Managing digital crowds for generativity: The role of scalability and forking

Joana R. Pereira

Nova Information Management School, Universidade Nova de Lisboa
Colégio Almada Negreiros
1070-312 Lisboa - Portugal

Leeds University Business School, University of Leeds
G.30A Charles Thackrah
Leeds LS2 9JT
United Kingdom
Email: j.pereira@leeds.ac.uk

Gianluigi Viscusi

Linköping University
Campus Valla, A-Huset,
Linköping 581 83
Sweden
Email: gianluigi.viscusi@liu.se

Christopher L. Tucci

Imperial Business School
Imperial College London
London SW7 2AZ
United Kingdom

College of Business & Innovation
NEOM University
Saudi Arabia
Email: c.tucci@imperial.ac.uk

Abstract. In this article, we provide a conceptual foundation for analyzing crowd forms of organizing in digital environments. In particular, we define and identify digital crowd forms of organizing and their antecedent production mechanisms for generativity (the ability to produce unprompted innovation) outcomes. We propose that crowds are composed of loosely coupled members who contribute to the emergence of norms toward a system-level goal. The forms of organizing, as illustrated by three archetypes—crowdsourcing, online communities, and Distributed Autonomous Organizations—achieve different degrees of generativity through two main production mechanisms: scalability and forking. We conclude with speculations on the role of AI agents in crowd innovation and propose future research on crowd forms of organizing and generativity.

Keywords: Forms of organizing, crowdsourcing, online communities, Distributed Autonomous Organizations, generativity, innovation

1 Introduction

Firms are increasingly engaging and interacting in various ways with different types of digital crowds and communities. Although the wide range of crowd forms of organizing are often conceived of as highly similar to each other when discussing sources of innovation, there are important differences between different kinds of crowds, which can have diverse implications for innovation. For example, some firms actively use crowdsourcing to search for solutions to innovation problems (e.g., Afuah and Tucci, 2012), some manage and attract communities of users to collect ideas and feedback (e.g., Dahlander and Frederiksen, 2012), and some are active participants in online communities (e.g., Linux). Others attempt to exploit technologies (e.g., blockchain) that rely heavily on the output of crowds and communities (e.g., Pereira *et al.,* 2019). Thus, understanding how firms can use or learn from different kinds of crowds is an important strategic decision, as managing such crowds involves how to allocate resources, how to organize, and how to succeed in the marketplace (e.g., Leiblein *et al*., 2018).

Powell (2017) explored, from a sociological perspective on crowds, the organizational form behind crowds, referring to it as a *crowd-native organization*. Indeed, we appear to be witnessing a consolidation of the transition from firm-centered open forms of collaboration to decentralized, self-organized, crowd-native modes of organizing (Lakhani *et al*., 2013; Majchrzak *et al*., 2021; Powell, 2017), enhanced by inexpensive technology, low computational costs, and distributed communication (Benner and Tushman, 2015, p.505). In many regards, the growing importance of collectives organizing through the Internet, such as crowds and communities, is due to their ability to create knowledge and stimulate innovation within and beyond the boundaries of the firm (Adler, 2015; Boudreau and Lakhani, 2009; Henkel and von Hippel, 2004; Jeppesen and Frederiksen, 2006). Accordingly, digital crowds in general have been attracting growing attention in the management literature since the convergence of academic and business interests in the diffusion of digital platforms for crowdsourcing, crowdfunding, open-source software, and the like (Afuah and Tucci, 2012; Brabham, 2008, 2013; Howe, 2006).

Crowdsourcing has been discussed by scholars interested in the strategy implications for social media (Klapper and Reitzig, 2018; Plesner and Gulbrandsen, 2015; Rhee and Leonardi, 2018) and platforms (Boudreau and Jeppesen, 2015; Fang *et al*., 2021; O'Mahony and Karp, 2020), although nearly always framing crowdsourcing as a subject of analysis under the label of instruments for innovation (Bagherzadeh *et al.,* 2020; Seidel *et al*., 2017) or knowledge co-creation (Benkler, 2016; Caner *et al.,* 2017; Heavey *et al.,* 2020). Although much effort has been dedicated to examining empirical manifestations of crowdsourcing (Acar, 2019; Afuah and Tucci, 2012) and online communities (Faraj *et al*., 2016; Füller *et al*., 2014; Lee and Cole, 2003; von Krogh *et al*., 2003; West and Lakhani, 2008), few contributions have explored the organizational form behind such online collectives and the mechanisms that allow them to generate knowledge and innovation. Some researchers have acknowledged that some large-scale attempts to exploit the "wisdom of the crowd" have failed (e.g., Armisen and Majchrzak, 2015) and we maintain that the question under study here is not *when* to use crowds, or *how* to access the crowd or community (Afuah and Tucci, 2012; Nickerson *et al.*, 2017), but given the shifting nature and wide variety of crowds in the digital era, the question is *why* different forms of organizing crowds enact different outcomes.

This topic is relevant to innovation, organizational studies, and strategic management. Before the 2000s, strategic management scholars focused on how firms could maintain a competitive advantage through within-firm sources (e.g., resources, capabilities, core competencies, and path dependencies); after that, it became evident among scholars and practitioners that firms were increasingly looking for differentiating knowledge sources outside their boundaries (Joy's Law, distributed knowledge, see Lakhani and Panetta, 2007). Thus, firms began to look for ways to conduct "distant search" as an attempt to enact open innovation to solve problems by tapping knowledge outside their boundaries (Afuah and Tucci, 2012; Tucci, *et al.*, 2016), raising a debate on the impact of crowdsourcing on the capacity of a focal firm to create and capture value through it (Afuah and Tucci, 2013; Bloodgood, 2013). Since then, a wide range of literature has explored ways to harness the knowledge of many minds (cf. Lakhani and Panetta, 2007), for example, through crowdsourcing (e.g., Afuah and Tucci, 2012) or online communities (Füller *et al*., 2014; West and Sims, 2018). Researchers at the intersection of crowdsourcing and strategic management have also discussed crowdsourcing as a way to open the strategy-making process of the firm (e.g., Zollo *et al*., 2018), calling for research on crowdsourced value creation in light of "the resource-based and capabilities perspectives" (Nickerson *et al*., 2017, p.278).

This article provides a working definition of *digital crowd forms of organizing* as diverse sources of innovation composed of loosely-coupled (autonomous but responsive) members that coordinate using digital means to achieve a system-level goal through spontaneous behaviors and beliefs that form without pre-planning (so-called *emergent norms*). We submit that digital crowd forms of organizing, due to their loosely-coupled membership and emergent norms, are able to create unprompted innovation that can evolve in unseen directions, which is the essence of *generativity* (cf. Zittrain, 2006).

We focus on two critical antecedents of generativity,[1] which we call *production mechanisms,* that can vary systematically based on governance choices: *scalability*, the capacity to attract an increasing number of members that can lead to variety but also redundancy of contributions (Bygstad, 2016; Henfridsson and Bygstad, 2013), and *forking*, in which projects can separate into different branches, which may lead to new projects with different goals and means or contestation and project dismissal/failure (Andersen and Bogusz,

[1] Although there may be many antecedents to digital crowd generativity, such as the mindset of crowd members, the kind of digital platform that connects them, and individual incentives such as gamification, these antecedents do not allow us to draw distinctions between different types of crowds.

2019; Hsieh and Vergne, 2023). Various forms of organizing digital crowds enact these production mechanisms differently, consequently influencing their generativity output. As examples, crowdsourcing represents a relatively lower level of generativity due to its bounded scalability and rare forking; online communities display medium levels of generativity, with bounded scalability and occasional forking; and distributed autonomous organizations (DAOs) display the highest generativity outcomes due to their nearly unbounded scalability and relatively frequent forking. Using such instances of digital crowd forms of organizing that display different governance configurations, we propose that the more unbounded the scalability and the more frequent the forks, the higher the generativity potential of the digital crowd form of organizing.

Consequently, our investigation begins with a review of background literature to understand the key characteristics of digital crowds as a form of organizing. We then explain two key crowd forms of organizing production mechanisms: scalability and forking. Finally, we identify examples of different known archetypes of digital crowd forms of organizing and relate them to their generativity outcomes.

2 The crowd as a form of organizing: From physical to digital

The literature presents different views on whether there is some sense of order in crowds or whether crowds are subject to "being organized." First, there is a distinction between "being organized" and self-organization. "Being organized" inherits a firm-centered tradition in which a firm or *sponsor* that organizes the crowd members' efforts and extracts value from the crowd, whereas "self-organization" places the crowd at the heart of the organization as an emergent phenomenon that evolves as crowd members change and interact. In this article, we consider the concept of emergence not in temporal terms but as the characteristic of a whole entity, such as a digital crowd, having "properties or capabilities that are not possessed by its parts" (Elder-Vass, 2010, p.4) and consequently a "causal impact on the world in its own right" (Elder-Vass, 2010, p.5).

While from the outside, self-organization may seem disorganized or even chaotic, it presents a form of dynamic organization that may challenge organizational scholars' usual silos of structures, hierarchies, goal setting, and planning. Such a distinction echoes different literature streams. The organizational perspective is that crowds are often excluded from being classified as either a designed or emergent organization, having autonomous participants who are not expected to make any effort toward achieving the collective's goals (Puranam *et al.*, 2014, p.164). However, more traditional sociological theories on crowd behavior propose the opposite. Marx and McAdam (1994) argue that organized or focused crowds (e.g., Marshall, 1998) exist. Such organized crowds, whose individuals intend to achieve some goal through collective behavior, show some structure and patterning, even when set up for a short duration. Couch (1968) considers crowds as organized social systems, pointing out how participants produce coordinated behavior, and Powell (2017) aligns with the sociological perspective on crowds, calling for research on crowd-native organizations and self-organization.

In what follows, we examine the idiosyncratic characteristics of crowd forms of organizing in digital environments, which we propose are composed of *loosely-coupled members* who contribute via *emergent norms* towards a *system-level goal* (see **Table 1**). We explore these crucial terms one at a time, referring to foundational prior work as needed.

***** Please insert Table 1 about here *****

2.1 Loosely-coupled members

Amongst the foundational theoretical and sociological perspectives on crowds, Le Bon (1896) defines crowds as a gathering of individuals of whatever nationality, profession, and gender. While in the past, the crowd phenomenon could only occur when people gathered in a physical space (e.g., Lang and Lang, 1968), with the advent of the Internet, crowd members can congregate in "online environments" (Howe, 2006; Wexler, 2011). Thus, the contemporary literature perceives digital crowds as collectives (e.g., Marshall, 1998) of individuals who are likely strangers to each other (e.g., Malhotra and Majchrzak, 2014), located anywhere in the world (Afuah and Tucci, 2012; Estélles-Arolas and Ladron-de-Guevara, 2012), who actively contribute with new knowledge, information, or artifacts to a system without an authoritative figure that has direct control over the individuals' actions (Suran *et al.,* 2020, p.23). From an organizational perspective, a digital crowd is a multi-agent agglomeration of *autonomous* agents who self-select to undertake a task inside the crowd (Boudreau and Lakhani, 2009; von Krogh *et al*., 2003).

The literature on digital technologies and innovation has already built on the idea of generating knowledge through the coordination of autonomous agents, using "loosely coupled" layers of components (Yoo, 2013; Yoo *et al*., 2010; Zittrain, 2006). *Loose coupling* was adopted by Glassman (1973) as well as March and Olsen (1976) when considering elements of a system that are "responsive," but each preserving its identity, uniqueness, and evidence of its separateness (Orton and Weick, 1990; Weick, 1976). The loose coupling attribute can apply to both human members and "system elements" corresponding to an enlarged vision of crowd members that can range from humans to human-developed intermediators and agents such as AI agents, bots, smart contracts, and IoT, amongst others (see Ericson, 1972; and discussion further below). Crowd members acting in digital environments, either human or AI agents, coordinate and collaborate without formal authority or employment contracts (e.g., Gulati *et al*., 2012); therefore, we maintain that *loose coupling* is a key membership property of digital crowd forms of organizing.

2.2 Emergence of norms

Crowd members initially coordinate via emergent norms, which are often associated with large collectives and crowds (Kudesia, 2021; Reicher, 2008; Turner and Killian, 1987;

Weller and Quarantelli, 1973). Norms are shared belief systems, standards of behavior, and prescriptions about means and goals that emerge through individuals' interactions and negotiations (Cialdini and Trost, 1998; Elster, 1989; Philippe and Durand, 2011; Sherif, 1936), guiding and constraining their social behavior (e.g., Cialdini and Trost, 1998). Crowds tend to emerge in uncertain and unstructured situations where there are no established social norms to meet the conditions of that particular situation (Kudesia, 2021; Reicher, 2008; Turner and Killian, 1987). Thus, as members interact and negotiate to coordinate and make sense of such an uncertain reality (Blumer, 1951; Cialdini and Trost, 1998; Marx and McAdam, 1994; Sherif, 1936; Turner and Killian, 1987), they develop behaviors and beliefs that lead to the appearance of new norms without prior coordination and pre-planning (cf. Anderson, 1970; Lang and Lang, 1968; Le Bon, 1896; Marx and McAdam, 1994; Turner and Killian, 1987).

Members' anonymity or pseudonymity in online and digital environments also contributes to the emergence of new norms. As Safadi and colleagues argued, "Given the open, pseudonymous participation, limited formal roles, and lean personal profiles of online innovation communities, the social status hierarchies present in many social settings are largely missing here. Instead, social position is achieved through participation—specifically, who interacts with whom" (2021, p.21). Under such circumstances, individuals may experience greater subjective freedom to express unconventional ideas or extreme behaviors, possibly deviating from social standards (Lang and Lang, 1968; Le Bon, 1896), contributing to the emergence of norms (Cauteruccio *et al.,* 2022; Leavitt, 2015; Medvedev *et al.,* 2019).

An interesting case of norm emergence that unfolded "organically" rather than being defined in advance (Marshall, 1998; Marx and McAdam, 1994; Turner and Killian, 1987) is identified by Bauer and colleagues in the context of the Threadless community. At that time, some norms emerged for different ways of sanctioning, such as downvoting, to "regulate the community's behavior with regard to intellectual property (IP) and provide the basis for the celebrated level of cooperation and innovation it achieves" (2016, p.740). This example illustrates how norms emerged to address unexpected situations related to IP protection, resulting in new participation rules. It is worth noting that emergent norms extend beyond participation rules that can be established by sponsors or co-created by the community. Instead, emergent norms may also translate into new evolving goals (Marx and McAdam, 1994; Searle, 1995; Turner and Killian, 1987) creating or defining new forms of behavior (Cherry, 1973; Searle, 1969), and allowing the emergence of a dynamic social order in crowds (Searle, 2008).[2]

2.3 System-level goals

The extent to which crowds are rational and goal-oriented has been widely discussed for over a century amongst researchers interested in what happens when crowds form. During the first wave of the literature on crowds, they were perceived as irrational and a threat to social order (Le Bon, 1896; Tarde, 1890). In the second wave, researchers characterized crowds as "rational-in-context," holding potential for social change (Canetti, 1962; Couch, 1968; Turner and Killian, 1957). Later on, researchers recognized that crowd members could be bound together by higher-level goals (Marshall, 1998; Marx and McAdam, 1994). Such literature acknowledges that crowds, even in unstructured or emergent ways (Marx and McAdam, 1994; Turner and Killian, 1987), can achieve system-level goals that may change as members make sense of reality and adapt to uncertain situations. With the advent of the Internet and the subsequent digital transformation, a crowd's ability to solve problems has been exalted, as being intelligent, wise, and even problem solvers (Afuah and Tucci, 2012; Howe, 2006; Surowiecki, 2004) and crowds have been increasingly used for programming challenges, idea competitions, information aggregation, prediction markets, innovation contests, and project

[2] Furthermore, according to Searle, "to describe the basic structure of social-institutional reality, we need exactly three primitives: collective intentionality, the assignment of function, and constitutive rules and procedures" (2008, p.31). Roversi pointed out that "by way of constitutive rules we create something: immaterial, rule-based institutional artifacts that can have emergent normative properties" (2021, p.2).

funding (Felin *et al*., 2017; Nickerson *et al*., 2017; Tucci *et al*., 2018), putting in evidence crowds' ability to coordinate to achieve an overarching system-level goal (Mindel *et al.,* 2018).

Crowds acting in digital environments have system-level goals that can vary in scope (e.g., Malhotra and Majchrzak, 2014). Referring to physical crowds, Marshall (1998) suggests that crowds can be instrumental and focused, with goals ranging from performing a simple task to pursuing higher-level purposes, such as making political statements or engaging in social movements. Thus, prior related literature is aligned with the contemporary crowdsourcing school, in which the digital crowds' scope can range from solving a well-defined problem; through performing a specific task, decomposed problem, or broadcast problem; to finding and/or redefining ill-defined problems (Majchrzak and Malhotra, 2020; Malhotra and Majchrzak, 2014) and finding solutions to such problems.

While crowd members may recognize and act consistently to achieve a system-level goal in digital environments, they might have different and even changing motivations and goals at an individual level, such as voicing opinions, learning, making changes, adding features for their benefit, personal use of innovation, enjoyment of problem-solving, problem identification, helping others, improving one's reputation, and so on (cf. von Hippel, 2016, on free innovators, especially Chapter 2; Boudreau and Lakhani, 2009). Despite having different individual goals or motivations, we assume that crowd members in digital environments have a general shared understanding of what should be accomplished by the crowd, and the articulation of members' actions in pursuit of their individual goals contributes to achieving the system-level goal (cf. Gulati *et al*., 2012).

3 Digital crowd forms of organizing production mechanisms

Scholars have recognized the existence of organizational forms behind crowds and communities that differ from other traditional forms of organizing, such as "authority-based hierarchies" (e.g., Felin *et al*., 2014). Furthermore, Altman and colleagues propose crowdsourcing as one of the "organizational structures of the modern economy" (2022, p.81) and advance the concept of a "managed ecosystem governance structure," which also encompasses online communities and "occurs when a central organization engages and shapes external communities for key value-creating and capturing activities." (2022, p.80). Nevertheless, crowd forms of organizing extend beyond the control of a single sponsor (usually a firm) to encompass organizational forms that are more self-directed and decentralized (Lakhani *et al*., 2013; Majchrzak *et al.,* 2021; Powell, 2017), relying on more "open" governance modes where the community co-creates the future endeavors of the organization. This governance mode is exemplified by the open-source world map OpenStreetMap (Nagaraj, 2021) and Wikipedia commons-based peer production (Aaltonen and Seiler, 2016).

From an organizational perspective, we know little about the mechanisms that crowd forms of organizing enact to achieve outcomes in digital environments. Thus, we consider organizational mechanisms oriented toward "production" within the frameworks proposed by Pajunen (2008), Bhaskar (1997, 1998), and Henfridsson and Bygstad (2013, p.911). In Pajunen's perspective, mechanisms are composed of parts and their activities or interactions for producing a given output, encompassing "representations or models" that "describe relevant characteristics of the mechanisms operating in organizational processes" (2008, p.1451). For Bhaskar (1997, 1998) and Henfridsson and Bygstad (2013, p.911), production mechanisms are "causal structures that generate observable events" (see also Bygstad, 2010, p.160). Other researchers have associated production mechanisms with emergence (Elder-Vass, 2010) and "transformation," as they act between the micro and the macro level (Hedström and Swedberg, 1996, pp.297-298), where "a number of individuals interact with one another and the specific mechanism (which depends upon the type of interaction) describes how these individual actions are transformed into a collective outcome, sometimes unintended and unexpected by all actors."

Below, we further explore two main production mechanisms that have been associated with generativity outcomes, namely scalability (Bygstad, 2016; Fürstenau *et al*., 2023; Viscusi and Tucci, 2018) and forking (e.g., Fürstenau *et al*., 2023). Our goal is not to be exhaustive about digital crowd forms of organizing production mechanisms (and we invite other researchers to build on this work). However, we theorize about two essential mechanisms—scalability and forking—that are intrinsically linked to crowd forms of organizing characterized by loosely-coupled membership, norm emergence, and system-level goals. In what follows, we investigate these production mechanisms in the context of digital systems, where we observe crowd forms of organizing. The two mechanisms have emerged as relevant after considering the main insights from both the literature focused on crowdsourcing and online communities as well as the literature on generativity in digital environments (see, e.g., the review by Thomas and Tee, 2022).

3.1 Scalability

Growth is a relevant factor in digital forms of organizing and innovation (Bygstad, 2016; Fürstenau *et al*., 2023; Viscusi and Tucci, 2018), and scaling is a mechanism that various contributions have identified as dealing with the expansion of the network of participants to a digital infrastructure (Bygstad, 2016; Henfridsson and Bygstad, 2013). Thus, we maintain that *scalability* is a production mechanism that can lead to generativity in digital forms of organizing.

Digital systems "are characterized by overall scalability to deal with increasing amounts of interactions, communications, and collective actions" (Van Osch and Avital, 2009, p.23). Scalability thus refers to the capacity to attract an increasing number of members and contributions while keeping the basic infrastructure constant—or at least growing at a slower rate than the membership. Scalability can be measured by the growth rates of members and contributions, and has been examined as a phenomenon enacted at an unprecedented pace by digital innovation, especially for data-driven organizations and digital ventures (e.g., Huang *et* *al*., 2017). The open boundaries of digital crowd forms of organizing, hypothetically open to anyone, and loosely coupled membership enhance the potential of digital crowds to scale. Digital crowds can achieve such large numbers that individuals who are part of the crowd may never have a clear idea of its size, and its boundaries may constantly change (cf. Canetti, 1962).

Scalability is a common issue when considering digital crowd forms of organizing with regard to the opportunity spaces they eventually create, which may influence the quality, variance, as well as potential similarity/redundancy of contributions (Bonazzi *et al*., 2024; Girotra *et al*., 2010; Kornish and Hutchison-Krupat, 2017; Kornish and Ulrich, 2014). Research on the effect of the increasing number of participants proposes that as the number of participants increases, the expected performance outcomes and the "maximum or top score shift" also increase (Boudreau *et al*., 2011). The larger scale of the crowd may thus be associated with a greater possibility of idea variance and diversity put forth by the crowd (e.g., Boudreau, 2012).

There are situations in which scalability is intentionally or unintentionally bounded. While in some situations, it may be desirable to limit or intentionally bound the scale of the crowd, in other situations, the crowd's characteristics for self-organization can limit its scalability potential. For example, in *crowdsourcing*, there are well-defined system-level goals that often represent well-defined problems or tasks (e.g., Malhotra and Majchrzak, 2014), which may limit the scale of the crowd-to-member contributions that fit such specificities and exclude members' contributions that reside outside of a specific goal. Additionally, in *crowdsourcing via commercial innovation,* intermediaries such as those organized by Wazoku (previously known as InnoCentive), sponsors often attempt to limit the number of contributions through targeted dissemination strategies (e.g., Majchrzak and Malhotra, 2020) to reach specific audiences with the ambition to obtain high performance contributions within a manageable scale, perhaps with an eye to the costs of screening contributions. In contrast, in online communities, strong ties and shared values can function as a natural barrier to entry, which may also limit the crowd's scalability potential.

3.2 Forking

The second production mechanism we propose is *forking*, which can act as a transformational mechanism that constrains or encourages generativity (e.g., Fürstenau *et al*., 2023). Forking means dividing into different branches or going separate ways, enabling new action axes that can lead to new goals and/or means (e.g., Andersen and Bogusz, 2019). This term has been widely used in software engineering and open-source software projects, where forking occurs when the source code is copied and modified, originating separate workstreams and parallel development lines. This outcome often happens because someone or a group of people want to experiment with new attributes without affecting the source code (e.g., Nyman and Mikkonen, 2011) or because part of a community wants to start a different line of development based on chunks of the source code (Andersen and Bogusz, 2019; Robles and González-Barahona, 2012).

More recently, forking has been applied in broader contexts, encompassing all situations in which one takes existing code and uses it in a different way (e.g., GitHub). GitHub users popularized the term and disseminated the practice, as anyone can fork open-source code and create project branches on GitHub. However, we adopt a more conservative definition of forking, comprising situations in which forks originate separate workstreams and community splits. In this context, forking can be measured in several ways, including the total number of forks, the number of forks per year, or the number of forks per active member.

In crowd forms of organizing, forking happens when, through emergent norms, new behaviors, beliefs, goals, or means unfold, and groups start forming, interacting, and building around these new norms. Forking is a mechanism that allows the resolution of dissonances in means and goals as well as conflicts among crowd members and can entail splits in the software layer (code) and/or in community groups (Andersen and Bogusz, 2019; Hsieh and Vergne, 2023). When forking happens, new means and goals unfold and are pursued by different branches, leading to new ways of organizing and potentially unpredictable outcomes.

In a corporate environment, with a *sponsor* controlling the crowd, forking tends to be rare, often taking the form of a spin-off, in which the company splits off a unit to create a new company. One example of forking is the original version of InnoCentive (renamed Wazoku), one of the first tournament-based crowdsourcing platforms (Acar, 2019; Lakhani and Jeppesen, 2007). InnoCentive began as an internal initiative at Eli Lilly and Company, a pharmaceutical company, which sought ways to leverage Internet tools to help find solutions for drug development problems. During a brainstorming session, employees imagined a web-based system that would attract hundreds or thousands of minds to tackle internal problems. Later, they decided to fork the platform, calling it InnoCentive, whose goal was to enable any company to submit problems and solicit contributions (Leone, 2016). Forking is also widely acknowledged in other crowd forms of organizing, such as online communities and DAOs. For example, the Linux kernel is an open-source UNIX-like operating system that has undergone various forks. Today, the Linux distribution serves as the umbrella for many Linux forks beyond the Linux kernel. Widely known examples of forks in DAOs are Bitcoin Cash and Bitcoin Gold, which are branches of Bitcoin (e.g., Andersen and Bogusz, 2019).

While forking can be used intentionally by crowd forms of organizing, it can also result from disputes about succession, legitimacy, and future directions of the project (Andersen and Bogusz, 2019; Fogel, 2005; Meeker, 2008; Raymond, 1999; Weber, 2004). A "hard" forking can result from conflicts between sponsoring firms/founding teams and individual members or among different groups of individuals inside the community that defend different directions for the project (e.g., changes in the rules or license, allocation of funds, etc.). Forks—depending on how incompatible or "hard" they are—can lead to multiple versions of software, which can discourage related future development, and potentially lead to the demise of one or both projects. For instance, in the case of Threadless, when the company altered its approach to crowdsourcing T-shirt designs, many contributors felt alienated by the shift in strategy. Some contributors expressed frustration, with some threatening to withdraw their participation from the platform (Brabham, 2013). In the case of Amazon Web Services (AWS) and Elasticsearch, a licensing dispute led AWS to fork Elasticsearch and launch a new open-source project called OpenSearch. In response, Elastic moved Elasticsearch to a more restrictive license to limit its use by cloud providers (Banon, 2021).

Table 2 summarizes the two generativity mechanisms proposed above (scalability and forking), their typical ranges, underpinning characteristics, and possible outcomes.

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4 Digital crowd forms of organizing: Governance and archetypes

Governance represents a critical issue in crowd forms of organizing. In this context, governance has been framed as the design principles for "achieving institutional robustness" (Ostrom, 1990, p.90) in the management and control of common-pool resources, having implications across boundaries, appropriation, and provision rules, collective-choice arrangements, monitoring, graduated sanctions, conflict-resolution mechanisms, rights to organize, amongst others (Ostrom, 1990). In the context of digital crowd forms of organizing, the governance design principles may involve system-level goal definition (e.g., problem formulation, task division, or broadcasting a problem) (Majchrzak and Malhotra, 2020; Malhotra and Majchrzak, 2014), boundary control (e.g. exclusion rules, dissemination strategies, and entry barriers) (Ostrom, 1990; Rozas *et al.,* 2021), and participation rules (e.g., how to contribute, when submissions are open vs. closed, members interactions, actions allowed through chat, posts, comments, replies, votes, resolution mechanisms, graduated sanctions) (Majchrzak and Malhotra, 2013; Ostrom, 1990; Rozas *et al*., 2021) (see Table 3).

Different configurations or governance choices can enhance or constrain scalability and forking production mechanisms.

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Crowd forms of organizing can vary across different combinations of governance choices, leading to different archetypes of organizing crowds that display more "open" or more "closed" governance modes.[3] Two recognizable crowd forms of organizing archetypes are crowdsourcing and online communities, which have been considered by organization theory and innovation scholars (Dahlander *et al.,* 2019; Faraj *et al*., 2016; von Krogh *et al*., 2003; West and Lakhani, 2008) as well as information systems and digitalization students interested in *information commons* (e.g., Mindel *et al*., 2018) and *digital commons* (e.g., Dulong De Rosnay and Stalder, 2020). Similarly, researchers interested in forms of self-governance or commons governance, inspired by the work of Ostrom (e.g., Rozas *et al.,* 2021), have identified Decentralized Autonomous Organizations (DAOs) as a form of self-governance in communities. Considering these studies, we have identified three "archetypes" of crowd forms of organizing, namely (sponsored) crowdsourcing, online communities, and DAOs. Next, we explain their governance choices and respective implications for the production mechanisms that they enact.

4.1 Archetype 1: Crowdsourcing

The most acknowledged and possibly celebrated instantiation of crowd forms of organizing is "tournament-based-crowdsourcing," in which a sponsor, which can be an individual, a firm, or other organization, defines the system-level goal through, for example, posting an open call to individuals who self-select to participate (Afuah and Tucci, 2012;

[3] We realize that "governance" is a multifaceted and complex subject. Below, we use the terms "more 'closed governance'" and "more 'open governance'" to indicate whether the crowd has greater (more closed) or less (more open) control.

Dahlander *et al.*, 2019). The sponsor also controls boundaries through strict rules and targeted dissemination strategies (e.g., Majchrzak and Malhotra, 2020), defines participation rules, and designs and provides the platforms where contributions are collected. The sponsor's goal is to generate a range of innovative solutions to complex problems (e.g., Majchrzak and Malhotra, 2013).[4] An example of such organizing is the above-mentioned InnoCentive, an innovation intermediary platform where companies post technical problems (Acar, 2019; Lakhani and Jeppesen, 2007), or the Netflix Prize, where a challenge was given to improve Netflix recommendations (e.g., Villarroel *et al.*, 2013). In such cases, participants (or groups of participants) submit their solutions individually and "anonymously" in a designated platform with specific rules. At the end of the tournament, the best idea is rewarded with a prize.

In sponsored crowdsourcing, the sponsor's delineation of the system-level goal and participation rules influences the scalability potential of the crowd, creating barriers to entry and limiting the number of participants who can fulfill the defined goal. System-level goal and participation rules definition lead to bounded scalability, which can be desirable for the sponsor (cf. Dahlander and Piezunka, 2020, p.5) and is intentionally imposed through targeted dissemination strategies (e.g., Majchrzak and Malhotra, 2020) to reduce the crowd to manageable numbers. An example from an InnoCentive open call for NASA titled the "Net Zero Emission Vehicle," might be instructive. The "Net Zero Emission Vehicle" goal was to develop new technologies able to reduce pollutant emissions emitted through the tailpipe of a car. The sponsor delineated the system-level goal and participation rules, stating that solutions should focus on the emissions process (e.g., combustion, catalysis, and capture) and reduce different types of emissions (primary, such as NOx, CO_2, hydrocarbons, soot, Sox, VOC, and

[4] Note that it does not need to be a competitive tournament to have a sponsor and a more "controlled" or "closed" governance structure. Crowdsourcing tournaments do appear to be more commonly discussed in the literature over pure temporary collaborative ideation exercises, such as tagging photographs for the Library of Congress or Facebook Translation exercises (cf. Afuah and Tucci, 2012; Boudreau and Lakhani, 2009).

secondary, such as N_2O and NH_3). Such a well-defined problem can constrain the number of possible respondents and, consequently, the range of solutions that the crowd could have generated.[5] While such constraints may be desirable to reduce the number of solutions to a "tractable" number, they may also discourage participants who possess knowledge focusing on different attributes from solving the problem.

Forking is also rare in sponsored crowdsourcing. While it is possible to observe norms emerging in crowdsourcing initiatives, such norms are unlikely to result in new means and goals as the sponsor defines the system-level goal and participation rules, and limits the interactions amongst members. In the Wazoku/InnoCentive open call "Net Zero Emission Vehicle" example, users contribute individually, which, *per se*, decreases the chances of them interacting and coming up with new goals and means. Additionally, if participants in their solutions suggest new means and goals, such contributions will likely be dismissed or censored (since the sponsor controls participation and contribution logistics), remaining unknown to the other participants. Therefore, forking is unlikely to happen in such controlled initiatives. When forking does occur in crowdsourcing forms of organizing, it typically happens in a controlled environment with support and investment from the sponsor (Burton and Galvin, 2018; Dahlander and Magnusson, 2005), as in the example of Eli Lilly /InnoCentive discussed above.

4.2 Archetype 2: Online Communities

Online communities are crowd forms of organizing that have been considered in the innovation (Faraj *et al.*, 2016; von Krogh *et al.,* 2003; West and Lakhani, 2008) and strategic management literatures as an "organizing structure for the exchange of ideas and knowledge" (Shah and Nagle, 2020, p.305). Online communities "are composed primarily of users working collaboratively, voluntarily, and with minimal oversight to freely and openly develop and

[5] For instance, the seven challenges that NASA posted at Wazoku attracted 2,900 solvers who proposed 221 solutions (Wazoku, 2023), which are "humanly tractable" numbers.

exchange knowledge around a common artifact" (Shah and Nagle, 2020, p.305). Community members share a mutual acknowledgment that they are undertaking a joint project or action, sharing not only goals (e.g., Young, 1994) but also values, beliefs, and codes (Adler, 2015; Young, 1994) as well as information, knowledge, and assistance (Dahlander and Frederiksen, 2012; Franke and Shah, 2003). Communities, in general, move beyond the sponsored crowdsourcing approach because community leaders (usually the founder of the community or a firm) (e.g., O'Mahony and Karp, 2020), the core of the community (group of members with reputation) (e.g., Lee and Cole, 2003) and other community members jointly (re)define and enforce the system-level goals, and co-design the participation rules that tend to evolve as members interact. Furthermore, a sponsor does not impose boundary control but naturally emerges through values-based entry barriers.

Communities tend to attract like-minded individuals who share common goals, knowledge backgrounds, strong ties, and values (Fiesler *et al*., 2018; Weld *et al*., 2021), thereby marginalizing members who do not identify with the community's goals and values. As communities are values-oriented, their scalability potential is limited to the number of members who identify with their values and goals. Therefore, shared values (Adler, 2015; Boudreau and Lakhani, 2009; West and Sims, 2018; Young, 1994) function as a barrier to entry, limiting the scalability potential of online communities. In the case of Linux, the goal is to provide a free open-source operating system, nurturing the values of open-source, meritocracy, involvement, and support, attracting members who defend these goals and values and repelling those who do not follow them. Linux has had more than 12,000 contributors since 2005 (Linux Foundation, 2023). While not always the case, online communities tend to attract larger numbers than sponsored crowdsourcing initiatives.

Community members' strong ties and shared values promote unification more often than dissonance. Therefore, even when new goals and means emerge as community members interact over time, such forks tend to create sub-communities that are responsive to and aligned with the original community, sharing a common member base, which can also lead to increased engagement toward the original community. For example, the Linux community forked the code to create Compute Node Linux, a runtime environment for supercomputers. Android was also an example of a fork that extended the Linux kernel to mobile devices. In total, Linux has had more than 600 forks (called "distributions" in the community), with 500 of them in active development (Gajić, 2023). In this context, forking allowed for the expansion of Linux's goals and created sub-communities that relied on the original and the community's shared members. Another example is from Reddit, where a community member (Alan Schaaf) created Imgur.com to facilitate uploading and viewing of content on the Reddit platform (Luckerson, 2014), which from 2008 to 2012 represented 27% of Reddit external content links (Fiesler *et al.*, 2018; Singer *et al.,* 2014; and Weld *et al.,* 2021). These examples show that forks occur occasionally in online communities, and when they do, they often give rise to subcommunities related to the original community.

4.3 Archetype 3: Distributed Autonomous Organizations

The rise of Bitcoin and blockchain (distributed ledger technology) has led to the emergence of new organizational forms known as Distributed Autonomous Organizations (DAOs) (Hsieh *et al.*, 2017; Rozas *et al.,* 2021).[6] Such organizations enable members to coordinate and govern themselves following self-executing automated rules that run without interference from a central authority (e.g., Hassan and De Filippi, 2021). DAOs are owned and governed by members through token ownership and formal (e.g., governance smart contracts for proposals and formal voting "on-chain" using blockchain technology) and informal (e.g., adoption of updates, discussion groups, and code suggestions) governance models. While the

[6] In this article, we use the term 'DAO' in a broad sense, encompassing all permissionless, open-source code, blockchain-based organizations where the community surrounding the organization has a say in its future through both formal and informal governance systems.

system-level goal is initially crafted by a system architect (or group of founders), after being deployed on-chain, it tends to evolve as the community around the DAO grows and jointly defines and redefines the direction of the project to adapt to local conditions (Rozas *et al*., 2021) through discussions, contributions to the code, proposals, voting, and other participation schemes (e.g., Febrero and Pereira, 2020). In DAOs, the system-level goal and participation rules are integrated into the organization's foundational rules (consensus mechanisms and smart contracts), enforced by automated self-executing rules.[7]

Due to its permissionless nature, DAOs tend to attract large digital crowds formed by multiple types of users (or communities), namely users, miners, contributors, and investors, who display motivations that range from intrinsic (self-satisfaction, values and belief fulfillment, intellectual stimulation, learning, and making a positive difference) and extrinsic benefits (monetary rewards, reputation) (Davidson *et al.,* 2018; Pereira *et al.,* 2019). For example, Bitcoin, a cryptocurrency based on blockchain technology designed to allow people to securely transact and exchange value at a global scale without the need for costly intermediaries (Catalini and Gans, 2020; Nakamoto, 2008), is sustained by users who transact Bitcoins, miners who verify and record transactions in exchange for rewards and fees, developers who share the values and goals of the project and want to propose code changes, and investors (e.g., retail investors or professional VCs) who own Bitcoin for speculative purposes (e.g., Febrero and Pereira, 2020). In this regard, DAOs can both attract large crowds due to the diversity of incentives they offer and accommodate and coordinate such large crowds due to the automated nature of smart contracts, displaying a seemingly unbounded scalability potential compared to other archetypes.

[7] Consensus mechanisms refer to the process by which transactions are validated, typically, but not exclusively, by "miners." Smart contracts execute automatically when certain conditions are met.

While DAOs display much potential for scalability due to their ability to attract diverse collectives, such diversity may also lead to conflicting views on goals and means. As DAO members interact and make sense of reality, their diverse backgrounds may become evident, and dissonant voices tend to emerge, proposing new action axes. Over time, dissonant voices may gain support, leading to the formation of sub-communities that advocate for different goals and means. When consensus is not achieved, forking is a solution to reconcile such opposing views (e.g., Andersen and Bogusz, 2019). DAOs' open-source, decentralized, and automated nature facilitates forking processes, which occur more frequently in such crowd forms of organizing. The older DAOs in the cryptocurrency space, such as Ethereum and Bitcoin, are vivid examples of projects that experienced numerous forks. Bitcoin alone has experienced at least 105 forks in a relatively short time-period (Bitstamp Learn, 2022). The Bitcoin forks vary in their goals and means. While some forks might be similar to the original Bitcoin, as is the case for BitcoinCash and BitcoinV, whose principal differences are the block size and higher scalability, others display different goals and means, for example, Quantum Bitcoin, which is intended to run on a quantum computer and reduce mining's environmental footprint. However, considering that all existing DAOs were inspired by and shared a large portion of Bitcoin code (at least initially), they can all be considered Bitcoin forks, which enlarges the forking of Bitcoin to tens of thousands of forks (e.g., Hicks and Adams, 2023).

5 Digital crowds forms of organizing generativity

We now turn to the final element in our overall argument: *generativity*. In the information systems (IS) and innovation literatures, crowdsourcing has been associated with generativity (Bygstad, 2016; Majchrzak and Malhotra, 2013; Nambisan, 2018; Nambisan *et al.,* 2019; Yoo, 2013). Traditionally, generativity refers to "a technology's overall capacity to produce unprompted change driven by large, varied, and uncoordinated audiences" (Zittrain, 2006, p.1980). IS scholars maintain that the digital technology characteristics of data homogenization, re-programmability, and self-referentiality (the need for digital technology to create digital innovation) make digital artifacts generative by nature (Yoo, 2013; Yoo *et al*., 2010). However, some system features can lead to different levels or degrees of generativity; for example, leverage, adaptability, ease of mastery, accessibility, and transferability can influence a system's capacity to be generative (Zittrain, 2008, pp.71-73).

Moreover, generativity has been investigated for its relation with platform-based technology ecosystems considered as collective "new ways of organizing interdependent innovation activities" (Cennamo and Santaló, 2019, p.617). Thomas and Tee (2022), for example, through a bibliometric analysis of the literature on generativity, provide a conceptual framework that identifies the main components of generativity as generative architecture (malleable and loosely coupled), generative governance (balancing access and control), and generative community. Considering the generative community, its members are heterogeneous and autonomous (Thomas and Tee, 2022, p.266), similar to the digital crowds discussed earlier. In addition, generative communities are characterized by a constant discourse among members on "mutual directedness" or "shared interests" that enable them "to reach collective goals" (Thomas and Tee, 2022, p.267), similar to the system-level goal orientation of digital crowds outlined in previous sections. Accordingly, we submit that generativity is particularly relevant to framing the output capacity of crowd forms of organizing due to their characteristics, which are further magnified by the use of technology (Yoo, 2013; Yoo et al., 2010) as a means for crowd members to communicate, coordinate, produce outcomes, and achieve their goals.

Organizational and technological factors make digital crowd forms of organizing the preferred form for generativity; however, their generativity potential may vary across different forms of organizing crowds (Tajedin *et al.,* 2019; Van Osch and Avital, 2010; Van Osch and Bulgurcu, 2020) with varying degrees of related generativity fit (Avital and Te'eni, 2009, p.352). Next, we maintain that the scalability and forking production mechanisms are antecedents of generativity outputs.

Digital crowd forms of organizing can attract large and heterogeneous crowds, resembling Zittrain's (2006) notion of large, varied, and uncoordinated audiences. Crowd forms of organizing are composed of autonomous volunteers who self-select to undertake a task inside the crowd without formal authority or employment contracts (Gulati *et al*., 2012; von Krogh *et al*., 2003; Yoo, 2013; Yoo *et al.,* 2010; Zittrain, 2006), which reduce barriers to entry, potentially attracting large collectives. The higher the scale of the crowd, the greater the possibility of idea variance and diversity put forth by the crowd (e.g., Boudreau, 2012). Therefore, highly scalable digital crowds tend to display variance in contributions, thereby reinforcing the knowledge generativity capacity of crowd forms of organizing. When new behaviors, beliefs, goals, or means gain support and adoption inside the crowd (e.g., via emergent norms as discussed above), a *forking* process may be instigated, and new branches may emerge that can lead to new ways of organizing as well as unpredictable outcomes, reinforcing the crowd forms of organizing's native ability to be generative.

In **crowdsourcing**, scalability is bound by system-level goal definition, limiting the number of crowd members and, consequently, the variety of ideas. Forking is also rare, as members do not often interact, and the sponsor might censor emergent new goals and means. Nevertheless, there could still be some generativity, as some new interactions amongst even pre-defined attributes may lead to innovation "unprompted" by or unknown to the sponsor. Some of the out-of-scope ideas may inspire the sponsor beyond what a purely internal innovation effort might have achieved. However, in this case, we observe how sponsored crowdsourcing constrains the variance across a limited number of goal attributes, thereby limiting its potential for generativity through bounded scalability and rarity of forking.

In **online communities**, scalability is bound by values, limiting the number of crowd members and, consequently, the variety of contributions, such as in (sponsored) crowdsourcing. However, forking is occasional, as members interact and new means and goals emerge, more members will be attracted, increasing the scalability potential of online communities. Thus, the scalability of online communities' potential is higher than that of crowdsourcing. The interactive effects of production mechanisms in online communities yield moderate generativity outputs, resulting from values-bounded scalability and occasional forking.

Both archetypes of crowdsourcing and online communities can eventually be considered to have a managed ecosystem governance structure advanced by Altman and colleagues. However, it depends upon the context, as in their example of open source software (OSS) communities, in which the OSS communities "are only managed ecosystems when one organization controls the direction in which the ecosystem moves" (2022, p.83).

While **Distributed Autonomous Organizations** display potential for scalability due to their ability to attract diverse collectives, this diversity may also lead to conflicting views and goals, with forking a solution to reconcile these opposing views, as discussed above. The example of Quantum Bitcoin shows how forking processes can lead to unpredictable directions and to unprompted change and innovation that may "fall far from the tree," demonstrating the higher generativity potential of DAOs, which thus exist at the intersection of unbounded scalability and frequent forking that unleashes their potential for generativity, which we call *discontinuous generativity*.

6 Discussion

While crowdsourcing, in general, has often been associated with generativity, this article maintains that the capacity for exploration and generativity varies across different forms of organizing crowds digitally, as depicted in Figure 1. This development not only contributes to literatures concerned with new forms of organizing enacted by digital technologies but also raises questions and extends some of the arguments from the search literature. This article's contributions include, on the one hand, identifying crowd forms of organizing as a common phenomenon across crowdsourcing, online communities, and DAOs; on the other hand, we have outlined their specific connection with production mechanisms and generativity outputs as theoretically identified above.

***** Please insert Figure 1 about here *****

In addition to considering matching problems with types of governance (Felin and Zenger, 2014), the current article suggests that it may also be useful to think about matching organizing forms, specifically crowd forms of organizing, to achieve the desired outputs in terms of generativity. If the desired output is a manageable number (controlled scalability) of ideas that fit a well-defined goal, more structured forms of crowd organizing would be preferable, as is the case with crowdsourcing. If the desired output is generativity and knowledge flows that can evolve in unforeseen directions, more open forms, such as online communities or DAOs, would be preferred instead. We submit that managers could benefit from understanding what they can expect when applying different forms of crowd organizing to calibrate their initiatives and investments and avoid disappointments when accessing the "wisdom of the crowd" (cf. Armisen and Majchrzak, 2015).

Below, we explore some of the extensions and implications of our framework developed in the preceding sections. We begin with a discussion of the implications for theory, followed by implications for practice and policy, outlining the limitations and future research possibilities that this work opens up.

6.1 Theoretical implications

The arguments developed in this article align with and extend contributions to strategic innovation through crowdsourcing and online communities, where the locus of innovation is increasingly shifting outside the firm's boundaries (Lakhani *et al.*, 2013; Tucci *et al.*, 2016).

As pointed out by Benner and Tushman, when managers face high modularization of core tasks for a product and low costs of communication, they should supplement organizational models based on hierarchy, power, and control with the "logic of openness, sharing, choice, distant search, intrinsic motivation, and communities" (2015, p.507).

In this article, we submit that defining system-level goals and participation rules, as well as controlling boundaries, can either constrain or enhance the scalability of production mechanisms. While the scalability potential of crowdsourcing initiatives appears high compared to other innovation initiatives, it may seem relatively modest in comparison to the achievements of online communities or DAOs. Our argument posits that when the community co-creates system-level goals and participation rules and the boundaries are not intentionally controlled, crowd-forms of organizing are more likely to attract larger collectives due to their comparatively lower barriers to entry and organic growth rates. The question that follows is whether such capacity to attract large collectives is productive or unproductive for collaboration and innovation. Answering this question also has implications for the literature on adaptation and selection as it highlights the change of perspective introduced by generativity enacted by digitalization and crowd forms of organizing.

Crowdsourcing, online communities, and DAOs are archetypes of crowd forms of organizing. In this sense, we use the term "digital crowds" as an umbrella concept that comprises online communities. The main distinction between crowds and communities as a collective of individuals is that in crowds, members tend to be anonymous or pseudonymous with no /few or random interactions (e.g., Afuah and Tucci, 2012), while in communities, members interact, building strong ties and individual reputation over time (even is associated to a pseudonym) (Fiesler *et al.,* 2018; Weld *et al*., 2021). However, what could happen if the repeated interactions amongst crowd members lead to more stable identities? Could a crowd evolve into a community in such a case? The subtle point of co-existence between crowds and communities, or the transformation of crowds into perpetual communities, or the interplay between crowds of communities is worth investigating further, extending the work of Viscusi and Tucci (2018), West and Sims (2018), and O'Mahony and Karp (2020), among others.

Crowd forms of organizing can encompass members ranging from humans to human-developed intermediators such as AI agents, bots, smart contracts, and IoT, among others. Algorithms and methods focused on crowdsourcing have been investigated to increase crowd productivity (Behl *et al*., 2021; Cavallo and Jain, 2012; Yin *et al.,* 2020; Yu *et al*., 2016, 2017A, 2017B), as well as eventual learning dynamics among participants (Bonazzi *et al*., 2024; Nagle, 2018; Wang *et al*., 2018; Yu *et al.,* 2017A).

Beyond that, there are interesting possibilities of how AI agents influence crowd-driven innovation and generativity. While AI agents have primarily been associated with accomplishing tasks for individuals (e.g., negotiating in a marketplace for professional services or planning a trip, research, and writing), we might speculate that the use of AI agents in crowd forms of organizing could transform the way organizations harness collective intelligence for generativity. From the point of view of evaluating or synthesizing ideas from humans and/or other AI agents, AI agents can serve as intermediaries that analyze, organize, and synthesize contributions from large, diverse groups of individuals. Using natural language processing, pattern recognition, and machine learning, agents can efficiently filter vast amounts of user-generated content, identify trends, and surface the most valuable ideas or solutions. This filtering would streamline the decision-making process, reduce redundancy, and help identify high-quality contributions. Moreover, AI agents can act as virtual collaborators, providing feedback, generating suggestions, or refining user-submitted ideas to enhance their feasibility and impact. Thus, AI agents in crowdsourcing exercises will likely focus on efficiency, precision, and alignment with predefined system-level goals and participation rules set by the sponsor or system architect. One could argue both directions for generativity in such a scenario:

the efficiency bump might lead to better generative outcomes, or if the AI agents interpret the sponsor's desires too strictly (a kind of so-called "sycophantic" behavior), one might argue that generativity may indeed suffer.

AI agents may also have a role in more "open" governance structures (e.g., online communities and DAOs), as AI agents might focus on inclusivity, fairness, and enabling self-organization within an online community. In this case, AI agents may act as enablers of self-governance and creativity, providing tools for human participants to collectively and interactively drive innovation while preserving the decentralized ethos of the process, possibly leading to even more scalability but also potential forking. The key difference resides in the agents' ability to adapt to the crowds' evolving dynamics and prioritize bottom-up contributions over top-down control. DAO community members may also delegate voting and decision-making to AI agents, something akin to AI-delegated proxy voting that has already been proposed by Optimism.ai (2025). Assuming that AI agents amplify the contributions, increasing scalability and forking, this would tend to increase generativity.

Finally, we highlight that the perceived generativity or lack thereof may change depending on the type of actor. Typically, a crowdsourcer would have goal attributes and pre-determined evaluation criteria to evaluate whether contributions are productive or unproductive. However, the idea of pre-determining evaluation criteria, which is always limited by bounded rationality and cognitive framing (Csaszar and Levinthal, 2016; Felin and Zenger, 2009), contradicts the very idea of generativity. If the crowd is growing and co-creating goals and rules, this means that, from the members' perspective, the crowd's output is productive. In contrast, the same output may be considered unproductive for an external crowdsourcer sponsor with a specific agenda.

6.2 Managerial implications

Executives may consider the best way to organize and control (or not control) the crowds they need for innovation input. Should they structure a competition along strict rules, or should they try to observe how crowd members (re)define problems and solutions? We submit that while crowdsourcing can partially overcome firms' established cognitive framings (cf. Tripsas and Gavetti, 2000) through distant search, cognitive framings will also limit distant search, as they guide the crowd's output in a particular direction through bounded scalability. In this sense, our article suggests a fundamental trade-off between the governance "openness" level of crowd forms of organizing and generativity. In this rationale, the increased risk of misbehavior and misdirection is the cost of having more generativity.

While crowd forms of organizing that enforce less control over the crowd offer the potential for unprompted innovation that can take any direction without pre-planning, they also provide some managerial challenges. For example, what happens when the contributions of the crowd exceed the platform's ability to integrate and coordinate knowledge? On one hand, more open crowd forms encourage broad participation, which may increase variance; on the other hand, such forms of organizing face higher ambiguity and uncertainty, competence gaps, missed coordination among members, misbehavior, extended contestation, or even conflicts (Gulati *et al*., 2012). An example of this phenomenon is the experimentation by the Obama administration with the White House "Open for Questions" platform, which aimed to utilize crowds to help set the agenda for US federal policy. The page was dominated by marijuana legalization proponents (!), which is quite "out of the box." Still, the dominance of this highly vocal few led ultimately to a lack of participation from other crowd members and project dismissal (Howe, 2009). Therefore, it is imperative to investigate the conditions that may lead to productive or unproductive outcomes in crowd forms of organizing, as well as the different perspectives that sponsors and crowd members may have on crowd outputs and productivity.

6.3 Limitations

We have outlined the distinguishing characteristics of crowd forms of organizing, but much remains to be learned. For example, while scholars understand fairly well when and under what conditions "traditional" crowdsourcing forms of organizing emerge, we do not know when and under what conditions we should expect to observe other crowd forms of organizing. To keep the article tractable, we proposed three contrasting illustrations (or "archetypes") of organizing crowds, and in so doing, we did not extensively develop in-between variations and hybrid forms of organizing crowds that may share elements of different modes of crowd forms of organizing (for crowd/community hybrids see West and Sims, 2018, p.70). Further research could help populate the modes of organizing crowds in the continuum between what we call "closed" and "open governance" modes.

We also reduced the differences between crowd forms of organizing to the existence or absence of an external crowdsourcer (sponsor) that controls and defines the goals of the crowds, as this is a relevant dimension to determine the capacity for generativity; however, other dimensions may characterize the different types of crowd forms of organizing. For example, some researchers (e.g., Afuah and Tucci, 2012) highlight the difference between tournament-based and collaboration-based crowdsourcing, and other dimensions could be problem modularization or problem complexity (cf. Felin and Zenger, 2014).

6.4 Future research

While we envision some of the problems and costs that more "open governance" in crowd forms of organizing entails, there is a need for systematic and empirical approaches to further understand the benefits and costs of such forms of organizing. If one can easily screen out bad ideas or bad plans, then higher variance via higher scalability is beneficial, as a wider funnel would capture more raw inputs, and the low cost of selection would allow the choice of more valuable ideas. However, if it is difficult or costly to weed out poor ideas, scalability might lead to more "noise" and make it more challenging to arrive at good solutions. Future research could explore this dual nature of scalability and generate other important nuances and moderating effects of high generativity.

To return to our consistent theme of corporate control and sponsorship as well as the relationship between control and generativity, we propose that more "closed governance" forms imposed by sponsors can rarely, if ever, achieve the same average generativity levels as in more "open governance" modes. This proposition also implies that bureaucratic controls may prevent generativity and could be tested in future research: Can bureaucratic organizations enact both scalability and forking? Internal crowdsourcing can make a bureaucratic organization act like a crowd. Can a sponsor make an internal crowd act like a crowd organization? This possibility is related to open innovation on many dimensions, and future research could explore how companies might exploit more "open governance" of crowds, essentially using the crowd as a learning mechanism rather than a mechanism for problem-solving. In an extension to that, we might think of a "spinout" (employee starting a new company, often due to disagreement with parent company) or "spinoff" (parent company creating a new company) as a kind of forking mechanism that might fit into an open innovation narrative that can increase the options for corporate explorations of different types. Additionally, further research is needed on the role and type of control required in crowdsourcing, a topic that has been recently explored in information systems and platforms (e.g., Eaton *et al*., 2015; Foerderer *et al.,* 2018).

We consider the ability to "fork" as something that adds a "random" element to how crowds behave or possibly as a counterweight to "groupthink," since, as crowds grow in size, some parts of the crowd can split off and start working on their ideas. This topic could lead to numerous paths for future research. The flip side of having some part of the crowd split off is that when you fork, you may divide the crowd in two (e.g., Champion, 2021). Future research could examine the human element, including the prevalence of opportunistic behavior, the processes leading to forking in crowds, and how such processes affect crowd dynamics. In addition, are there alternative ways of adding variance to "governance"? Are there alternative ways to accomplish similar goals? Less so in cryptocurrencies, but likely in other areas of crowd-driven innovation, there could be fruitful avenues of research in simulating forking that could create generativity. Third, what is the role of conflict and deviation from "groupthink" in crowd innovation and generativity?

Groupthink is related to the emergence or enforcement of norms in many ways. We discussed the idea of the emergence of norms in an abstract way. Future research could address the emergence of norms in crowds. What are the different processes of norms emergence in sponsored crowdsourcing exercises vs. communities and DAOs? What is the role of the sponsor vs. peers in influencing and setting norms in an emerging crowd? What cues are salient as the crowd starts to work together? Further investigation is needed to understand and measure the extent to which the emergence of norms influences the scalability and generativity potential of crowd forms of organizing.

Crowds are often intended to be temporary, but the perpetuity of crowd agents' interactions and consequent development of identities represents more of a medium- to long-term phenomenon that characterizes communities (as in Threadless). In the long run, communities may scale to a point where sub-communities emerge and branch out, eventually forming a crowd of communities. Relatedly, the crowdfunding literature has also crossed the bridge between a crowd of contributors (monetary contributions) that may evolve into a community of supporters essential for the development of the project (Belleflamme *et al*., 2014; Josefy *et al.,* 2017; Murray *et al.,* 2020), suggesting that crowds may evolve into communities over time. Therefore, crowd organization dynamics, longevity, and temporality are dimensions worth further investigation.

Finally, some connections with quantum approaches (cf. Lord *et al.,* 2015) could be explored in future research. This research considers the "rare and unpredictable events that change the course of history," which seems to have a natural connection with generativity. We speculate that if crowdsourcing represents summative generativity, DAOs might be considered "quantum generativity." If one takes a snapshot at a certain point in time, one sees different communities surrounding various cryptocurrencies. However, examining the dynamics over time, a "crowd of communities" may form, with applications that emerge without preplanning, which might be considered a form of quantum generativity. Which kind of generativity would be represented by traditional communities, perhaps "anti-summative"? In communities, people interact, and some argue that the collective nurtures a personality different from the sum of its parts, which is the definition of non-summative. Future research could investigate the differences in summative versus quantum generativity enabled by various types of crowds.

7 Conclusion

In this article, we submit that the crowd innovation phenomenon extends beyond crowdsourcing as a one-size-fits-all form, and we investigate how crowds can take on various forms of organizing. We propose that not all crowds or forms of organizing crowds are the same. The literature has done an excellent job exploring the *sourcing* part of crowdsourcing (e.g., problem definition and how to motivate crowd members). However, there is still much to be learned about the *crowd* aspect of it and the resulting organization. This article takes a step in that direction by identifying and discussing distinguishing characteristics of crowd forms of organizing that could and should be organized and governed in different ways to exploit these inherent differences in innovation potential for various goals.

This line of research may open new avenues related to unstructured, dynamic, emergent forms of organizing and the impact of such mechanisms on generativity, knowledge creation, diffusion, and innovation. Such attempts lead to a deeper understanding of crowd-specific phenomena and stimulate debate among scholarly communities in strategic management, innovation, information systems, and organization studies. We hope this article stimulates further empirical and theoretical work on how organizations can work with and organize crowds.

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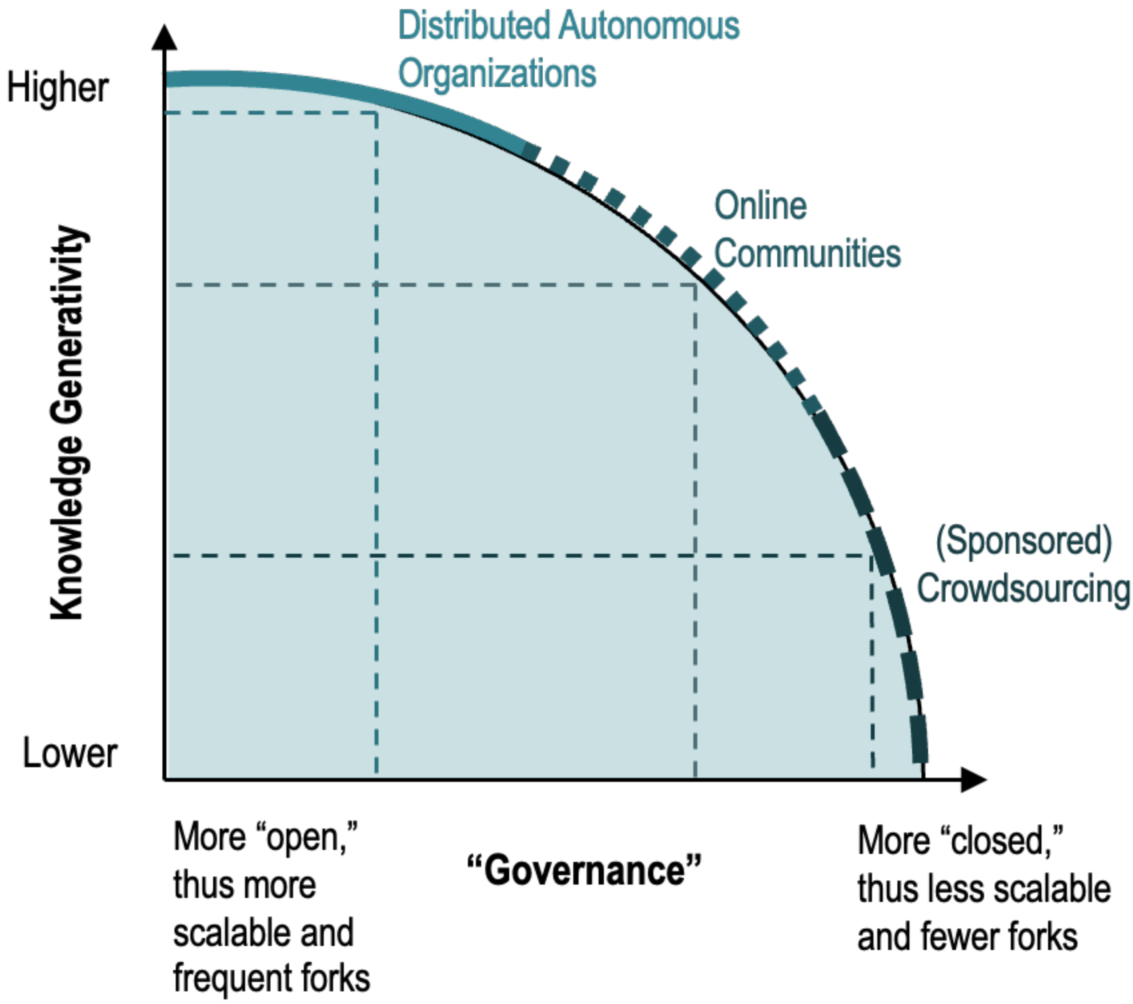
FIGURE

Figure 1: Generativity frontier for different "governance" profiles



TABLES

Table 1: Crowd forms of organizing characteristics

Characteristics	Description	References
Loosely-coupled members	*Autonomous* but responsive volunteers who self-select to undertake a task inside the crowd, without formal authority or employment contracts	Boudreau and Lakhani, 2011 Gulati *et al.,* 2012 von Krogh *et al.,*2003 Yoo, 2013 Yoo *et al*., 2010 Zittrain, 2006
Emergent norms	Unfolding of new behaviors and beliefs without prior coordination and pre-planning	Blumer, 1951 Cialdini and Trost, 1998 Lang and Lang, 1968 Marx and McAdam, 1994 Sherif, 1936 Turner and Killian, 1987
System-level goals	Crowds have a shared understanding of goals that can range from performing a simple task to seeking higher-level purposes	Canetti,1960 Couch, 1968 Majchrzak and Malhotra, 2020 Malhotra and Majchrzak, 2014 Marshall, 1998 Marx and McAdam, 1994 Turner and Killian, 1957 von Hippel, 2016

Table 2 – Crowd forms of organizing antecedent production mechanisms definition, underpinning characteristics

Production mechanism	Definition	Range	Underpinning characteristics
Scalability	The capacity to attract increasing numbers of members and contributions	Bounded to unbounded	Loosely coupled membership System-level goals
Forking	Separation in different branches with different means and/or goals	Rare to frequent	Emergent norms

Table 3 – Crowd forms of organizing governance choices and production mechanisms

	Governance choices			Production mechanisms	
	System-level goal	**Boundaries control**	**Participation rules**	**Scalability**	**Forking**
Crowdsourcing	Sponsor defines and enforces the system-level goal	The number of participants is intentionally limited by the sponsor through strict rules and targeted dissemination strategies	Sponsor delineates the participation rules unilaterally	Bounded (e.g., intentionally bounded by strict rules and targeted dissemination strategies)	Rare (e.g., controlled by the sponsor)
Online communities	Community leader(s), core, and other members jointly (re)define and enforce the system-level goal	Values-based "entry barriers" that exclude members who are not aligned with goals and values	Community leader(s), core, and other members co-design the participation rules that change over time	Bounded (e.g., unintentionally bounded by shared values)	Occasional (e.g., creation of sub-communities)
DAOs	System architect and community (re)define the system-level goals that are enforced through automated self-executing code	Permeable boundaries, as DAOs attract diverse types of members with different motivations	System architect and community co-design the participation rules that are embedded in the automated self-executing code	Unbounded (e.g., permissionless access)	Frequent (e.g., splintering the community into different communities)