Conceptualizing Online Content from a Game-Theoretic and Relational Perspective

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Online participation involves the creation and consumption of content. However, there has been no explicit agreement on the definition of online content. This obscures the impacts various online content has on online participation. In this article, we propose a conceptual framework to distinguish the wide range of online content, focusing on their relational properties (i.e., cocreation and co-ownership potentials). Consonance between these relational dimensions is expected to influence the overall stability of online participation. Our framework of online content builds on a game-theoretic perspective of online participation: Collective dynamics observed in online participation are modeled by the stag hunt game, and the dilemma that players face is applied to the creation and ownership dimensions of online content. Theoretical implications include informing empirical research in the relationships among content creation, ownership, and online participation; reviewing policymaking related to media ownership structure; and advancing discourse in arts, technology, and media.

Keywords: online content, online participation, stag hunt game, relational properties, cocreation, co-ownership

Online participation involves the creation and consumption of online content by users. Following an extensive review, Lutz, Hoffmann, and Meckel (2014) define online participation as "the creation and sharing of content on the Internet addressed at a specific audience and driven by a social purpose" (p. 2). In their view, online participation is conceived as having three dimensions, namely creative, social, and motivational. This marks a significant progress in defining online participation, but current conceptions of "content" remain uncertain and limit the utility of this characterization of online participation. Greater clarification of what online content entails in the context of online participation can help address this constraint.

Online content, including text-based online discussion, Internet memes, professional music videos, personal photographs, and e-books, occupies a central position in online participation. Yet there is no explicit agreement on the definition of online content. Previous studies operationalized online content in various ways, largely depending on their research purposes, disciplinary perspectives, and data available. Extant

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research emphasizes different aspects of online content, including their typology and forms (Berger & Milkman, 2012; Sanchez-Olmos & Vinuela, 2017), originating sources (Müller & Christandl, 2019), distinct functions (Holliman & Rowley, 2014), and the material communicated (Nobata, Tetreault, Thomas, Mehdad, & Chang, 2016). These variable views on online content have helped facilitate the inquiry of online participation by capturing domain-specific aspects of participation and their implications. However, such "scattered" views obliterate how online content can relate with one another in terms of mediating user contribution and consumption. This article considers how online content can be characterized and then proposes a conceptual framework, based on their relational properties, from a game-theoretic perspective.

Characterization of Online Content

Broadly speaking, any digital material that can be exchanged among users would constitute online content. Examples include text-based posts, videos, music, memes, photographs, graphics interchange format (GIFs), and even "likes." For our current purpose, trace data that are not immediately accessible via Web browsers, such as user network data and metadata used for digital advertising, would not be considered online content. Although it can be characterized differently, online content shares common attributes that are similar to those of public goods, namely nonrivalry and nonexcludability (Samuelson, 1954). Nonrivalry occurs when one's use of the good does not affect others' use of it, whereas nonexcludability occurs when no one can be effectively prevented from using it (Varian, 2009). Because of these characteristics, rational individuals are incentivized to free-ride on the efforts of others instead of paying their shares to produce public goods. The tendency to free-ride is high in large groups where contributions are less noticeable (Olson, 1965). Thus, public goods are often underproduced or overconsumed and require provision by authorized third parties.

Granted, online content may not be purely nonrivalrous and nonexcludable in nature. For example, individuals can be excluded from accessing a YouTube video by adjusting privacy settings. Nonetheless, a video can be replicated, perpetuated, and viewed in full, either synchronously or asynchronously, through unauthorized downloads and streaming websites. Moreover, the risks entailed in creating and posting a video are arguably high, because effort is necessary and rewards are not always guaranteed. Taken together, these features of online content are expected to result in free-riding problems. Few would choose to contribute, and the vast majority simply enjoy content with little to no risk.

Although online content shares the characteristics of public goods, it differs from traditional public goods in important ways. Online content comprises all digital entities, where marginal production costs are negligible and little temporal and spatial constraints on production and distribution are expected. That is, online content can be easily replicated at little to no cost and at any time and place. For these reasons, online content is better conceived as public information goods, which "can be digitized" and are "commodities that derive their market value from the information they contain" (Vafopoulos, 2012, pp. 10–12).

Fulk, Flanagin, Kalman, Monge, and Ryan (1996) posit a distinct class of information goods called "public communication goods," emphasizing the communicative and informative functions conferred by interactive communication systems (p. 61). Emphasizing their relational properties, Fulk and colleagues (1996) distinguished these goods in terms of connective goods, directly linking individuals to enable communication (e.g., communications through a national postal service), or communal goods, whereby

individuals co-own a body of information (e.g., information repositories at a city library). Nonetheless, connectivity and communality are not necessarily mutually exclusive regarding online content. For example, in public discourse on social media platforms like Reddit and Twitter, text-based posts are regularly utilized to facilitate communication of information. At the same time, these posts are also owned by participants because they are publicly accessible and subjectable to modification and sharing. Further extension on the theoretical conception of public communication goods is pertinent to account for online content that differ in levels of connectivity and communality.

We expand on public communication goods and propose a conceptual framework that characterizes online content relationally in context of online participation, so as to systematically illuminate ways in which people consume or create in reaction to other content. Our framework is consistent with current conceptions of online participation and helps further hypotheses related to impacts of content on online participation, including the relative attention and nature of responses to content. At present, online content is being characterized both as vaguely as things observed or exchanged on the Web and as precisely as the message communicated within. The absence of a clear conceptual framework for online content means there is no common basis on which content can be investigated and compared. It also obscures the differential impacts of the diverse range of content on overall online participation. A framework that elucidates whether and how people choose to contribute which content will be helpful.

Game Theory: Guiding Principles for Coordination in Online Participation

As part of the effort to develop a framework for online content, this article begins by formulating online participation from a game-theoretic perspective. Game theory is "the study of mathematical models of conflict and cooperation between rational decision-makers" (Myerson, 1997, p. 1). It has served as a useful theoretical and empirical tool in predicting and explaining collective outcomes from interactions among individuals with conflicting interests and has been applied across economics, political sciences, sociology, and computer science. Von Neumann and Morgenstern (1953), the founding fathers of game theory, stressed the mutual dependence among individuals in influencing outcomes, noting that "if two or more persons exchange goods with each other, then the result for each one will depend in general not merely upon his own actions but on those of the others as well" (p. 11). As will be discussed, online participation in the creation and consumption of content constitutes one such collective situation.

In game theory, games are an abstraction of real-world situations that involve two or more individuals, who are known as players, behaving in ways that maximize their own payoffs. Fundamental assumptions of game theory are that individuals (a) can make rational choices based on cost-benefit analyses, (b) share a common knowledge of this rationality, and (c) make the same inferences on gameplay (Hargreaves-Heap & Varoufakis, 2004). Well-known examples of games include prisoner's dilemmas (Poundstone, 1993), the tragedy of the commons (Hardin, 1968), and the stag hunt (Skyrms, 2004). Games are defined by a set of strategies available to players and payoffs associated with the strategies, which together determine the rules of the game and allow players to predict others' decisions and respond to them in the way that maximizes their own payoffs.

Despite the assumption that all players are rational, game theory posits that collective outcomes are not always optimal, demonstrating how in reality a group of rational individuals often fail to coordinate and thus produce suboptimal collective outcomes (Von Neumann & Morgenstern, 1953). For instance, in a two-person

prisoner's dilemma, rational players would choose to defect out of self-interest even though they know that cooperation pays off better collectively than mutual defection (Axelrod & Hamilton, 1981). Many social situations have been modeled by different games, each of which has a unique set of strategies and associated payoff structure that best represent the situation in question. Online participation, which involves individual decisions leading to coordination or not, is one situation to which such games can be applied.

Among various games studied in game theory, we focus on the dilemma that players face in the stag hunt game, which resembles those observed in online participation. In brief, the stag hunt game models a dilemmatic situation in which players must choose between two strategies, namely hunting a stag or hares. Stag hunting offers higher payoffs but is riskier in that payoffs are not guaranteed; in contrast, hare hunting offers lower payoffs that are always guaranteed. Stag hunting is akin to the risky, active creation of online content without the guaranteed rewards in online participation, whereas hare hunting is the safe, passive noncreation of content. The stag can be understood as achievement of social goals, such as spreading messages, gaining public attention, nurturing communal support, and the availing or enjoyment of online content that are products of one's and others' actions; hares can be understood as self-gratification or the availing and enjoyment of content that are products of others' actions alone.

By adopting a game-theoretic perspective, this article proposes a framework that conceptualizes online content based on its relational properties and further develops hypotheses about their impacts on online participation. The rest of this article is organized as follows. First, we discuss the conceptual relevance between online participation and the hypothetical situation modeled by the stag hunt game. We then introduce our framework of online content based on the discussion. Examples of online content are raised to explicate the framework. We conclude with the theoretical implications of our framework. Given game theory's extensive history and praxis, the reader is advised to refer to other sources for an in-depth discussion on game theory, games, and their applications (e.g., Hargreaves-Heap & Varoufakis, 2004; Von Neumann & Morgenstern, 1953).

Online Participation and the Stag Hunt Game

A Brief Overview of the Stag Hunt Game

This section expounds on the conceptual relevance between online participation and the stag hunt game. The stag hunt game serves as a useful model of online participation at the collective level and at both single and multiple time points. Originating from French philosopher Jean-Jacques Rousseau (1999), the stag hunt game describes a minimal group situation involving two players who must decide independently whether to hunt a stag or hares (Skyrms, 2004). To successfully hunt a stag, which confers a greater payoff than the hare, the two players must cooperate and risk one's counterpart defecting and oneself ending up with nothing. In contrast, capturing a hare requires only one player, thereby minimizing such a risk and yielding smaller payoffs. This produces two stable Nash equilibria, which reflect how both players choose the same strategy and neither has anything to gain by changing only their own strategy. One of the Nash equilibria is social cooperation (i.e., both choose to hunt a stag together), and the other is private safety (i.e., both choose to hunt hares individually). Figure 1 shows a typical payoff matrix in a stag hunt game. If the players do not foresee the other would cooperate, both choose the surer, hare-hunting option. If they

are willing to take the risk, both choose the cooperative and more rewarding stag-hunting option. A player starves when he opts to cooperate and hunt a stag while the other chooses to hunt hare.

Player 2

	Stag hunting (Cooperation)	Hare hunting (Safety)
Stag hunting (Cooperation)	5 / 5	2 / 0
Hare hunting (Safety)	0 / 2	1 / 1

Player 1

Figure 1. A payoff matrix of the stag hunt game. The two numbers in each cell indicate the payoffs of Players 1 and 2, respectively.

"Stag Hunting" in Online Participation

The stag hunt game models a social situation in which individuals face a dilemma between the riskier but greater reward (i.e., social cooperation) and the guaranteed but lower payoff (i.e., private safety). It elucidates coordinated behaviors, or the lack thereof, observed in online participation. At the minimal group level (i.e., two users), the stag hunt game reflects a situation where each user must decide whether to contribute content online (hunt a stag) or to remain passive by lurking (hunt hares). Even the contribution of modest content can be significant (Bighash, Oh, Fulk, & Monge, 2017). When two users coordinate and contribute, more content is shared and available for enjoyment; when both fail to achieve coordination and remain passive, no content is shared and made available. In the latter scenario, enjoyment relies on content created outside the minimal group setting. Where only one of two individuals contribute, content is made available to the passive individual while costs and risks are incurred by the active participant.

Because it requires other players' cooperation, which is uncertain, stag hunting is risky and not always successful. A stag hunter loses his payoffs in choosing to cooperate when the other player decides to hunt hares on his own. Meanwhile, the hare hunter retains his guaranteed payoffs at little or no risk. Individual payoffs of hare hunting are guaranteed with or without others' cooperation, such that the hare hunter enjoys content while experiencing no risk from not creating content. Online content creation is largely ambiguous and associated with multiple risks, including opportunity costs of time and effort, privacy risks, receiving disapproval, and potentially hurting one's reputation (Khan, Swar, & Lee, 2014). Participants who are risk averse likely remain passive lurkers (Girtz, Hill, & Owens, 2017). When one player chooses to hunt hare and the other chooses to hunt stag, risks are relegated to the stag hunter. Following this line of reasoning, online participants would prefer passive noncreation to active creation of content, while enjoying content created by others.

Notwithstanding, active creation of content is plausible when it requires minimal time and effort (Capraro, Rodriguez-Lara, & Ruiz-Martos, 2020). This means that content creation requiring little resources from contributors, perhaps because of technological affordances and their individual competencies, could facilitate content creation. Technical and stylistic differences are discernible across forms of content, which impact their uptake and degree of proliferation. Levels of activity are differentially influenced by perceived competence, skills, motivation, age, gender, and socioeconomic status based on artistic forms (Blank, 2013; Correa, 2010; Hargittai & Walejko, 2008; Hoffmann, Lutz, & Meckel, 2015). Individuals who are skilled in specific creative activities (e.g., video production) can participate more through the corresponding online content (e.g., vlogs, music covers) and in more diverse ways than their counterparts who are less trained.

The stag hunt game assumes that players can find the best strategy that maximizes their payoffs over time through reinforcement learning (Jara-Ettinger, 2019; Lahkar & Seymour, 2014; Roth & Erev, 1995). In reinforcement learning, individuals "learn" what strategy would maximize their own payoffs by continually updating their strategies based on past experiences of successful and unsuccessful choices (Skyrms, 2004). Content creation reflects such an evolving scenario. For online participants, the decision to create content depends on the varying levels of risks and rewards in generating and sharing content. To illustrate, assume that one is creating content for the first time using basic smartphone capabilities. Simply clicking on the "like" button or producing a word post involves less effort than creating a five-minute video clip from one's digital album. Users can also easily recreate a word post following their failure to generate a well-received one. However, given the higher costs involved, users would arguably be more hesitant to produce a second clip after previous failure. Here, the decision to contribute repeatedly depends on behavioral modifications through reinforcement learning during the ongoing participatory process.

Whereas stag hunt games usually assume pairs of individuals, groups of more than two individuals are common in reality. Contributors and lurkers coexist as groups in the stag hunt game beyond the minimal group setting (Luo, Liu, & Chen, 2021; Pacheco, Santos, Souza, & Skyrms, 2009). Proportions of contributors and lurkers can shift dynamically because individuals interact and switch choices by observing and responding to others over time (Easley & Kleinberg, 2010; Young, 2009). Likewise, multiple communities of active and passive participants can be observed in online participation, where individuals congregate or partake based on personal interests, skills, and affiliations.

Still, lurking prevails, and coordination often fails (Battalio, Samuelson, & Van Huyck, 2001; Cooper, Douglas, Forsythe, & Ross, 1990), reflecting the power-law distributions universally observed in boundary-spanning social networks (Clauset, Shalizi, & Newman, 2009; Muchnik et al., 2013). Fortuitously, achieving a state of socially optimal equilibrium and greater participation over time even in the absence of complete information is not impossible (Lahkar, 2017; Van Huyck, Viriyavipart, & Brown, 2018). Trust, or more precisely the propensity to cooperate under uncertainty, can emerge at both local and population levels through random interactions and reinforcement learning (Fang, Kimbrough, Pace, Valluri, & Zheng, 2002), in turn improving coordination in the stag hunt (Bosworth, 2013). Full participation can occur, at least theoretically, when everyone "learns" to cooperate and contribute content.

Overall, the stag hunt game analogy captures the dynamic collective aspect of online participation whereby groups of individuals make decisions to cooperate or not, in view of risks and uncertainty. Although

the choice for safety tends to prevail, groups of individuals continue to coordinate and contribute actively. Some decisional factors that have been discussed thus far include interpersonal risks, efficiency, and trust. It is at this point that we conceive a need to switch the focal lens from participant behavior to online content. Can content mediate coordination differently in the online context?

In keeping with Fulk and colleagues' (1996) theorization involving connectivity and communality, the stag hunt game model of online participation highlights the importance of coordinated, uniform behavior. Stag hunt games often result in either of two equilibria, such that individuals choose cooperation or safety collectively. This means that when content creation is coordinated and uniform, connectivity is high and stable; when creation is uniform but fails to be coordinated, connectivity is stable but low. Content creation and ownership are highly intertwined (Kirk & Swain, 2018; Pierce & Jussila, 2010; Pierce, Kostova, & Dirks, 2003) but are not necessarily consonant (Harwood & Garry, 2010; Levene, Starmans, & Friedman, 2015). Although the discussion thus far has focused on content creation, the dilemma and coordination principles of the stag hunt game can likewise be applied to communality and content ownership, which is an underserved dimension in online participation (Baum & Zhukov, 2019). Appropriately, when ownership is shared, communality is high, and vice versa. It remains a question how online content of variable levels of connectivity and communality can mediate overall participation differentially over time.

Relational Dimensions of Online Content

This article places content at the center of discourse, extending on Fulk and colleagues' (1996) public communication goods and the stag hunt game model of online participation. Based on our framework, online content can differ in important ways to impact participation over time. A framework is proposed that characterizes the wide array of online content along two relational dimensions and that accounts for their relative impacts on participation. Online participation, when viewed from the stag hunt game perspective, represents a situation whereby social cooperation and private safety coexist. It involves two stable and dominant equilibria, where users choose the same strategies, and two unstable alternatives, where users choose different strategies. Our framework integrates coordination principles in the stag hunt with the connective and communal nature of online content in projecting the impacts of content on the overall stability of online participation.

Figure 2 summarizes our framework. It conceptualizes existing content on two intersecting relational dimensions, their potentials for connectivity or cocreation and communality or co-ownership. Briefly, the cocreation potential describes the amenability of content to serve as key communicative devices between groups of individuals; the co-ownership potential reflects the flexibility for content to be accessed between groups of individuals regardless of one's contributions. Respective stabilities in cocreation and co-ownership are achieved when individuals collectively create similar content or choose not to create it, and when individuals collectively own or not own their contributions. Positive feedback loops are generated as groups of individuals repeatedly choose the same behavior with regard to (non)creation and (non)ownership (i.e., reinforcement learning; Roth & Erev, 1995). Further, consonance between these dimensions, that is, the extent to which the levels of two potentials are consistent with one another, is expected to influence the overall stability of online participation. Overall stability refers to how likely users are to continually and repeatedly participate in creating and owning the specific content over time. Our focus on potentialities recognizes how creation and ownership of online content are constantly changing over time, based on individual characteristics, technological affordances and

developments, and commercial interests. Although Figure 2 presents content in four broad categories, online content is more likely asymmetrically mapped across the plane.
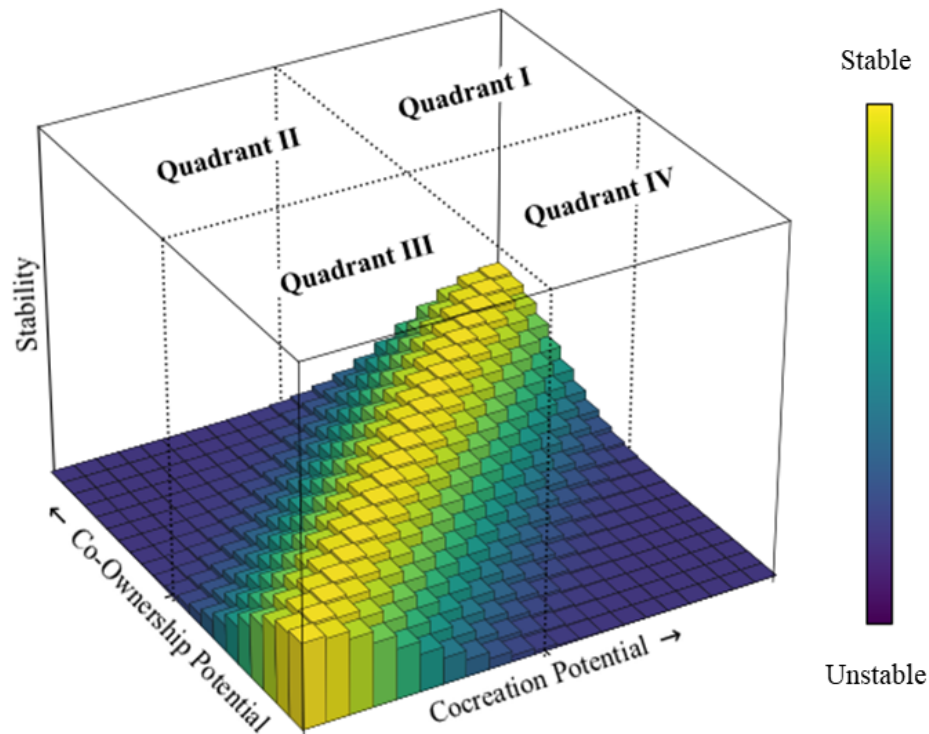
Examples

Quadrant I	Memes, GIFs, stickers, "likes," publicly available text-based posts/comments
Quadrant II	Personal photos/poetry, tweets
Quadrant III	Professional music videos/animations/films, unique digital artworks, organizational ads
Quadrant IV	Copyright free e-books, educational videos, memetic videos

Figure 2. A conceptual framework for online content with examples. Yellow bars indicate high levels of stability, which are found around the diagonal and reflect consonance between cocreation and co-ownership. Blue bars indicate low levels of stability, reflecting inconsonance between cocreation and co-ownership.

Cocreation Potential

The cocreation potential reflects the degree to which content can and will serve as key communicative devices between groups of individuals. Reciprocal communication is critical for coordination and thus participation (Blume & Ortmann, 2007; Chaudhuri, Schotter, & Sopher, 2009; Van Huyck, Battalio, & Beil, 1993). Any factor that affects the ease with which such content can be simultaneously created and understood by at least two individuals comes to play. Artifacts generated by the creative industries, such as professional films, observe lower cocreation potentials (Quadrant III). Professional films are the commercial products of industry, which encompasses audiences, producers, and regulators, and are deliberately produced for reasons of profit and entertainment (Loria, 2020). Pecuniary motivation and the sheer amount of resources required to produce these artifacts mean that they do not serve well as shared communicative devices among online participants. Even though films can reflect collectively derived cultural content (Tudor, 2013), they fundamentally invoke a one-way communication from producers to consumers.

Several factors can boost cocreation potential. Raising the attractiveness of cooperation (Battalio et al., 2001; Brandts & Cooper, 2006; Clark, Kay, & Sefton, 2001; Dubois, Willinger, & Van Nguyen, 2011; Schmidt, Shupp, Walker, & Ostrom, 2003), reducing the opportunity cost of exploring alternative actions (Berninghaus & Ehrhart, 1998; Van Huyck, Battalio, & Rankin, 2007), and high trait patience (Al-Ubaydli, Jones, & Weel, 2013) have all facilitated greater coordination in the stag hunt game. A content creation process that naturally appeals, is low in cost, or does not demand considerable patience can encourage users' willingness to express themselves and respond through the corresponding content, thereby improving participation. Creative activities that evoke intuitive processing, rather than deliberation, could also achieve greater social cooperation (Belloc, Bilancini, Boncinelli, & D'Alessandro, 2019; Zhu, Ritter, Müller, & Dijksterhuis, 2017). That is, content that can be generated spontaneously can and should facilitate their use as a communicative device. One example is the "like" button, which elicits high collective usage rates (Quadrant I).

Online content that makes visible the willingness of the creator to bear intrinsic social risk can likewise enhance their cocreation potential and thus coordination. Coordination in the stag hunt can be improved by such other factors (Devetag & Ortmann, 2007), including informing individuals about others' risk tolerance (Buyukboyaci, 2014) and sharing common knowledge to pick the riskier cooperative option (Bangun, Chaudhuri, Prak, & Zhou, 2006). Internet memes, which are humorous or satirical images with text produced and selectively propagated through the Internet (Barnes et al., 2021; Shifman, 2013), are an instance of online content with high cocreation potential (Quadrant I). Memes are publicly visible, easy to create, and unconcerned with aesthetics. They can mediate unfamiliar and uncertain online encounters by communicating cooperative intent while minimizing the risk of disapproval or dissent. Specifically, overt communications of similarity to signal cooperation can also convey differences and provoke conflict with dissimilar individuals. This poses a risk to the user in an open online setting where anyone can access and react to the content. Memes serve as a mode of covert signaling, which is the "transmission of information that is accurately received by its intended audience but obscured when perceived by others" (Smaldino, Flamson, & McElreath, 2018, p. 1). By disguising messages using humor and satire, memes can help solicit cooperation within and between communities, without engendering outright conflict with dissimilar others. Consequently, risks can be reduced, and coordination can be raised.

Co-Ownership Potential

Ownership is another major dimension in online participation. It may be legally bound or psychologically experienced. A full review of ownership is beyond the scope of this article. Although ownership of content instinctively belongs to their creators, this is not necessarily the case in online contexts (Harwood & Garry, 2010; Levene et al., 2015). Ownership terms and conditions on social media have been unfavorable toward creators themselves (Bosher, 2020). Behind a façade of decentralized technology-mediated ecologies lie media ownership structures that are deeply complex (Pickard, 2015). Exclusive rights can be conferred to an entity that might not be the creator (Honoré, 1961). Legal ownership of online content adheres to a fractional model, where rights are temporary, shared, and purchased in parts (Morewedge, 2021). Problems inadvertently arise when individuals reshape or recreate existing content for which they do not own intellectual property rights (Highfield & Leaver, 2016; Jenkins, Ford, & Green, 2013).

Despite the unfavorable ownership structures and the intangibility of online content, users feel subjective ownership over a range of digital properties (Kirk & Swain, 2018). Online participation could be compelled not only by legal ownership but also by an implicit level of psychological ownership. In psychological ownership, creators who have invested in a content's emergence develop a sense of possession over or experiences an extension of the self to the content (Pierce & Jussila, 2010; Pierce et al., 2003). Therefore, the more one has contributed to a content's creation, the more one would feel a sense of ownership over it; further, the more one feels ownership over a content, the more one would contribute the content. Psychological ownership encourages social media engagement (Karahanna, Xu, & Zhang, 2015), stewardship behaviors toward public goods (Peck, Kirk, Luangrath, & Shu, 2021), intention to share in online communities (Kim, Kim, Jeon, Jun, & Kim, 2016), and quality of online contributions (Lee & Suh, 2015). The distinction between legal and psychological ownership remains arbitrary because psychological ownership can be cultivated by rendering content open source or copyright free, and vice versa.

Here, the co-ownership potential indicates the degree to which content can and will be possessed and accessed by groups of individuals regardless of one's contributions. Content with high co-ownership potential is that whose possession and access are unaffected by individual contributions. Such a content is nonexcludable, and online participants are "free" to possess and access it. Examples include publicly accessible GIFs and "likes" (Quadrant I). Artifacts from creative industries possess low co-ownership potential (Quadrant III) because access is determined by willingness and ability of individuals to contribute to their production (e.g., by paying subscription fees). Copyrights, a profit-driven intent, and the significant amount of resources required to produce professional films also mean that films cannot be co-owned, accessed, and subsequently modified by the broader online community with legal impunity.

Factors that enable replication or modification of the content, including those made by users who are not already part of the ensuing communication, are pertinent to the co-ownership potential of content. The probability of coordination success in the stag hunt is raised by enabling repeated encounters (Clark & Sefton, 2001; Schmidt et al., 2003) and the possibility of observing prior actions (Duffy & Feltovich, 2002, 2006). At the outset, any content that can be frequently reproduced or altered without social disapproval or legal repercussions will exhibit a high co-ownership potential and thus enhance participation in their creation, ownership, and consumption. Movie quotes and other adages are one such instance (Quadrant I).

Memes constitute another example because anyone can remix or repurpose images and text at will in their generation and propagation. In fact, memes have been shown to "invite alignment around a collective identity," fostering communal ties (Newton, Zappavigna, Drysdale, & Newman, 2022, p. 1).

High co-ownership fosters communities by the sharing of a common pool of content. Such communities are pertinent in online participation as teams are superior to individuals in coordinating optimally (Feri, Irlenbusch, & Sutter, 2010). Even though large and unstructured social networks can hinder coordination in the stag hunt (Clark & Sefton, 2001; Schmidt et al., 2003; Van Huyck, Battalio, & Beil, 1990), achieving cooperation has shown to be viable through gradual growth and allowing convergence toward greater coordination over time (Devetag, 2003; Weber, 2006). Put another way, content that cannot be collectively owned and manipulated constrain repetitive contact between individuals and content, as well as limit the possibility of learning about others' intent through behavior. Thus, content with restricted access, such as privatized personal photographs (Quadrant II), are likely to "undermine" coordination and encourage free-riding. Contrariwise, high co-ownership of content facilitates convergence toward coordination by maintaining large-scale and time-independent access.

Overall Stability of Participation

Both cocreation and co-ownership potentials characterize the degree of collective behavior involving online content at a single time point. A third temporal dimension (the vertical axis in Figure 2) captures the overall stability of participation (how likely users are to sustain and create and own the specific content over time) resulting from the consonance between cocreation and co-ownership. As alluded to before, creation and ownership are not always in alignment. Figure 2 shows a color gradient, where lighter shades indicate highly stable participation or nonparticipation. Quadrants I and III represent high overall stability over time, where levels of cocreation and co-ownership are consistently high or low. In contrast, Quadrants II and IV fall within the darker shades and reflect unstable states of participation, where levels of cocreation and co-ownership are unbalanced. When levels of cocreation and co-ownership are consonant, participation grows or diminishes in tandem over time, producing stable outcomes. When the two levels are unbalanced, participation grows or diminishes haphazardly and remains in a state of flux until overall stability is reached.

Internet memes and artifacts from creative industries demonstrate consonant levels of cocreation and co-ownership. Theoretically, then, they exhibit highly stable participation rates. That is, user creation and ownership of memes are expected to remain high over time (Quadrant I), and those of professional artifacts remain low over time (Quadrant III). Whereas professional artifacts like films have been implicated in extended social discourse and action (Rosenstone, 2014; Tan, 2013), materialization of downstream social processes manifests not as entire films but as memes, reaction videos, and questions-and-answers on forums, etc. (Jenkins, 2006), which possess relatively higher cocreation and co-ownership potentials.

Uneven levels of cocreation and co-ownership, where cocreation is high and co-ownership is low and vice versa, produce unstable participation. This means that given a mismatch between levels of cocreation and ownership, groups of users are less likely to repeatedly create and own such content. Content like privatized personal photographs (Quadrant II) is likely to shift toward high co-ownership (e.g., by

changing privacy settings), facilitating coordination, or low cocreation in that people simply do not post and thus dampening coordination. Contrary to personal photographs, copyright-free e-books (Quadrant IV) hold low cocreation but high co-ownership potential. Few would be incentivized to produce for free a book that incurs high cost. Writing a book incurs significant resources, so it is unviable as a real-time communicative device. Still, copyright-free e-books possess a high co-ownership potential because people can and will make use of, reproduce, and alter content simultaneously without legal or social repercussions. As with personal photographs, copyright-free e-books will shift toward high cocreation (e.g., depending on values of social consciousness), enhancing coordination, or low co-ownership, because people deem them dispensable and thus diminishing coordination.

Theoretical Implications

Our framework offers a means to characterize content in online participation in terms of their relational properties. It is undergirded by a largely rational, game-theoretic perspective. In particular, the proposed framework applies coordination principles in the stag hunt game to Fulk and colleagues' (1996) conception of communication goods. States of stability could then be theorized, such that collective (non)creation or (non)ownership predicts greater stability. Positive feedback loops are generated as groups of individuals repeatedly choose the same behavior with regard to (non)creation and (non)ownership. Instability in cocreation or co-ownership occurs when two individuals or groups choose different strategies. Finally, our conceptual framework extends on work on the stag hunt game and Fulk and colleagues' (1996) theoretical conception by further considering how consonance between collective creation and ownership impacts overall stability or sustainability in participation.

Future work includes empirically examining the relationship between creation and ownership in affecting active contributions, as well as the specific psychological factors that influence these potentials and disturb the overall stability of participation. Indeed, behavioral game theorists (e.g., Camerer, 2003) have challenged the assumption of human rationality and demonstrate how psychological biases (e.g., loss aversion, concerns about fairness) impact decision making, including the choice to contribute content. Extensive research in group dynamics has also shown that performance is influenced by situational and individual factors, such as group structure and personality traits (Forsyth, 2018). Future research should illuminate the individual, group, and situational factors that affect levels of cocreation and/or co-ownership of various content and, with our framework, relate these factors to the overall stability in online participation.

Other areas of research include clarifying the trajectories of online participation, such as whether unstable states (Quadrants II and IV) necessarily precede stable states (Quadrants I and III). This entails quantitative work examining the thresholds between high and low cocreation or co-ownership potentials, as well as between stable and unstable participation. Emerging factors like media affordances and technology developments could also influence participation. Before, photography and videography used to necessitate sophisticated tools. Now, they are easily accessible through point-and-click personal mobile devices. Artifacts produced using emerging technologies involving virtual reality and augmented reality can likewise foresee greater participation if they were made similarly easy. Nonetheless, based on our conception, high and stable participation cannot occur simply by making

technology access and content creation easy. Rather, it is only possible when groups of individuals have this access and will to create and own them collectively.

Apart from informing empirical work, a second implication relates to policymaking. In what ways can states or corporations encourage greater and stable online participation? Ownership remains a highly contentious and underserved issue today, following a global trend toward increased consolidation among a minority (Baum & Zhukov, 2019). This means that the nature, subject matter, and volume of content accessible by large social networks are controlled by a few who hold power, which can in turn affect how and in which content individuals within these networks participate. How should we structure or restructure new media ownership to promote greater participation? Based on our conceptualization, it is hypothesized that stable participation can be encouraged by facilitating the formation of collectives of creators and giving these collectives greater ownership over their products. To this end, more work may be necessary to distinguish between the impacts of legal vis-à-vis psychological ownership of online content. How profits are distributed (e.g., among individuals, collectives, and social media providers) will be implicated. Clarifying these questions likely requires a cross-disciplinary effort to identify variables in ownership structure that can raise or diminish content creation and ownership over time.

The third implication is theoretical discourse. At present, the study of arts and media can be broadly delineated in two academic paradigms. The first focuses on the aesthetics of creative works, examining stylistic features that render artifacts "masterpieces"; the second emphasizes their representations of society, examining elements and content that reflect, exaggerate, or reimagine the prevailing ideologies and practices. These approaches neglect the embodied and participatory experience brought forth by technological advancements (Asenbaum, 2021), namely, that creative works by the masses can construct our experience and that creative production is no longer a one-way affair by industry practitioners for consumers. Our game-theoretic framework introduces a relational paradigm to systematically explore this evolving phenomenon. By conceptualizing content creation as a dynamic collective process, it also provides a frame to test abstract theories of participatory arts and media. With the emergence of generative artificial intelligence (AI) and its potential applications (e.g., image and video synthesis, text generation, data augmentation, and chatbots), future theoretical work exploring how the framework extends to human-computer interactions will be helpful. For instance, can users cocreate and co-own an AI-generated artwork? Where appropriate, further theoretical expansion could consider how the machine fits within our framework.

Although we have discussed how the relational properties of online content impact participation, this does not imply that passive participation or nonparticipation is undesirable. Passive participation or nonparticipation can serve as intentional political action (Casemajor, Couture, Delfin, Goerzen, & Delfanti, 2015; Lutz & Hoffmann, 2017). Lurkers can also be beneficial in advertising-based remuneration systems, given that passive viewing raises view counts and generates income for creators. In addition, it should be highlighted that our framework does not support one content to be superior to another. It simply provides a structure to examine inconspicuous online socialization processes. Our framework also does not preclude the possibility for specific content to overlap between categories or shift from one category to another. Cocreation and co-ownership potentials can change. For instance, what used to be a corporation-owned copyright image (e.g., movie poster) can eventually be copyright free (through sectioning and partial

appropriation), which can then be repurposed and propagated as a meme. The framework helps serve as a basis to classify and compare statuses of the same online content at different points in time, as well as statuses of different online content at any one time point. Following our line of argument, their impact on participation can be hypothesized and investigated. Future work should assess the feasibility of our framework by conducting experiments using different content.

Conclusion

This article presents one framework to conceptualize online content from a game-theoretic and relational perspective. It is premised on the view that online content is socially consequential. Such a position complements existing literature that explored online content through specific technical attributes, frames of function and purpose, and the meaning and subjects being depicted. By locating content at the center of participation, our framework offers a common basis of comparison without conflating content as one and the same. It conceives content not only in terms of goods, byproducts, or representations of the physical world but also as dynamic social behavior that can be characterized by their cocreation and co-ownership potentials. A basis of comparison is offered to evaluate participatory effects of content creation that could differ or overlap considerably in technical features and subject matter. Hypothetically, this framework can also be a means to evaluate the evolving implications of "new" content that will emerge from the novel recombination of multimedia or future innovative technologies (e.g., virtual reality artworks and films). Online content makes visible online participation, and a conceptual framework that illuminates this nexus is high time.

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