Guest Editorial: The Age of Crowdsourcing and Crowdfunding for Technological Innovation: Where We Are, and Where to Go?

I. Introduction

TAKING advantage of the combined labor of individual users or even groups of users, organizations can increase the resources to which they have access. Crowdsourcing enables companies to create and capture more value than either the company or the user could do on their own. One of the chief enablers of crowdsourcing's rapid increase is the development and pervasive growth of information and communications technology (ICT), which has led to an explosion of possible crowdsourcing opportunities [1], [20]. Although crowdsourcing has had a significant impact on the practice of management, especially in entrepreneurship [16], there continues to be a multitude of research gaps and, therefore, many openings for future research. Thus, the purpose of this article is to not only introduce our special issue on the topic, but to highlight and summarize some of the research gaps and directions that have the potential to influence the future development of the field of crowdsourcing.

While crowdsourcing is a comparatively young field of inquiry (cf., [12], [13], [15], [16], [35]), it touches upon several concepts and research streams. According to Brown [8], crowdsourcing has theoretical connections to several fields including open innovation (e.g., [10], [30]), outsourcing (e.g., [18]), wisdom of crowds (e.g., [11], [27]), collective intelligence [24], social web/socialmedia (e.g., [19], and cocreation (e.g., [36]). Additionally, crowdsourcing can be seen as closely associated with user innovation while remaining distinct (Brem et al. [7] and Schenk and Guittard [25]).

Open and user innovation as a field has gained momentum since the Internet transformed online communities and crowds into powerful sources of innovation [1], [5], [14]. Within this context, organizations are experimenting with a variety of new and modified innovation research approaches promoting the role of customers and ecosystem participants as valuable cocreators of products and services [10], [22], [34]. With these developments, the nature of corporate innovation is slowly evolving [11]. Indeed, the terms *crowdsourcing* and *crowdfunding* have gained in popularity to describe how to integrate "the crowd" into new product development and entrepreneurial activities. The activities of the crowd may lower or increase crowd capital, an organizational level capability, or organizational resources acquired through crowdsourcing ([23], p. 80).

Further interesting topics are the role of experts and nonexperts [11], the impact of crowdsourcing not only on the structure of the organization but also on the structure of organizations themselves [31]. Fellow researchers have called for broader and deeper research into crowdsourcing as it has a potentially significant economic and social impact [4].

Given this background, this special issue was designed to explore in detail how the large-scale outsourcing of two key functions such as the creative identification of solutions to innovation problems (crowdsourcing) and the funding for innovation projects (crowdfunding) have changed how organizations innovate. Crowdsourcing and crowdfunding leverage their potentially disruptive power by using the "crowd" as a lever to build a new type of large-scale outsourcing. Hence, a specific emphasis was given on how the multiple roles of the participants, from provider of ideas to users, customers, investors, or brand ambassadors, create intended and unintended impacts on market structure, and might introduce new opportunities and challenges for innovation management.

Together, the articles in this special issue should be viewed as a solid step in advancing crowdsourcing research; however, no special issue can cover the entire field adequately. At the end of this article, we identify some key challenges that remain to be explored by the academic community.

II. Where We are: Current Issues in Crowdsourcing Research

Current research gaps that are relatively unexplored or underexplored, and might be interesting for academic researchers, can be grouped into five areas.

These are 1) the value capture implications of crowdsourcing for innovation as well as crowdfunding; 2) Organizing for crowd innovation; 3) The characteristics and relative benefits of internal versus external crowds for innovation; 4) The "dark side" of crowdsourcing and crowdfunding; and 5) Theory building and empirical research that develops and tests predictions, respectively.

First, although it has been acknowledged that more attention has been spent examining value creation rather than value capture, crowdsourcing researchers have still not systematically addressed this research imbalance [2], [6], nor has it been

Date of current version 6 July 2023.
Digital Object Identifier 10.1109/TEM.2023.3270022

0018-9391 © 2023 IEEE. Personal use is permitted, but republication/redistribution requires IEEE permission.
See https://www.ieee.org/publications/rights/index.html for more information.

systematically studied with regard to crowdfunding. The argument goes that if a focal firm publicizes its challenges via an open call to whoever wants to help solve the challenges, does that not open the focal firm up to knowledge spillovers, competitive intelligence, loss of intellectual property, and ultimately competitiveness? How much do the benefits of having many eyes on the problem outweigh the potential costs of knowledge leakage, and what are the circumstances under which the focal firm is better off even in the face of knowledge leakage, e.g., what are the role that complementary assets play in protecting competitive advantage even when the challenges are crowdsourced? What are other ways to disguise the true intention of the focal firm, including but also going beyond innovation intermediaries? The same holds for crowdfunding as well. By putting a prototype or preselling on a crowdfunding platform, the firm puts valuable knowledge into the public domain, possibly inviting competition from better-funded competitors. What the nuances of these benefits and costs?

Second, little attention has been given to-date to organizational issues surrounding crowd forms of organizing including structure, systems, culture, and strategies that can or should be used to increase the value created and captured by organizations desiring to utilize crowdsourcing techniques. Scholars recognize that some kind of internal capacity must be available to take advantage of crowdsourcing (cf., [20]), but what has not been explored is what organizational design principles lead to the best acceptance and integration of external solutions by internal staff. What sort of experimentation principles work best and what incentives avoid rejection of good and workable solutions?

Third, what are the differences, if any, between internal versus external crowds used in crowdsourcing? Beyond the obvious firm boundary issues (the locus of the crowd for large firms with many employees, see [26] and [32], for an overview), there are many open issues in internal versus external crowdsourcing. For example, the interaction with value capture and knowledge leakage (see point 1 above), the benefits and costs of using external crowds even if internal ones are available and vice versa, the incentive mechanisms for internal crowdsourcing and idea contests (see point 2 above), e.g., shadow equity, real equity, prizes, recognition, and how they influence motivation of participants and nonparticipants.

Fourth is the possible dark side of crowdsourcing (see [8]). Like many research fields in early and phenomenologically-based stages, the emphasis is on the positive attributes and advantages of the new technology and new advances; however, as is often the case, there are pros and cons. This applies to crowdfunding as well as crowdsourcing. As a result, there are open research questions about the disadvantages of crowdsourcing and how they might be lessened. Not just for the focal firm but also for the members of the crowd. For the focal firm, there are crowds that are too small to generate ideas, too large to manage, and that might be open to pranks and sabotage. For the members of the crowd, crowdsourcing is starting to appear as a "perfect market for labor" where workers do not get paid for their effort, only their output, and in some cases, only upon "winning" a contest or contributing a "winning" design or solution. In the extreme, making every employee into an "independent contractor" might not be the paradise that some people had in mind when crowd members need to perform crowd work to make a living. This phenomenon is already taking root in the related "gig" or "sharing" economy, and in many cases, not to the benefit of individuals participating in the platforms [17]. Thus, there are quite a few opportunities in the sociological implications of crowdsourcing and crowd work.

Fifth, solid research explains and predicts. There is an opportunity for scholars to produce research on crowdsourcing that does just that. In these early days, many scholars have described the phenomenon and as mentioned in point 4 above, extolled the virtues of crowdsourcing and crowdfunding, but less work has been published that make actual predictions, and even less on testing the predictive power of the theories. Part of the issue so far has been the difficulty of generalizing across sectors, or even across companies, for all the reasons outlined previously. Still, there are many opportunities to try developing predictive theories and testing them in this space.

III. This Special Issue

This special issue attracted 21 manuscripts that were screened by the Special Issue Editors. In total, 11 of them were sent out for review, and in the end, eight were accepted for inclusion in the special issue. They span the range of crowdsourcing in general (the first two articles) to crowdfunding more specifically (the next six articles), and surface many nuances of these phenomena.[1] In this section, we give an overview of the main themes and results of these eight articles.

The first article, "Crowdsourcing properties and mechanisms of 'Mega Hackathons' The case of Junction," by Jaribion et al. [A1] discusses a relatively new phenomenon in crowdsourcing: the "mega-hackathon." These intense crowdsourcing exercises often take place over a weekend or a very limited period of time and take the form of a contest or tournament, with a large (hence "mega") number of crowd members or teams competing to come up with the best solution. The authors analyze the largest hackathon in Europe, Junction, along many dimensions and data sets to help understand the conditions under which these hackathons can be successful. They find that highly innovative solutions often follow from what they call intricate (highly publicized and multistage) crowd selection, having a strong crowd "vibe" (playful but competitive atmosphere and at the same time having mentors and connections), instant crowd feedback (in terms or transparency and evaluation), versatile crowd potential (having broad challenges that stimulate innovation), and pervasive information technology.

In the article "Why and how firms implement internal crowdsourcing platforms" by Beretta et al. [A2], the authors use qualitative methods in five large organizations to better understand what motivates managers on a more personal level (as opposed to the idea of tapping into a broader knowledge pool for example) to undertake internal crowdsourcing. They identify three important motives for managers to create and implement these projects: reacting

[1]We did receive more crowdfunding manuscripts than crowdsourcing, but probably the largest determinant of this seemingly skewed ratio is that in crowdfunding, the outcome is often clearer and, therefore, perhaps less difficult to test theory.

to internal problems ("problem-stimulated"), seeking transformational change outside of traditional R&D ("opportunity-driven"), and seeking legitimacy by projecting an image of innovativeness ("legitimacy-seeking"). These motives have different implications for how the initiatives were designed and help explain why some companies persist in pursuing internal crowdsourcing, even if it is not the best use of their resources.

The article "The impact of product and reward types in reward-based crowdfunding" by Cappa et al. [A3] tackles the problem of the most appropriate way to structure a call when using rewards-based crowdfunding. The authors investigate using experimental methods two different types of products (ones that are more like subscriptions or servitized products ["temporary use"] versus ones where the customer buys and owns the product) and how four different types of rewards interact with those product types to increase the amount funded. Investors appear to prefer direct ownership of the prototype over access to temporary use. Within direct ownership, having an actual early prototype or a special edition were more motivating, but for the temporary use services, a special edition for accessing the service seemed highly motivating. Discounts on the products/services and merchandise related to the product/service (e.g., company brand name) were considered less desirable.

"Direct and configurational paths of capital signals to technology crowdfunding fundraising" by Liu et al. [A4], discusses the complex interaction between different types of signals given off by 516 technology startups seeking (rewards-based) crowdfunding. The authors draw a distinction between social capital (prominent partner), human capital (backgrounds, prior successes), and intellectual capital (patents, videos), and find that social capital signals are often more effective than human or intellectual capital, although there are many nuances and complex interactions between the different types of capital and the presence or absence of "third-parties" attesting to the different types of capital.

The next two articles are literature reviews that help organize the crowdfunding literature according to two interesting topics. The first review, tackling a more general view of crowdfunding, is "What, where, who, and how? A bibliometric study of crowdfunding research" by Butticè and Ughetto [A5]. This review describes the evolution of the field over the last ten years in terms of subject matter as well as the community of scholars working in this area. In addition to characteristics of the field's researchers and themes in the literature, the authors study the methodologies employed, the outlets in which the works have been published, and the geographic diffusion of the scholars over time. In addition, the authors perform citation analyses, both backwards and forwards, to demonstrate the impact and discuss the broader impact of crowdfunding research in general.

The next, more specific, review is "Crowdfunding for a sustainable future? A systematic literature review" by Wehnert and Beckmann [A6]. Crowdfunding is thought to be a highly promising source of financing for sustainability initiatives, given the difficulty in attracting bank or early seed stage venture funding for products and services whose benefits (also mainly social) may not be apparent for many years. In this systematic literature review of 78 articles concerning crowdfunding for sustainability, the authors discuss the role of information asymmetries and motivational effects, and develop research propositions based on the entire crowdfunding "ecosystem" from the regulatory environment through to crowdsourcing platforms, types of crowdfunding, campaigns, and postcrowdfunding phases.

In "What do crowd equity investors do? Exploring postinvestment activities in equity crowdfunding" by Garaus et al. [A7], the authors explore a relatively recent but increasingly important type of crowdfunding, equity-based, where the investors take an ownership stake in the venture. The authors set out to explore, via two different survey studies, how much equity crowdfunding investors engage with the ventures once they own a share of it, and what determines their level and type of engagement. Most investors do engage in some forms of "low-involvement" engagement, such as spreading news about the company, whereas a much smaller number take a "high-engagement" approach, such as giving strategic advice to the company. The amount of investment (despite the lower absolute amounts invested relative to say IPOs) does appear to be associated with involvement in the ventures, with intrinsic motivation and personal (social) proximity often leading to high-involvement engagement, versus age and geographic proximity often leading to lower-involvement engagement.

The last article, "Social interaction and crowdfunding project success: Moderating roles of product development stage and product innovativeness" by Pati and Garud [A8], explores the value of "social interaction" (updating potential investors and asking for feedback) on receiving crowdfunding investments at different stages of the product development process and for different levels of innovativeness. They analyze these situations in the mobile app sector via a cross-sectional analysis of 203 Kickstarter projects followed by an experiment with 132 potential backers. The authors find that projects earlier on (ideation) benefit more from social interaction than those at later stages, and that counterintuitively, incremental innovations appear to benefit more from social interaction than radical innovations do.

IV. Where to Go: Future Research

The motivation behind this special issue was not to create specific definitions of constructs, build and test long-proposed hypotheses, or present specific causal arguments, but rather to demonstrate that there still unsolved mysteries and open questions in the research field of crowdsourcing. The full potential—both scientific and practical—of crowdsourcing is likely to be attained when researchers take the field to the next level and explore explanation and prediction. Luckily, as the identified research gaps suggest, there are plenty of opportunities to write papers that make meaningful contributions to advancing knowledge in crowdsourcing. So, what could be next?

As indicated earlier, we identified five areas in which research on crowdsourcing and crowdfunding could be promising: 1) The value capture implications of crowdsourcing for innovation as well as crowdfunding; 2) Organizing for crowd innovation; 3) The characteristics and relative benefits of internal versus external crowds for innovation; 4) The "dark side" of crowdsourcing and crowdfunding; and 5) Theory building and empirical research that develops and tests predictions, respectively.

In this context of these five areas, we see some "low hanging fruit" for future research, which we outline below. First of all, future research should explore value capture to a greater degree, especially the roles of complementary assets and business models (cf., [21], [28]). Next, we urge longitudinal studies to analyze effects during particular crowdsourcing or crowdfunding campaigns in more detail to be able to draw conclusions about timing effects. So far, this approach is relatively rare, as most researchers focus only on single campaigns. In addition, we see a dominance of linear processes when looking at crowdsourcing and crowdfunding campaigns. Hence, we suggest conducting more detailed analyses of the dynamic processes, which are often observed in practice. So far, there has also been a focus on qualitative research, mainly case studies. After all these years of research, we would like to motivate academics to bring in new methodological approaches (e.g., quantitative studies or experiments) and data sources (e.g., surveys, archival studies with secondary sources, or computational social science techniques) to complement the existing evidence from crowdsourcing and crowdfunding platforms.

Thus, there are plenty of opportunities to conduct meaningful research that makes significant contributions to advancing knowledge in crowdsourcing and crowdfunding. Looking further into the future, and being a little more speculative, we propose the following exciting developments.

1) *Artificial Intelligence will dramatically change the way crowdsourcing and crowdfunding are practiced.*
   Some years back, Zhao and Zhu [35] gave a comprehensive overview of crowdsourcing research and highlighted some future research directions, stating that "Crowdsourcing is a new Web 2.0-based phenomenon." At this point, the Web 2.0 element of creating content, solving problems, or raising resources by relying on a crowd is fairly well understood. What is less well understood in 2023 is the role that artificial intelligence (AI) can play in crowdsourcing and crowdfunding. This may take several forms.

   First, as mentioned previously in our section on the dark side of crowdsourcing, crowds have been known to help train AI for several years now (cf., [17]). Projects such as the Google Image Labeler game spring to mind where Google was able to tag images [31], enabling them to not only develop an image search function, but also incorporate image analyses into advertising services. But these tagged images can also serve as a gold mine for training data for machine learning models. Recent developments in large language models such as ChatGPT point also to the role that passive crowdsourcing can play in the future of AI. Thus, how crowds can amplify or speed up AI development and subsequent data network effects is a potentially interesting empirical context for exploring digital strategy.

   The second AI/crowd connection relates to idea evaluation from crowdsourcing. This is normally quite a tedious process in practice and many companies can be overwhelmed by the volume of suggestions from crowds with few ways of speeding up the process. Such was the case with BP after the oil spill in the Gulf of Mexico [3], [33]. Some companies solved this by having test data sets or encouraging voting, but those solutions are not always relevant, and voting opens up the results to pranks and sabotage. If AI systems for automating the evaluation of crowd output could be developed, it would have large implications for open innovation, knowledge recombination, and other related areas. AI may also be useful in identifying experts or contributors with specific skills or resources and weighting their contributions more (or less) highly, depending on the context.
2) *Hybrid crowds will bring about entirely new dynamics in crowdsourcing initiatives.*
   Hybrid here can mean two different things: One is human/AI hybridity (to continue the theme started above), and the second is online/offline hybridity. Both offer exciting research opportunities. To start with the human/AI hybridity, a third potential issue in the connection of AI and crowds is how AI might be used to seed and shape crowds. Practitioners discovered 10–15 years ago already that seeding a crowd and getting it into a generative state is an art more than a science, and often more difficult than originally imagined.

   Since the rise of large language model tools, new technological opportunities arise on how a crowd can engage, and to artificially support them, or even create ideas, which represents the fourth connection between AI and crowds. Some companies, such as IDEO, are already using AI to come up with novel solutions for ideation in teams, but with recent advances in AI "chat," this might be scaled up to large crowds.

   Regarding online/offline hybridity, in earlier days, campaigns were mainly planned and executed online or offline only. Since the pandemic, working from home or hybrid has emerged as the standard mode of work. This is not only true in a few countries or companies, but as a worldwide phenomenon. Hence, this is already changing the way the interaction works with crowds and vice versa.
3) *The further development of blockchain technologies will change the nature of crowdsourcing and crowdfunding.*
   Digital technologies offer different opportunities for crowdsourcing and crowdfunding campaigns. Crowdfunding operations can be done in real time, as the transfer of, e.g., bitcoins can happen in a short period of time, with some degree of anonymity. This has implications for crowdfunding intermediary platform business models, as it might disintermediate one important element of the platforms (the processing and aggregation of payments). Also, since many applications are based on the idea of anonymity, this can create tensions. Crowdsourcing campaigns can also be based on blockchain, so that the individual engagement or contributions can be traced and tracked, possibly leading to new intellectual property sharing models that can accommodate large crowds. Even though blockchain as a research topic is out in the field for a couple of years already, much more work can be done to investigate its impact on crowdsourcing and crowdfunding.

We hope this special issue stimulates even more interest in the topic so that our research community can grow into a large,

open crowd, teeming with excitement about crowdsourcing's and crowdfunding's potential.

Acknowledgments

The authors would like to thank a few people who helped to make this special issue happen. First and foremost, T. Daim, who offered the opportunity to edit this special issue, the IEEE publication team around B. Johnson, all other involved technical support staff members, and also our fantastic reviewers, who did an excellent job in helping authors take their articles to the next level.

Alexander M. Brem
University of Stuttgart
70569 Stuttgart, Germany

Christopher L. Tucci
Imperial College London
SW7 2BX London, U.K.

Terrence Brown
KTH Royal Institute of Technology
10044 Stockholm, Sweden

Jin Chen
Tsinghua University
Beijing 100190, China

Appendix
Related Articles

[A1] A. Jaribion, S. H. Khajavi, U. Järvihaavisto, I. Nurmi, R. Gustafsson, and J. Holmström, "Crowdsourcing properties and mechanisms of mega hackathons: The case of junction," *IEEE Trans. Eng. Manage.*, to be published, doi: 10.1109/TEM.2021.3079107.

[A2] M. Beretta, L. Frederiksen, M. Wallin, and V. Kulikovskaja, "Why and how firms implement internal crowdsourcing platforms," *IEEE Trans. Eng. Manage.*, to be published, doi: 10.1109/TEM.2020.3045118.

[A3] F. Cappa, S. Franco, E. Ferrucci, and R. Maiolini, "The impact of product and reward types in reward-based crowdfunding," *IEEE Trans. Eng. Manage.*, to be published, doi: 10.1109/TEM.2021.3058309.

[A4] T. Liu, X. Gong, Z. Liu, and C. Ma, "Direct and configurational paths of capital signals to technology crowdfunding fundraising," *IEEE Trans. Eng. Manage.*, to be published, doi: 10.1109/TEM.2021.3068524.

[A5] V. Butticè and E. Ughetto, "What, where, who, and how? a bibliometric study of crowdfunding research," *IEEE Trans. Eng. Manage.*, to be published, doi: 10.1109/TEM.2020.3040902.

[A6] P. Wehnert and M. Beckmann, "Crowdfunding for a sustainable future: A systematic literature review," *IEEE Trans. Eng. Manage.*, to be published, doi: 10.1109/TEM.2021.3066305.

[A7] C. Garaus, N. Izdebski, and C. Lettl, "What do crowd equity investors do? exploring postinvestment activities in equity crowd funding," *IEEE Trans. Eng. Manage.*, to be published, doi: 10.1109/TEM.2020.3041073.

[A8] R. Pati and N. Garud, "Social interaction and crowdfunding project success: Moderating roles of product development stage and product innovativeness," *IEEE Trans. Eng. Manage.*, to be published, doi: 10.1109/TEM.2021.3061532.

References

[1] A. Afuah and C. L. Tucci, "Crowdsourcing as a solution to distant search," *Acad. Manage. Rev.*, vol. 3, no. 3, pp. 355–375, 2012, doi: 10.5465/amr.2010.0146.

[2] A. Afuah and C. L. Tucci, "Value capture and crowdsourcing," *Acad. Manage. Rev.*, vol. 38, no. 3, pp. 457–460, 2013.

[3] O. Alexy, P. Criscuolo, and A. Salter, "Managing unsolicited ideas for R&D," *California Manage. Rev.*, vol. 54, no. 3, pp. 116–139, 2012.

[4] R. M. Bauer and T. Gegenhuber, "Crowdsourcing: Global search and the twisted roles of consumers and producers," *Organization*, vol. 22, no. 5, pp. 661–681, 2015, doi: 10.1177/1350508415585030.

[5] V. Bilgram, A. Brem, and K.-I. Voigt, "User-centric innovations in new product development — Systematic identification of lead users harnessing interactive and collaborative online-tools," *Int. J. Innov. Manage.*, vol. 12, no. 3, pp. 419–458, 2008, doi: 10.1142/S1363919608002096.

[6] J. Bloodgood, "Crowdsourcing: Useful for problem solving, but what about value capture?," *Acad. Manage. Rev.*, vol. 38, no. 3, pp. 455–457, 2013.

[7] A. Brem, V. Bilgram, and A. Marchuk, "How crowdfunding platforms change the nature of user innovation - from problem solving to entrepreneurship," *Technol. Forecasting Social Change*, vol. 144, pp. 348–360, 2019, doi: 10.1016/j.techfore.2017.11.020.

[8] T. Brown, "An evaluation of crowdsourcing as a tool for marketing activities," M.S. thesis, Luleå Univ. of Technol., Bus. Administ. and Ind. Eng., Dept. of Bus. Administ., Luleå, Sweden, 2019.

[9] H. Chesbrough, *Open Innovation*. Boston, MA, USA: Harvard Bus. School Press, 2003.

[10] H. Chesbrough, "The logic of open innovation: Managing intellectual property," *California Manage. Rev.*, vol. 45, no. 3, pp. 33–58, 2003.

[11] T. Clauss, R. J. Breitenecker, S. Kraus, A. Brem, and C. Richter, "Directing the wisdom of the crowd: The importance of social interaction among founders and the crowd during crowdfunding campaigns," *Econ. Innov. New Technol.*, vol. 27, no. 8, pp. 731–751, 2018, doi: 10.1080/10438599.2018.1396660.

[12] G. Demartini, D. E. Difallah, and P. Cudré-Mauroux, "ZenCrowd: Leveraging probabilistic reasoning and crowdsourcing techniques for large-scale entity linking," in *Proc. 21st Int. Conf. World Wide Web*, 2012, pp. 469–478.

[13] S. Djelassi and I. Decoopman, "Customers' participation in product development through crowdsourcing: Issues and implications," *Ind. Marketing Manage.*, vol. 42, no. 5, pp. 683–692, 2013, doi: 10.1016/j.indmarman.2013.05.006.

[14] J. Füller, H. Mühlbacher, K. Matzler, and G. Jawecki, "Consumer empowerment through internet-based co-creation," *J. Manage. Inf. Syst.*, vol. 26, no. 3, pp. 71–102, 2009, doi: 10.2753/MIS0742-1222260303.

[15] F. J. Garrigos-Simon, R. L. Alcamí, and T. B. Ribera, "Social networks and Web 3.0: Their impact on the management and marketing of organizations," *Manage. Decis.*, vol. 50, no. 10, pp. 1880–1890, 2012, doi: 10.1108/00251741211279657.

[16] F. Giones and A. Brem, "Crowdfunding as a tool for innovation marketing: Technology entrepreneurship commercialization strategies," in *Handbook of Research on Techno-Entrepreneurship*, 3rd ed. Cheltenham, U.K.: Edward Elgar, 2019, pp. 156–174.

[17] M. L. Gray and S. Suri, *Ghost Work: How to Stop Silicon Valley From Building a New Global Underclass*. New York, NY, USA: Eamon Dolan Books, 2019.

[18] J. Howe, "The rise of crowdsourcing," *Wired Mag.*, vol. 14, no. 6, pp. 1–5, 2006, doi: 10.1086/599595.

[19] J. H. Kietzmann, K. Hermkens, I. P. McCarthy, and B. S. Silvestre, "Social media? Get serious! Understanding the functional building blocks of social media," *Bus. Horiz.*, vol. 54, no. 3, pp. 241–251, 2011, doi: 10.1016/j.bushor.2011.01.005.

[20] N. Levina and A. L. Fayard, "Tapping into diversity through open innovation platforms: The emergence of boundary-spanning practices," in *Creating and Capturing Value Through Crowdsourcing*, C. L. Tucci, A. Afuah, and G. Viscusi, Eds. London, U.K.: Oxford Univ. Press, 2018, pp. 204–235.

[21] L. Massa, C. L. Tucci, and A. Afuah, "A critical assessment of business model research," *Acad. Manage. Ann.*, vol. 11, no. 1, pp. 73–104, 2017.

[22] C. K. Prahalad and V. Ramaswamy, "Co-opting customer competence," *Harvard Bus. Rev.*, vol. 78, no. 1, pp. 79–90, 2000, doi: 10.1086/250095.

[23] J. Prpić, A. Taeihagh, and J. Melton, "The fundamentals of policy crowdsourcing," *Policy Internet*, vol. 7, no. 3, pp. 340–361, 2015, doi: 10.1002/poi3.102.

[24] G. D. Saxton, O. Oh, and R. Kishore, "Rules of crowdsourcing: Models, issues, and systems of control," *Inform. Syst. Manage.*, vol. 30 no. 1, pp. 2–20, 2013, doi: 10.1080/10580530.2013.739883.

[25] E. Schenk and C. Guittard, "Crowdsourcing: What can be outsourced to the crowd, and why?," *Work. paper*, HAL. HAL Id: halshs-00439256, 2012. [Online]. Available: https://shs.hal.science/halshs-00439256v1

[26] M. Šundić and K. H. Leitner, "Crowdsourcing as an innovation strategy: A study on innovation platforms in Austria and Switzerland," *Commun. Strategies*, vol. 31, no. 89, pp. 55–72, 2013.

[27] J. Surowiecki, "The wisdom of crowds: Why the many are smarter than the few and how collective wisdom shapes business," Anchor, 2004.

[28] D. J. Teece, "Business models, business strategy and innovation," *Long Range Plan.*, vol. 43, no. 2/3, pp. 172–194, 2010.

[29] C. L. Tucci, A. Afuah, and G. Viscusi, Eds., *Creating and Capturing Value Through Crowdsourcing*. London, U.K.: Oxford Univ. Press, 2018.

[30] C. L. Tucci, H. Chesbrough, F. Piller, and J. West, "When do firms undertake open, collaborative activities? Introduction to the special section on open innovation and open business models," *Ind. Corporate Change*, vol. 25, no. 2, pp. 283–288, 2016.

[31] V. Fernández and J. Andrei, "Open source corporate strategy (OSCS): Unveiling the firm's open sources of competitive advantage," Ph.D. dissertation, EPFL, Lausanne, Switzerland, 2008.

[32] J. A. Villarroel and F. Reis, "Intra-corporate crowdsourcing (ICC): Leveraging upon rank and site marginality for innovation," in *Proc. Crowd Conf.*, 2010, pp. 4–8.

[33] G. Viscusi and C. L. Tucci, "Three's a crowd?," in *Creating and Capturing Value Through Crowdsourcing*, C. L. Tucci, A. Afuah, and G. Viscusi, Eds. London, U.K.: Oxford Univ. Press, 2018, pp. 39–57.

[34] E. von Hippel. *Democratizing Innovation*. Cambridge, MA, USA: MIT press, 2005.

[35] Y. Zhao and Q. Zhu, "Evaluation on crowdsourcing research: Current status and future direction," *Inf. Syst. Front.*, vol. 16, no. 3, pp. 417–434, 2014, doi: 10.1007/s10796-012-9350-4.

[36] V. Zwass, "Co-creation: Toward a taxonomy and an integrated research perspective," *Int. J. Electron. Commerce*, vol. 15, no. 1, pp. 11–48, 2010, doi: 10.2753/JEC1086-4415150101.

[37] M. Flores et al., "How can hackathons accelerate corporate innovation?," in *Advances in Production Management Systems. Production Management for Data-Driven, Intelligent, Collaborative, and Sustainable Manufacturing*, Springer International Publishing, 2008, pp. 167–175.