and Cultures*. Harvard Business School Press.

Johnson, S. (2011). *Where Good Ideas Come From: The Natural History of Innovation*. Riverhead Books.

Katz, L. (1953). A new status index derived from sociometric analysis. *Psychometrika, 18*(1), 39–43.

Kim, J., & Wilemon, D. (2002). Focusing the Fuzzy Front-End in New Product Development. *R&D Management, 32*(4), 269–279.

Kline, S. J., & Rosenberg, N. (1986). An Overview of Innovation. In N. Rosenberg & R. Landau (Eds.), *The Positive Sum Strategy: Harnessing Technology for Economic Growth* (pp. 275–307). National Academies Press.

Knoke, D., & Burt, R. S. (1983). Prominence. In R. S. Burt & M. J. Minor (Eds.), *Applied Network Analysis: A Methodological Introduction* (pp. 195–222). SAGE Publications.

Koh, T. K., & Cheung, M. Y. M. (2022). Seeker Exemplars and Quantitative Ideation Outcomes in Crowdsourcing Contests. *Information Systems Research, 33*, 265–284.

Kornish, L. J., & Hutchison-Krupat, J. (2016). Research on Idea Generation and Selection: Implications for Management of Technology. *Production and Operations Management, 26*(4), 633–651.

Kornish, L. J., & Jones, S. M. (2021). Raw Ideas in the Fuzzy Front End: Verbosity Increases Perceived Creativity. *Marketing ScienCe, 40*(6), 1106–1122.

Kornish, L. J., & Ulrich, K. T. (2014). The Importance of the Raw Idea in Innovation: Testing the Sow's Ear Hypothesis. *Journal of Marketing Research, 51*(1), 14–26.

LaComb, C. A., Barnett, J. A., & Pan, Q. (2007). The imagination market. *Information Systems Frontiers, 9*(2), 245–256.

Lin, N. (2001). *Social Capital: A Theory of Social Structure and Action*. Cambridge Univ. Press.

Lu, Y., Jerath, K., & Singh, P. V. (2013). The Emergence of Opinion Leaders in a Networked Online Community: A Dyadic Model with Time Dynamics and a Heuristic for Fast Estimation. *Management Science, 59*(8), 1783–1799.

Luo, L., & Toubia, O. (2015). Improving Online Idea Generation Platforms and Customizing the Task Structure on the Basis of Consumers' Domain-Specific Knowledge. *Journal of Marketing, 79*, 100–114.

Malek, S. L., Sarin, S., & Haon, C. (2020). Extrinsic Rewards, Intrinsic Motivation, and New Product Development Performance. *Journal of Product Innovation Management, 37*, 528–551.

Mallapragada, G., Grewal, R., & Lilien, G. L. (2012). User-Generated Open Source Products: Founder's Social Capital and Time-to-Product-Release. *Marketing Science, 37*(3), 474–492.

Mangold, B., Dooley, M., Flake, G. W., Hoffman, H., Kasturi, T., Pennock, D. M., et al. (2005). The Tech Buzz Game [stock market prediction]. *Computer, 38*(7), 94–97.

Muller, E., & Peres, R. (2019). The effect of social networks structure on innovation performance: A review and directions for research. *International Journal of Research in Marketing, 36*, 3–19.

Newman, M. E. J. (2008). Mathematics of Networks. In S. N. Durlauf & L. E. Blume (Eds.), *The New Palgrave Dictionary of Economics*. Oxfordshire, United Kingdom of Great Britain & Northern Ireland: Taylor & Francis Ltd.

Opsahl, T., Agneessens, F., & Skvoretz, J. (2010). Node centrality in weighted networks: Generalizing degree and shortest paths. *Social Networks, 32*, 245–251.

Packard, G., Aribarg, A., Eliashberg, J., & Foutz, N. Z. (2016). The role of network embeddedness in film success. *International Journal of Research in Marketing, 33*(2), 328–342.

Page, L., Brin, S., Motwani, R., & Winograd, T. (1998). *The PageRank Citation Ranking: Bringing Order to the Web*. The Web Conference.

Podolny, J. M. (2010). *Status Signals*. Princeton University Press.

Redhead, D., & Power, E. A. (2022). Social hierarchies and social networks in humans. *Philosophical transactions of the Royal Society of London. Series B, Biological Sciences, 377*, 20200440.

Reid, S. E., & de Brentani, U. (2004). The Fuzzy Front End of New Product Development for Discontinuous Innovations: A Theoretical Model. *Journal of Product Innovation Management, 21*(3), 170–184.

Rietzschel, E. F., Nijstad, B. A., & Stroebe, W. (2007). Relative accessibility of domain knowledge and creativity: The effects of knowledge activation on the quantity and originality of generated ideas. *Journal of Experimental Social Psychology, 43*(6), 933–946.

Rubera, G., Chandrasekaran, D., & Ordanini, A. (2016). Open innovation, product portfolio innovativeness and firm performance: The dual role of new product development capabilities. *Journal of the Academy of Marketing Science, 44*, 166–184.

Salter, A., ter Wal, A. L. J., Criscuolo, P., & Alexy, O. (2015). Open for Ideation: Individual-Level Openness and Idea Generation in R&D. *Journal of Product Innovation Management, 32*, 488–504.

Samuelson, W., & Zeckhauser, R. (1988). Status Quo Bias in Decision Making. *Journal of Risk and Uncertainty, 1*, 7–59.

Servan-Schreiber, E., Wolfers, J., Pennock, D. M., & Galebach, B. (2004). Prediction Markets: Does Money Matter? *Electronic Markets, 14*(3), 243–251.

Simonton, D. K. (1999). *Origins of Genius: Darwinian Perspectives on Creativity*. Oxford University Press.

Slamka, C., Jank, W., & Skiera, B. (2012). Second-Generation Prediction Markets for Information Aggregation: A Comparison of Payoff Mechanisms. *Journal of Forecasting, 31*(6), 469–489.

Slamka, C., Skiera, B., & Spann, M. (2013). Prediction Market Performance and Market Liquidity: A Comparison of Automated Market Makers. *IEEE Transactions on Engineering Management, 60*(1), 169–185.

Smith, V. L., Suchanek, G. L., & Williams, A. W. (1988). Bubbles, Crashes, and Endogenous Expectations in Experimental Spot Asset Markets. *Econometrica, 56*(5), 1119–1151.

Soukhoroukova, A., Spann, M., & Skiera, B. (2012). Sourcing, Filtering, and Evaluating New Product Ideas: An Empirical Exploration of the Performance of Idea Markets. *Journal of Product Innovation Management, 29*(1), 100–112.

Spann, M., & Skiera, B. (2003). Internet-Based Virtual Stock Markets for Business Forecasting. *Management Science, 49*(10), 1310–1326.

Stephen, A. T., Zubcsek, P. P., & Goldenberg, J. (2016). Lower Connectivity is Better: The Effects of Network Structure on Redundancy of Ideas and Customer Innovativeness in Interdependent Ideation Tasks. *Journal of Marketing Research, 53*(2), 263–279.

Terwiesch, C., & Xu, Y. (2008). Innovation Contests, Open Innovation, and Multiagent Problem Solving. *Management Science, 54*, 1529–1543.

Thomke, S., & Fujimoto, T. (2000). The effect of "front-loading" problem-solving on product development performance. *Journal of Product Innovation Management, 17*(2), 128–142.

Toubia, O. (2006). Idea Generation, Creativity, and Incentives. *Marketing Science, 25*(5), 411–425.

Toubia, O., & Netzer, O. (2017). Idea Generation, Creativity, and Prototypicality. *Marketing Science, 36*, 1–20.

Toubia, O., & Stephen, A. T. (2013). Intrinsic vs. Image-Related Utility in Social Media: Why Do People Contribute Content to Twitter? *Marketing Science, 32*, 368–392.

van Bruggen, G. H., Spann, M., Lilien, G. L., & Skiera, B. (2010). Prediction Markets as institutional forecasting support systems. *Decision Support Systems, 49*, 404–416.

van der Heijden, B. I., de Lange, A. H., Demerouti, E., & van der Heijde, C. M. (2009). Age effects on the employability–career success relationship. *Journal of Vocational Behavior, 74*, 156–164.

Wasserman, S., & Faust, K. (1994). *Social Network Analysis: Methods and Applications* (*Structural Analysis in the Social Sciences*). Cambridge University Press.

Wolfers, J., & Zitzewitz, E. (2004). Prediction Markets. *Journal of Economic Perspectives, 18*(2), 107–126.

Woolley, A. W., Chabris, C. F., Pentland, A., Hashmi, N., & Malone, T. W. (2010). Evidence for a collective intelligence factor in the performance of human groups. *Science (New York, N.Y.), 330*, 686–688.