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The broadcasting trap: TikTok and the “democratization” of digital content production

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Social media and digital production tools have provided a big impulse to the possibility of a democratization of content production. However, enhanced viability does not imply an actual capacity to tap into the opportunity. Research on social media participation shows that content production, and especially the most popular content, is mostly driven by a small elite of super-users, and an additional but still small share of content creators. In this paper, we wonder whether a more recent social media such as TikTok, whose design features are optimized to facilitate content production and to enhance visibility of content from unknown users, actually makes a difference in this regard. To do so, we analyzed the production and networking patterns observed on a large database of 24,992,678 videos posted by 6,973,120 unique users on TikTok between October 2014 and December 2019. We find that in TikTok, the implicit operational logic is that of broadcasting. To spark a real democratization in digital content production, it is necessary to overcome this model and to embrace more radical forms of production and distribution, most notably intrinsically collective forms of online creation. Insofar as content production reflects a broadcasting logic, no targeted changes in the design features are likely to substantially affect the patterns of active participation in social media such as TikTok.

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Introduction

It is often maintained that the rapid development of digital media, and social media in particular, has provided a key impulse toward a democratization of content production (Manovich 2009). Long-established barriers between creators and the public have been broken down, leading to the emergence of new, hybrid figures such as the prosumer, mixing the roles of the producer and of the consumer (Ritzer and Jurgenson 2010). The availability of powerful, cheap digital content production tools that enable self-taught users to quickly reach semi-professional and even professional standards without the need of bulky, expensive, and difficult to use physical equipment (Schön et al. 2014), as well as of pervasive social networking sites that allow everybody to potentially deliver all kinds of content to millions of users without mediators (Miller 2016), has wreaked havoc in the ecosystem of cultural production, delivery, and circulation (Sacco et al. 2018). As the once wide gulf separating creators from the public dramatically narrowed, it was increasingly expected that the blurring of the two roles would have led to a new era in which everybody could be an artist, or at least a content creator.

Whereas, in the light of the above remarks, this is certainly a possibility, it need not imply it is really happening, or at least not at the large scale that one might expect. Having access to the tools for content production does not mean that such tools will be successfully deployed (Brusk and Engström 2021). Opening an account on a social media platform does not mean that such an account will be actively used to post content (Sun et al. 2014). If access to content production technology has become more inclusive, the motivation, focus, and skills needed to create appealing content still call for time, energy, and resources (Ribeiro et al. 2018). Moreover, posting content exposes individuals to the judgment of others, and online interaction often favors aggressive communication and feedback (Recuero 2015). Furthermore, the social currency of online content delivery is the attention and approval of others, and individuals may be wary of sharing content whose reception by others might be delusional (Rosenthal-von der Pütten et al. 2019). There are, therefore, many reasons why the possibility to participate in the digital content production arena might not translate into actual participation.

Within this context, it is therefore crucial to critically examine what we mean by “democratization” in the context of digital platforms. While the term suggests increased accessibility and participation, the reality is more nuanced. Platform democratization encompasses multiple dimensions: access to production tools, visibility of content, distribution of attention, and agency in platform governance (Nieborg et al. 2019). Technical accessibility does not automatically translate into meaningful participation or influence. As Gillespie (2018) argues, platforms operate through complex sociotechnical systems that can simultaneously enable and constrain user agency. For example, the promise of democratized creative expression often gives way to aspirational labor, where content creators internalize market logics and self-commodification practices (Duffy and Sawey 2022). Understanding platform democratization, therefore, requires examining not just the technical affordances that enable participation (Van Dijck 2021), but also the social incentives and constraints that shape how these affordances are actually deployed and experienced by users (Bhandari and Bimo 2020; Bhandari and Bimo 2022). This is particularly relevant for platforms that explicitly position themselves as apparently democratizing forces while potentially reinforcing or creating new forms of hierarchical creation and consumption patterns (Cammaerts and Mansell 2020; Lehdonvirta 2022).

It might be tempting in turn to frame the democratization debate in terms of a simple, clear-cut centralization vs decentralization dyad, but this would not be entirely appropriate. It is,

in fact, difficult to categorize social media as either centralized or decentralized systems, as the reality presents a more complex picture that resists such binary classification. As Plantin et al. (2018) argue, contemporary digital platforms often exhibit hybrid characteristics that combine centralized control mechanisms with decentralized participation patterns. While content creation and distribution on social media may appear decentralized at first glance, with millions of users able to produce and share content, algorithmic curation, data infrastructure, and governance policies often remain highly centralized if not purposefully designed to the contrary (Jhaver et al. 2023). Moreover, the emergence of influencer hierarchies (Sacco et al. 2021) and content creator economies (Pilati et al. 2024) introduces additional layers of informal centralization within ostensibly decentralized networks. This ambiguity between centralization and decentralization is not merely a technical consideration but reflects deeper tensions in how digital platforms mediate between individual agency and institutional control, between bottom-up participation and top-down governance, and between organic content emergence and algorithmic amplification (Houssard et al. 2023).

In view of these remarks, an ideal test bed to assess the extent of active participation in content production by social media users is those platforms that are explicitly designed to remove any barriers to content creation and to encourage and facilitate activity through user-friendly interfaces, interaction formats, and production tools.

Social media typically favor the emergence of patterns where a small elite of super-users monopolize the truly popular content, a minority of contributors generate content that gets some (or no) attention and visibility, and a large majority of lurkers basically enjoy the content created by others (Garfield 2020). Participation on social media is characterized, as a rule of thumb, by a so-called 90-9-1 law (Nielsen 2006; Baeza-Yates and Saez-Trumper 2015), that is, by an approximate distribution of styles of engagement that consists of a 90% of Lurkers, that is, passive users who consume the content of others but do not post their own, 9% of Contributors who post some content, and 1% of super-users who are fully engaged and post most of the content, in particular of the highly popular one.

Such structure is qualitatively not so different from the one that is typical of pre-digital media, were it not for a re-scaling of the pools of super-users and contributors which now are not limited to the tiny number of players who have access to the (physical, bulky, expensive) pre-digital production and distribution facilities but can be counted in the hundreds of thousands, as they manage to secure a niche of interest and attention from a specific community of users, whose size may vary from millions to a few thousands. Such rescaling, however, still reproduces existing socio-economic inequalities, providing most opportunities to people with larger economic and social endowments (Schradié 2011). Traditional mechanisms such as the popularity and visibility of the author of the post, the amount of resources spent to promote the content on the platform, or the role of professional intermediaries still make a big difference, not unlike what happened on pre-digital content markets (Stoldt et al. 2019), although with the major difference that in pre-digital environments reputation and resources were preconditions.

In principle, TikTok has been designed to overcome such implicit barriers to participation (Roth et al. 2021), and this may partly explain why it has quickly surged to global notoriety and relevance (Abidin 2021; Kaye et al. 2021). Owned by the Chinese tech company ByteDance, TikTok is a social networking application that allows users to create and share short videos. In September 2016, the company released the Chinese version, called Douyin, while TikTok was launched in 2017 (Kaye et al. 2021).

Finally, in 2018, TikTok expanded its market and user base, by merging with the already popular social media app Musical.ly. With about 1 billion monthly active users worldwide in 2024, TikTok owes its popularity to teenagers and young adults, who, according to recent statistics, account for over 60% of the user base (Doyle 2021).

The literature has offered various explanations of the popularity of the platform, with special emphasis on its design features (Bresnick 2019; Beer 2019). Some argue that, unlike other platforms, TikTok emphasizes content production over consumption (Beer 2019). Moreover, in terms of interaction formats, TikTok has brought some relevant innovations compared to previous social media, such as the possibility to reuse musical pre-sets within the platform and combining endorsement of choreography or sketches created by users with more direct and traditional forms of mediated interaction (e.g., private messages). TikTok provides users with a rich toolbox that puts sophisticated technology at the service of socially rewarded creative engagement with content creation, including “in-camera speed controls, image-tracking composites, collaborative split-screens” (Bresnick 2019).

Moreover, content posted by unknown users seems to have a higher chance to become popular, and the content timeline is explicitly featuring a selection that draws on different categories of users (niche, amateur, trend, celebrity), promoting exposure of content that would otherwise likely go unnoticed (Yang and Ma 2021). And in fact, the most popular TikTok star, Khaby Lame, a Senegalese influencer based in Italy with more than 162 million fans, started posting on the platform after having lost his job as a factory worker in March 2020. Despite his humble background and modest economic resources, in about two years, he has been able to outperform even the most resourceful and famous personalities, only thanks to the extreme communicative power of his silent videos (Kaye et al. 2022). Indeed, TikTok’s algorithm builds a user’s wall through the selection of relevant content not only on the basis of topological proximity (i.e., how close one node is to another, that is, for example, who you follow or who you are followed by) or from a given view history, but also especially on the serendipitous selection of niche contents that is receiving enthusiastic reactions and therefore have greater potential of intercepting a general audience. We should remember, however, that, in the light of the attention economy, the final goal still is to keep the user’s eyeballs glued to the screen (Zhang et al. 2021).

Apart from such exceptional success stories, are TikTok’s design features sufficient to ensure wider participation and to significantly expand the pool of highly engaged, active users? This question is crucial to assess whether an up-scaled facilitation of content production and exposure, as featured by TikTok, may be a key factor driving wider active participation in the digital content production sphere. At the moment, large-scale empirical evidence that supports this claim is still lacking. Therefore, it might also be the case that such TikTok features that in principle should enable many more users to be active content creators are not actually making a big difference in this regard.

It is therefore not surprising that TikTok has become a conceptual testing ground for scholars working on media democratization and algorithmic literacy. Issar (2024) offers qualitative evidence on how different levels of algorithmic awareness of TikTok users modulate their understanding of the platform’s algorithmic mechanics. Schellewald (2021) documents how TikTok’s affordances are optimally designed to enable rich and varied forms of experience by means of algorithmic personalization, characterizing TikTok experience as a feel-good space where people may pursue highly characteristic forms of social interaction shielded from social obligation; in this regard, TikTok

marks a significant difference with respect to other social media platforms (Schellewald 2023) and is regarded by young users as a provider of new forms of social intimacy in ways that may seem contradictory to older observers (Şot 2022). Siles et al. (2024) illustrate how the process of algorithmic personalization also stimulates users’ agency in the ‘training’ of the algorithm for optimal customization, with subtle socio-affective implications, and this becomes particularly evident in the co-design of the personalized “For you” page between the user and the algorithm (Schellewald 2024). On the other hand, the personalization affordances may also be conducive to new forms of digital activism and algorithmic resistance, although with significant limitations, built into the platform design (Jones 2023).

TikTok is therefore an ideal platform to assess the actual level of democratization of digital content production, being one of the most user-friendly production-oriented social media. Our aim is to explore the patterns of content production and popularity on TikTok using a computational approach, as a means to assess the extent to which the promise of democratization has been fulfilled by the current state of play.

Research design

Our study is based on a secondary data analysis of the Pushshift TikTok dataset made publicly available by Jason Baumgartner. The dataset contains information related to 24,992,678 videos posted by 6,973,120 unique users on TikTok between October 2014 and December 2019. The videos posted before the launch of TikTok itself have been uploaded to the *musical.ly* platform, which has subsequently merged with TikTok. If any video in the dataset has not been deleted from the platform and the inquiring user has a public profile, it is accessible. In addition, for all videos we have the text accompanying the post, as well as information regarding the identity of the user who posted the video. A wealth of metadata related to the video is also available: time of creation, duration and resolution of the video, song used in the video, identification with a specific challenge, number of digs (aka likes), shares and comments, in addition to many other features we do not consider in the present study.

Our research leverages this dataset to critically examine the dynamics of participation and engagement on TikTok, focusing on whether the platform’s design fosters broader user participation and democratizes digital content production. TikTok is often celebrated for its innovative features, such as algorithmically curated feeds and challenge-based interactions, which are said to offer visibility and engagement opportunities even for previously unknown creators. However, these claims remain underexplored at scale and over time. To address this gap, our study integrates different computational analyses to interrogate TikTok’s content production.

The first step of our analysis examines traditional content production and participation metrics. By constructing probability density functions to describe the distribution of video and comments, we investigate whether these metrics are equitably distributed or concentrated among a small subset of highly visible users and videos. This approach allows us to interrogate whether TikTok’s algorithm amplifies content broadly or privileges certain creators.

We then examine challenges’ popularity and user interactions with challenges, a core feature of TikTok designed to encourage widespread participation through creative prompts. We develop a synthetic engagement metric to evaluate the popularity of challenges and their capacity to attract participants. By analyzing the distribution of user participation in challenges, we aim to uncover whether challenges serve as a democratizing force or reinforce existing disparities in participation.

Our analysis also investigates the structural organization of user interactions with challenges by constructing a bipartite network of users and challenges. This network is projected onto a user-only layer to study clustering, influence, and connectivity. Using community detection methods, we examine how participation is organized and whether it clusters around a few central influencers or is distributed across diverse communities. This multi-scalar approach enables us to connect individual interactions to broader patterns of visibility and influence.

Finally, we explore the temporal dynamics of participation by focusing on users and challenges that consistently rank in the weekly top ten percent of engagement. This analysis allows us to study whether TikTok facilitates sustained visibility for a diverse set of participants or if engagement patterns follow cumulative advantage dynamics, where prior success leads to further visibility. Weekly segmentation of the dataset provides insight into whether the platform supports ongoing engagement or favors sporadic bursts of popularity.

Our methodological approach moves beyond surface-level descriptions of engagement to interrogate the logics of participation and visibility that underpin TikTok’s infrastructure. By critically examining these dynamics, our study contributes to platform studies by challenging the assumption that TikTok represents a unique social media space. Instead, we explore whether the platform’s dynamics align more closely with those observed on older platforms, offering new insights into how digital content production manifests at scale.

Results

Popularity and participation. The tendency to post videos and comments is an initial proxy for understanding how much the TikTok environment may or may not incentivize users to create content. In Fig. 1, the left panel shows the normalized histogram of the number of videos posted by individual users, also binned logarithmically for clarity. This distribution, spanning several orders of magnitude, indicates that while most users post only a few videos (or none), a smaller subset of highly active users contributes a disproportionately large volume of content. Such patterns reflect an unequal participation structure, where the majority of content production can be attributed to a relatively small group of highly engaged users. Complementing this view, the right panel of Fig. 1 shows again a normalized histogram of the number of comments received by videos in our dataset. This measure reflects the probability that a video, selected uniformly at random, would receive a certain number of comments, serving as an initial indicator of content popularity. The probability density decays spanning several orders of magnitude. This slow decay is characteristic of a heavy-tailed distribution, where a small fraction of videos receive a disproportionately high number of comments, while the majority garner far fewer.

These initial data confirm that TikTok users are characterized by different levels of engagement with content production,

depending on their motivations and the kinds of rewards that are sought (Bossen and Kottasz 2020). Commenting on the videos of others is a much more popular activity than posting one’s own videos, as might be expected, as the former allows one to interact in ways that imply less personal exposure to others than posting one’s own videos (Meng and Leung 2021; Montag et al. 2021). Comments appear, therefore, as a viable option for people who are not active enough to post large amounts of content but nevertheless willing to cross the threshold of purely passive participation (Barta and Andalibi 2021).

Challenges in popularity, engagement, and participation. Apart from the general production of videos and their related comments that can be found on any social media, TikTok has introduced some relevant innovations to sustain users’ engagement and active participation. First of all, the possibility to reuse musical pre-sets within the platform and the endorsement of choreography or sketches created by users is a trademark of TikTok. These innovations are not merely technical, but also enact new cultural phenomena such as the so-called challenges.

To investigate the popularity of challenges, we considered the dataset containing the top 10% of challenges ($n = 2620$) in terms of average Tot_Eng, that is, for each challenge, consider all the posts in which it appears and compute the average Tot_Eng. We therefore have a list of challenges $c_1, c_2, \dots, c_{2620}$, and for each c_i , there will be a set of users $U_i = \{u_{i,1}, \dots, u_{i,m}\}$ who took part in the challenge.

We can consequently build scatter plots such as those shown in Fig. 2, yielding the distribution of the following three variables (which we will be able to represent in a Cartesian plane by coding the third variable with a color range):

- Percentage of users who took part in the challenge: $\frac{|U_i|}{|U|}$ where $|U|$ is the total number of users;
- Average Tot_Eng of the users who took part in the challenge: Given the challenge c_i and the set U_i of the users who took part in it, we compute, for each $u_{i,j}$, the $TotEng_{u_{i,j}}$, namely the total average of the $TotEng$ of all the posts by u_j before they took part in the challenge c_i . Finally, we attach to each challenge c_i the corresponding $TotEng_i$ given by
$$TotEng_i = \frac{\sum_{u_{i,j} \in U_i} TotEng_{u_{i,j}}}{|U_i|};$$
- The average Tot_Eng of the challenge is measured by considering the TotEng of all the posts where it appears.

The two plots in Fig. 2 highlight different relationships between the three variables defined above. The plot on the left represents popularity vs average engagement of users, and is characterized by two distinct regions: on the leftmost part of the plot, corresponding to relatively less popular challenges, we find that the average value of TotEng for both users and the challenge as a whole is generally in the lower range of the distribution. More

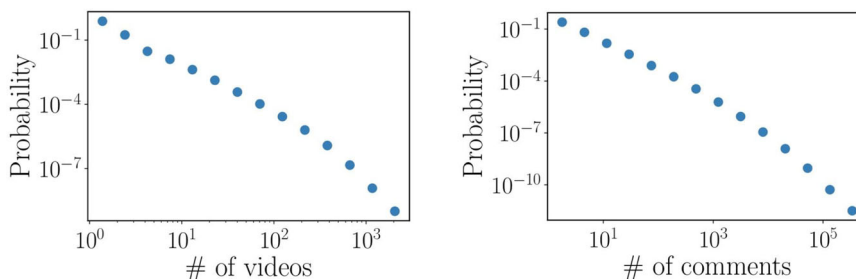


Fig. 1 On the left, a normalized histogram of the number of comments posted in the videos. On the right, a normalized histogram of the number of videos posted by individual users. In both figures, the data have been logarithmically binned for a cleaner representation.

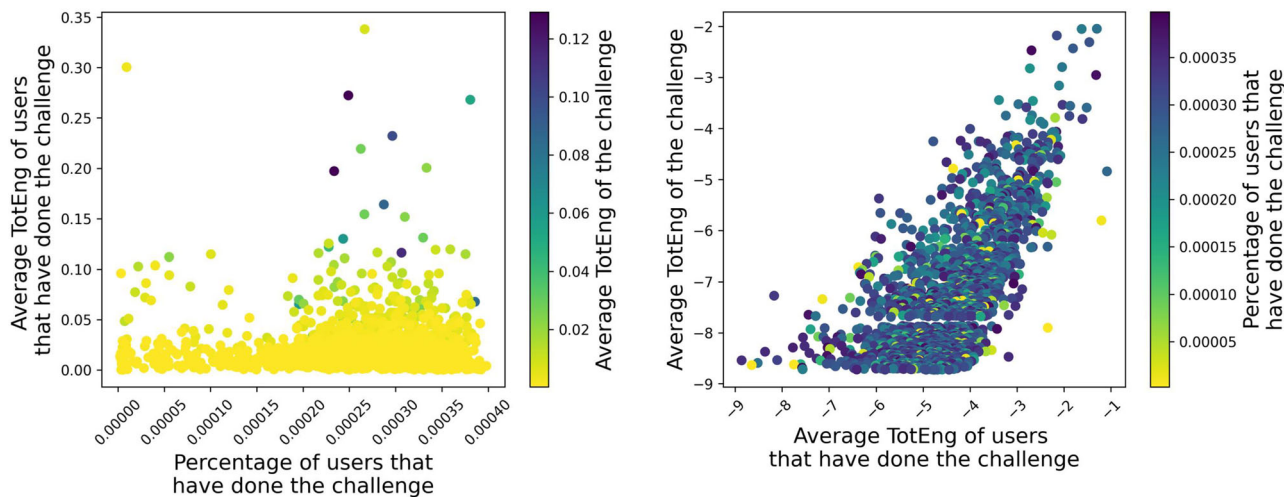


Fig. 2 Two scatterplots detailing the relationship between the popularity of the challenge (as measured by the percentage of users who took part in it), the average total engagement of the users taking part in it, and the average total engagement of the challenge.

popular challenges in the rightmost part of the plot contain various challenges with higher levels of both user engagement and overall engagement, but the bulk of the distribution does not significantly differ either for level of user or challenge engagement from that found for less popular challenges. This suggests that TikTok does not uniformly amplify engagement across the board. Instead, challenges may capture attention initially, but do not necessarily sustain higher engagement levels as they become more popular.

The plot on the right, on the other hand, represents the average value of user engagement vs average value of challenge engagement, and the plot on a logarithmic scale highlights a positive linear correlation among the two variables, as expected. Nonetheless, no clear pattern regarding challenge popularity (coded in color) is found. This uncoupling of popularity and engagement has different implications. Challenge popularity is not the sole driver of engagement. Even niche challenges with lower overall popularity can sustain significant engagement. Engagement may reflect a more fragmented and individualized consumption, where certain users invest deeply in some challenges regardless of their popularity.

To better understand and disentangle this pattern, we turn our attention directly to users' participation in challenges. Our complete database contains $n = 6,980,159$ unique users, and $n = 26,203$ challenges. We can thus define an $m \times n$ matrix where the cell $C_{i,j}$ contains the number of times the user i took part in the challenge j . A first noticeable property of this matrix is its sparsity. The 6,742,836 users took part in less than ten challenges each (median = 1). Hence, as a preliminary scraping, we consider only those users with more than ten non-zero entries (for a total of 204,603). Figure 3 reports the distribution of challenges per user and the distribution of users for a varying minimum number of challenges, for users who took part in more than ten challenges.

To get a more granular picture of the structure of the distribution of challenges across users, we further reduce the scope of the analysis by only focusing on users taking part in at least 50 challenges (which amount to 15,746). The resulting users-challenge matrix contains just 1,440,715 nonzero values over a total of 395,226,488 users-challenge combinations, with an overall density of 0.036, i.e., a sparse matrix. This sparseness of the user-challenge matrix reveals that the majority of TikTok users participate only with a very small subset of challenges.

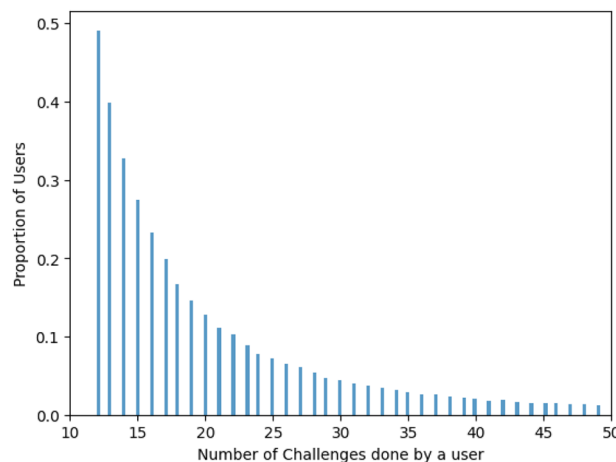


Fig. 3 Distribution of users according to their level of participation in challenges, for users taking part in more than ten challenges each.

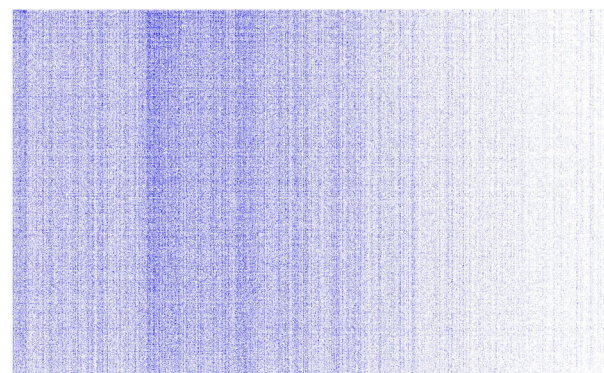


Fig. 4 Sparse user x challenge matrix for users participating in at least 50 challenges each.

In Fig. 4 we provide a barcode heatmap representation of the matrix (users on the rows, challenges on the columns). As we can see, there is no clear separation of users into groups in terms of common challenges. The three more dense, vertical areas found in the matrix suggest that certain challenges achieved widespread viral adoption, transcending user groups. Moreover, as the numerical coding of the challenges reflects their order of

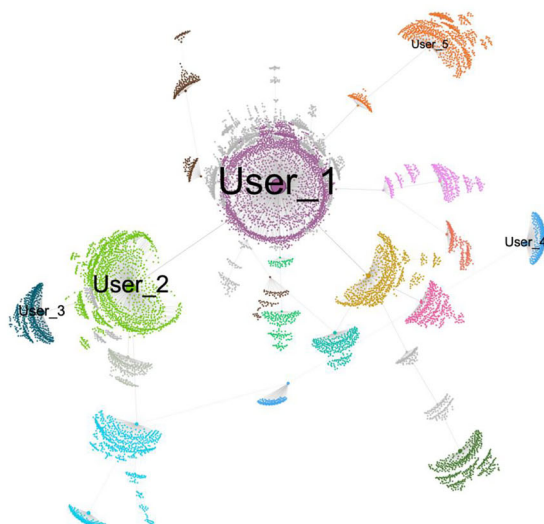
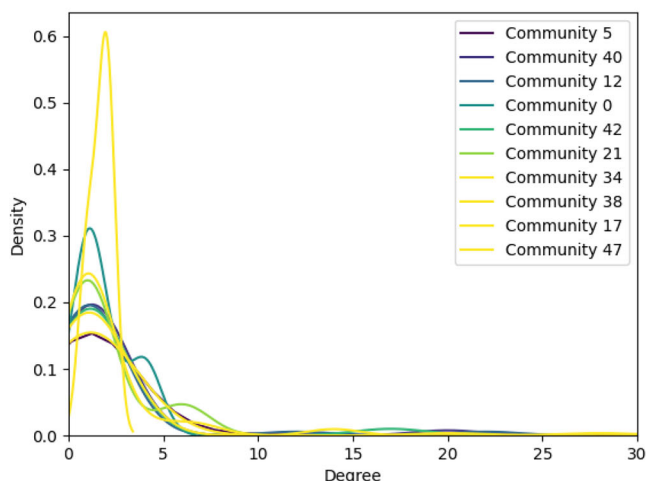


Fig. 5 Left: degree distribution of the ten top communities. Right: network visualization.

appearance, the vanishing density of the matrix moving from left to right suggests a decreasing user participation trend and a faster decay in challenge hype for relatively more recent challenges.

The presence of three prominent vertical bars in the barcode heat map indicates that a small number of challenges achieve widespread adoption, transcending the boundaries of individual user groups. These challenges demonstrate TikTok’s capability to generate viral content. At the same time, the declining density of participation in newer challenges reflects a faster decay in challenge hype, suggesting that while certain challenges achieve virality, their popularity is often short-lived. While TikTok is often celebrated as a democratized platform where any challenge can go viral, these results suggest that this potential is highly constrained. Only a select, tiny ratio of challenges achieve platform-wide penetration, complicating the narrative of equal visibility and opportunity. This aligns TikTok more closely with recurrent cultural production patterns, where a small number of products dominate public attention.

Acknowledging that challenges echo legacy media forms of cultural production, we then focused our attention on the underlying network structures, to understand if the one-wins-all scheme is reinforced by a latent hierarchical form of connection between users that gives rise to a broadcast model. To do so, we constructed a bipartite network of the top 10,000 most engaging users and their associated challenges (10,778 challenge nodes, 250,108 edges, 0.001 density). When projected onto the users layer to examine relationships based on shared challenges, we obtained a network with 10,070,402 edges and a density of 0.2. Notice that both the edges of the original bipartite graph and the projected one are weighted according to the number of times user i took part in challenge j . Since the projected network ends up being quite dense and connected, to provide a more intuitive yet reliable representation of the dynamics of the network, we prune it to its minimum spanning tree. The resulting network consists of 9999 edges with a density of 0.0002; its average degree is 1.9998 with a SD of 12.17. We then run a community detection algorithm, tuning the resolution parameter in order to maximize the partition modularity. In Fig. 5 we find on the left the degree distribution of the first ten communities ranked by the highest degree node within each community, whereas on the right we report the top five nodes (users) with the highest degrees. The resulting network consists of 52 components (community), with a

modularity of 0.838. The network with its communities is visualized in the rightmost part of Fig. 5.

The community analysis through our network approach reveals a characteristic spoke–hub distribution or star structure, with high-degree nodes connected to many peripheral nodes. This topology suggests that even within the supposedly democratizing environment of TikTok, influence on challenges tends to concentrate around central figures who serve as community hubs. The varying engagement patterns of these central users, with TotEng scores ranging across several orders of magnitude (i.e., from 0.000086 to 0.085406), indicate different strategies for maintaining influence, but all still operating within a fundamentally hierarchical structure.

The spoke–hub or star-like structure of the network indicates that influence within TikTok’s challenges is highly centralized. Central nodes (users with high degrees) act as hubs, connecting to numerous peripheral users. These central figures exert significant influence, while peripheral users engage primarily through their connections to these hubs rather than directly with each other, a characteristic that aligns with traditional broadcasting models that favor few, very popular users and content.

Time as a variable on the most popular users and challenges.

After having highlighted how challenges are structurally shaped in terms of popularity, engagement, and participation to better understand these dynamics in their temporal evolution, we analyzed those users and challenges appearing in the top 10% of content by engagement. For this analysis—starting from what we already proposed in the second section of the results—we developed a composite engagement metric (TotEng) combining values of likes (CountDigg), comments (CountComments), and shares (CountShare), each normalized as

$$\frac{m_i - \min_{m_i}}{\max_{m_i} - \min_{m_i}}$$

where m_i is the given value of the metric i and the minimum and maximum values for the metric i are computed on the whole dataset. Then the three resulting normalized metrics are summed together in a new metric $TotEng \in [0, 3]$ standing for the overall engagement capacity of the given post. The probability distribution for the three engagement metrics for users and challenges, respectively, is shown in Fig. 6 below.

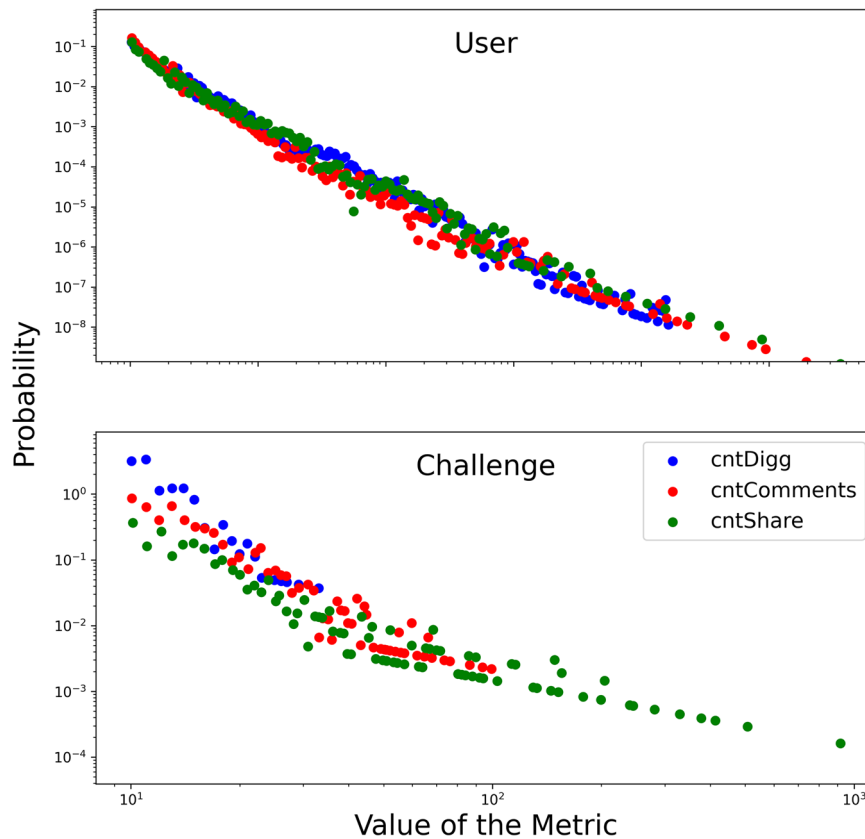


Fig. 6 Top: probability distribution of the three metrics for users, i.e., likes, comments, and shares of the given post. Bottom: probability distribution of the three metrics for challenges. In both figures, the data have been logarithmically binned for a cleaner representation.

We restrict attention to the single entities (users, challenges) belonging to the top 10% of the average *TotEng*. To this purpose, for each entity, we calculate the *TotEng* score for each post in which the entity appears (posted by the given user or related to the given challenge) and we average it, obtaining an overall engagement capacity of the given entity. To analyze the temporal dynamics of engagement, we divide the dataset into time windows on a weekly basis, and we start by focusing upon the time span between two consecutive appearances of an item in the top 10% contents of a specific week. In Fig. 7, each dot represents an entity belonging to the 10%, with users and challenges distinguished by color.

Our analysis revealed a statistically striking inverse relationship between the frequency of appearance in the top 10% and the time gap between appearances. Content creators or challenges that frequently reach the top 10% tend to do so at shorter intervals. Notably, the pattern is nearly identical for both users and challenges. In Fig. 8, different boxplots are shown presenting the distribution of the number of weeks between the *i*th and the *i* + 1th appearance in the top 10% for users and challenges.

This temporal analysis reveals that after an entity first appears in the top 10%, subsequent appearances become progressively easier. For users specifically, while the initial gap between first and second top 10% appearances can stretch to around 10 weeks, by the time we examine the gap between third and fourth appearances, this interval typically halves. Challenges consistently required fewer weeks to reappear in the top 10% compared to users, suggesting different dynamics for content themes vs content creators.

High-engagement trajectories reveal a complex temporal dynamic that goes beyond simple popularity metrics. The inverse relationship between frequency of top 10% appearances and time

gaps between appearances suggests a “rich-get-richer” effect that operates on a temporal dimension. Once users or challenges break into the highest engagement tier, they tend to maintain or increase their presence there, with progressively shorter intervals between appearances. This finding contradicts once more the narrative of democratization on TikTok content production, revealing how TikTok’s most iconic and participative style of content production (i.e., challenges) may actually reinforce rather than distribute well known power-laws. The differential temporal patterns between users and challenges are particularly telling. The fact that challenges consistently require fewer weeks to reappear in the top 10% compared to users suggests that content themes can maintain substantial popularity. This dynamic hints at a platform broadcasting logic that may facilitate content virality while still maintaining traditional hierarchies of influencers.

Discussion

In this paper, we have addressed a so far under-researched but important question: to what extent the availability of increasingly user-friendly social media that are designed to facilitate digital content production is actually contributing to the enlargement of the pool of active content creators and to their popularity? We have focused our attention on TikTok as one of the most meaningful test beds in this regard.

Despite the substantial progress in production facilities and exposure of user content, TikTok does not cause fundamental changes in the patterns of digital content creation on social media, as shown by our results above. If possible, it exacerbates it, providing even more opportunities for the emergence of super-influencers, further widening the participation gap with the majority of users.

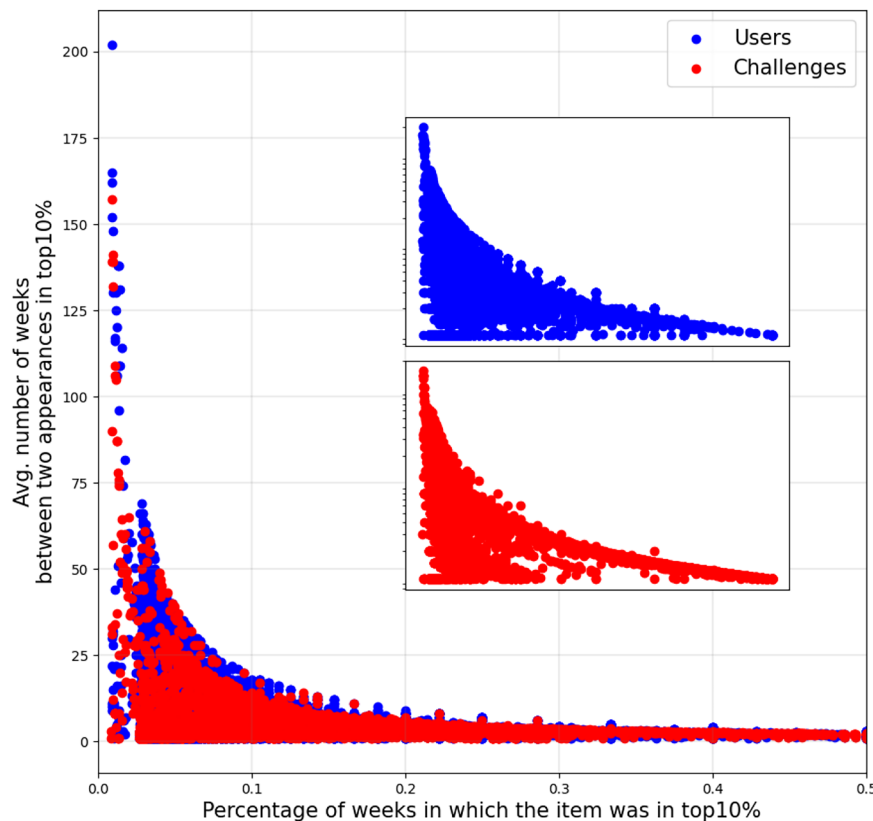


Fig. 7 Relation between consecutive and overall appearances in the top 10% of entities. On the horizontal axis we report the share of weeks in which the entity appeared in the top 10%, over the total number of weeks in the dataset; on the vertical axis, we find the number of weeks that pass on average between two appearances of the given entity in the top 10% of TotEng.

The main reason, simply put, is that despite the innovation it introduced, TikTok does not question in any way the fundamental structure of content production. If broadcasting is the driving principle behind content production, it is almost inevitable that the digital content ecosystem will organize into a small elite of content creators and a large pool of passive users. There is simply not enough space to host too many successful broadcasters, and this remains true even if the pool of potentially active users and the possibilities to produce and distribute content expand dramatically.

The reason why social media actually rescales the pool of content producers but preserves the division between a relatively small group of content creators and a very large number of passive consumers of content is that the experience formats that are enabled by such media essentially replicate pre-digital ones (Sandvig 2015). In particular, social media offer users the possibility to broadcast their own content according to a logic that reflects that of traditional 20th-century media (Juza 2021). What counts is the amount of attention (i.e., the share) that one is able to reach, which can be monetized in terms of advertising revenue (Kopf 2020). Essentially, social media accounts then become personal broadcast channels (Livingstone 2008), and thus ultimately create one's own palimpsest of content to be offered to possible viewers (Flew 2018). The fact that users can comment on such content or interact with the broadcasters is a clear innovation with respect to pre-digital media, but does not essentially change the direction of the flow of communication, that fundamentally goes from the broadcasters to their public, and invites the former to a sophisticated strategic intelligence of the mechanisms that can help them promote the appeal and popularity of their contents (Klug et al. 2021).

As in the case of pre-digital media, the most popular broadcasters, those who get the higher shares of attention, also reap the most of the economic and social benefits, and are subject to the

familiar logic of stardom and popularity that is typical of the 20th century cultural industry (Budzinski and Gaenssle 2018). The most striking difference is perhaps that, due to the substantially higher number of broadcasters with respect to the pre-digital content ecosystems, the life cycle of popularity may be markedly shorter due to higher competition and faster pace of trends creation (Gómez 2019)—with a further incentive for broadcasters to capitalize on their success while it lasts.

In principle, social media could enable much more radical forms of content creation and distribution, most notably intrinsically collective forms of creation (Barrass and Laws 2014) that would break away from the more conventional logic of broadcasting, but these are still in their very early stage (Holdgaard and Klastrup 2014). Such new possibilities are increasingly explored and developed by specific communities of users (Govier et al. 2009; Walmsley 2013). The reason why collective creation might facilitate much broader active participation is that, by disentangling the creative output from the notion of individual authorship and the related social implications, these processes allow individuals to engage in collective play (Rettberg 2005), a form of interaction that is deeply ingrained in human social emotions (Meng et al. 2022), and even to develop new forms of collective problem solving (Lambton-Howard et al. 2020). Interestingly, when social media are used as platforms for collective playful action, active participation is in fact massive, as recently documented, for example, by the r/Place experiment in 2022 on Reddit. r/Place provides a publicly accessible digital canvas that could only be shaped through massive, coordinated action, thereby shifting creative agency from individuals to communities. In the space of its scheduled four days, the experiment saw the active participation of more than 6 million users, a 6-fold increase with respect to the users involved in a previous version of the experiment carried out in 2017 (Lorenz 2022).

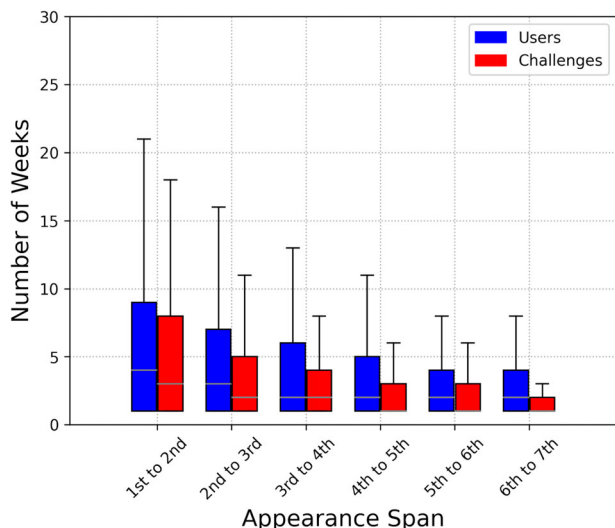


Fig. 8 Number of weeks between two consecutive appearances in the top 10% for users and challenges as time unfolds.

This perspective paves the way for stimulating questions for future research. The first is about the tension between TikTok's broadcasting architecture and emerging forms of coordinated user action. Recent instances of users deliberately manipulating trending algorithms through coordinated action (like mass-reporting or deliberate misuse of hashtags) suggest a growing resistance to platform-imposed individualization is likely developing, although this can be effectively countervailed by algorithmic surveillance and control (Zeng and Kaye 2022). Understanding how these collective practices emerge and evolve could reveal new, not yet fully understood models of distributed digital agency as users increasingly demonstrate sophisticated understanding of platform mechanics while developing counter-practices. Second, whereas TikTok emphasizes individual broadcasting, users increasingly engage in cross-platform collective creation practices, using multiple platforms simultaneously to create distributed narratives and participatory stories (Jenkins et al. 2015). Understanding how these practices emerge despite platform constraints is crucial to tracking the emergence of more collaborative content creation models where users transcend single-platform limitations to achieve collective agency. Third, there's growing evidence of digital communities developing alternative metrics and reward systems that prioritize collective over individual achievement (Maris et al. 2024). These users increasingly develop and share collective understandings of how TikTok's algorithms work. Studying how these kinds of folk theories develop and spread is key to spotting new forms of collective digital literacy that challenge individual-centered platform designs (Karizat et al. 2021).

However, as social media platforms are owned and managed by private parties whose business model is still essentially driven by advertising and user profiling, there is very little interest in enabling such forms of participation. Not incidentally, most experiments are being conducted under the initiative of public institutions or in the public realm (Morell and Hidalgo 2020). On the contrary, digitally empowered forms of broadcasting are perfectly consistent with the extractive, advertising-driven business model and are massively facilitated (Collie and Wilson-Barnao 2020). Therefore, despite that the digital platform economy has been the developer of a disruptive technology that might in principle revolutionize the logic of content production paving the way to new forms of collective creative intelligence (Savage 2012), such economy has no incentive to promote a truly innovative use of their technology, as the financial interest of the incumbent is to force the new content ecosystems into

the old business models to extract as much value as possible from them (Fuchs 2010; Rey 2012).

This is ironically not different from what happened on the eve of the cultural industry revolution at the transition between the 19th and 20th centuries. At that time, Europe developed most of the technology for content reproduction that would have paved the way to 20th century cultural industries (cinema, music, photography, radio, etc.), but tried to force them into the pre-existing value creation models of highbrow culture due to its incumbent position and the level of vested interests related to the preservation of that system, thus consigning the leadership of the new industries to the US (Sacco et al. 2018).

It is interesting to remark again that, unlike the older generation of social media that are all American, TikTok is Chinese. However, instead of developing a truly alternative model with respect to US social media, whose traditional approach is, as discussed above, largely a reflex of the incumbent position of the US creative economy in the global content ecosystem, TikTok actually adopts the same underlying logic of content creation and the associated business model (Daryus et al. 2022). It is reasonable to expect that the next, possibly truly disruptive social media that fully leverages upon the untapped potential of collective creation will emerge outside of the US, in the absence of incumbent incentives to capitalize on the existing status quo. But for this to happen, there must exist cultural environments that do not take the US creative economy as the reference, as it has clearly happened in the case of the development of TikTok, whose design innovation is not a radical alternative to pre-existing social media but rather a targeted improvement of some of their features.

Once again, this is not different from what happened in the early days of cinema, where the implicit model of content production still reflected that of the closest pre-industrial analog, which in the case of cinema was theater—and not incidentally, still today cinemas are also named movie theaters (Brewster and Jacobs 1997). On the other hand, it may also be argued that production of content is not necessarily the only meaningful mode of active participation on social media, and that creation of connections might be as important as creation of content (Villi and Matikainen 2016). However, as broadcasting remains the default mode of content creation, social networking sites indirectly work as amplification systems for the small elite of content creators rather than as an alternative form of collective sense-making.

Insofar as broadcasting is the driving principle, one cannot expect that innovations in the user interface, interaction format, or content filtering and selection may make a big difference in terms of democratization of digital content production. The major change that would make this possible is new forms of collective content creation, where the emphasis shifts from the individual creators to the content created, curated, and maintained by the group. We should therefore consider this stage of development as a historically preliminary one, where technological developments have not been matched yet by the substantial transformation of the cognitive and social attitudes of both business owners and platform users, both of whom still stick to the logic of content broadcasting typical of pre-digital cultural industries.

Data availability

The dataset analyzed during the current study is available from the authors upon request.

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Author contributions

FP designed the research. OA collected the data. OA and MS analyzed the data and prepared the figures. PLS and FP interpreted the results and wrote the paper.

Competing interests

The authors declare no competing interests. PLS was a member of the Editorial Board of this journal at the time of acceptance for publication. The manuscript was assessed in line with the journal's standard editorial processes, including its policy on competing interests.

Ethical approval

This article does not contain any studies with human participants performed by any of the authors.

Informed consent

This article does not contain any studies with human participants performed by any of the authors.

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