DECOUPLING SEARCH TOPIC AND POPULARITY RANKING: INSIGHTS ON ONLINE ECHO CHAMBERS

Sagit Bar-Gill and Neil Gandal

Just as sound reverberates in an enclosed space, so do opinions and information "bounce" among social circles. Since "birds of a feather flock together," these social circles consist mostly of like-minded individuals, making it harder for dissenting views to permeate our discourse, and creating an echo of our own information and views (1). This echo chamber phenomenon has drawn growing concern in post-election USA, post-Brexit UK, and pretty much everywhere in our increasingly connected world (2–4). Echo chambers have always been around as a natural result of our homophilous social choices. But as our social networking continues its shift online, the echoes seem to be getting worse (2, 4, 5).

Who is responsible for our online echo chambers – ourselves or filtering and ranking algorithms beyond our control? Filtering and ranking algorithms are implemented in many of our online environments, creating much-debated personalization of search results (6–9), and holding the potential to influence individual behaviors and aggregate outcomes (10).

Yet the human factor carries substantial weight, too. Bakshy and colleagues at Facebook research labs (11) find that individuals' own choices are more responsible for their echo chambers than Facebook's newsfeed ranking algorithm. In line with this, recent Pew research (12) finds that 83% of social media users ignore political posts with which they disagree.

We primarily examined two factors: The types of users most likely to get caught in content echo chambers, and the role of displaying popularity information (view counts), in facilitating content echo chambers. By creating a simple online environment for content exploration, we broke down search into two dimensions — content topic and content popularity. We then looked at the ways individuals moved through the material. We observed, for instance, the weight that users placed on their own interests versus those of the crowd, and how these patterns relate to an individual's characteristics, such as how social they regard themselves and whether they try to influence others in their social circles (what we term "opinion leaders").

In our experimental environment, susceptibility to echo chambers is well-proxied by: (I) conducting relatively little exploration in the search process, and (II) relying on popularity in content choice.

Therefore, users who conduct little exploration and rely more heavily on the crowd's previous choices will, over time, see less diverse content. As a result, they'll be at a higher risk of getting caught in an echo chamber.

IN THIS RESEARCH BRIEF

- Echo chambers have always been around as a natural result of homophilous social choices. But as social networking continues its shift online, the echoes seem to be getting worse.
- Algorithmic ranking, based on popularity, users' previous searches, clicks, and other factors, is an integral part of search engines, social media, and other online environments.
- Ranking of results has been shown to have a major influence on user choices, and could introduce biases that go unnoticed as users are largely unaware of the mechanisms determining their search results and news feeds.
- Highly social users, those searching in a content space they are already familiar with, and young users, are all at a higher risk of echo chambers.
- Users who consistently search by topics of interest and rely less on the crowd's previous choices were less likely to suffer from echo chambers.

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Opinion leaders – individuals who influence others' opinions or choices (13–20) – are likely to affect their peers' content exposure. We thus specifically studied their search patterns, comparing influencers to individuals who are not opinion leaders.

THE EXPERIMENTAL SETTING

In our experimental search environment, named TED-it, 1,846 study participants explored the collection of TED talks posted on YouTube (roughly 1,600 short videos).[1] Participants navigated using two buttons, Category and Popularity. The Category button allowed users to choose one of 15 content groupings and presented a list of talks in random order, without any ranking. By contrast, the Popularity button sorted the displayed search results by their number of views on YouTube — from most to least popular — or simply sorted all talks by popularity if no category was chosen. Users could click each of the buttons as many times as they like, creating a search sequence. This search journey was the object of our study.

The relationship between search patterns and viewers' social characteristics was further determined by a series of questionnaires, which assessed users' sociability, opinion leadership, and previous experience with TED content, along with some demographics.

As with most content platforms, there are popular TED talks as well as many others with fewer views. We found that generally, people who explored content with less reliance on its popularity metrics ended up at content that is less known by their peers, but more suited to their personal interests. As assumed, users who consistently search by topics of interest and rely less on the crowd's previous choices were less likely to suffer from echo chambers. On the flip side, people
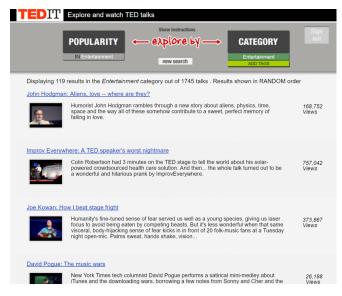

Figure 1: A screenshot with search results on TED-it as it appeared after a user clicked on Category, and chose the Entertainment category.

who relied strongly on Popularity sorting and conducted little to no Category search, were more susceptible to echo chambers in our research setting.

USER CHARACTERISTICS AND EXPLORATION PATTERNS

We examined how user characteristics such as sociability, familiarity with content, opinion leadership and age affect content exploration. We operationalized "exploration" by studying users' search flow in our environment: from their first click, to follow-up clicks, to the type of results they choose, and the chosen talk's location (or, scroll depth) in that list.

Three types of people were most at risk for falling into echo chambers: highly social individuals; those already familiar with TED content, and young users. Each was more likely to rely on popularity considerations and explore less.

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1 TED is a nonprofit organization devoted to spreading ideas, usually in the form of short talks (18 minutes or less). TED stands for Technology, Entertainment and Design, though TED talks today may cover any topic (more at https://www.ted.com/about/). We use TED talks in compliance with their Creative Commons license.

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Additionally, opinion leaders were more likely to explore the videos and had lower reliance on popularity sorting. We found that male opinion leaders in our sample conducted more topic-based exploration and invested more effort in search than male non-leaders. Apparently, these opinion leaders are more likely to seek new avenues for influence, and look for novel content to introduce to their followers that may ameliorate their group's own echo chamber.[2]

We also studied how influenced people are by knowing the popularity of content. With "like" counts and view counts now baked into most online environments, was this information making people more likely or less likely to explore unfamiliar territories?

To answer this question, we randomly assigned users to one of two conditions, where popularity information was either shown or blocked in category-based searches. Interestingly, in our study, only male opinion leaders were affected by the display of view counts, responding to this information by increasing their popularity reliance.

Our study was not designed to uncover gender differences in the relationship between user characteristics and content exploration patterns, however, these do exist. Namely, our regression models and relationships between variables of interest are largely statistically significant for males, and not significant for females, indicating the existence of consistent patterns for men, but not for women.

CONCLUSIONS

Tendencies to conduct limited exploration and rely on peers' past choices in own content choice are likely to lead users down echo chambers, with limited exposure to content that is not in line with their peers' and own views and opinions. Exposure to diverse content may be further limited over time, as user tendencies feed into personalization algorithms. We find that highly social users, those searching in a content space they are already familiar with, and young users, are all at a higher risk of such echo chambers.

Opinion leaders may ameliorate echo chamber concerns within their social circles, due to their tendency to conduct more popularity-independent exploration compared to their followers. However, their inclination to explore is highly sensitive to the provision of popularity information, and curtailed by it.

Should we therefore, suppress or, at least, reduce the visibility of popularity information in our online environments to increase the diversity of content consumed? To the extent that content diversity is a desired end, the answer is yes. Furthermore, in our analyses, there were no statistically significant correlations between users' exploration characteristics, and proxies for enjoyment, such as viewing talks past the mandated time, or watching an extra talk. This suggests that, at least in the realm of curated content, such as TED talks, popular content is not inherently superior to less popular content. Therefore, designing online environments that encourage exploration (e.g., with increased visibility of non-hit content, and reduced visibility of view counts) may alleviate content echo chambers, with little impact on user satisfaction.

While our experiment takes place in a non-standard search environment, it offers first insights as to users' personal preferences for exploration and to the extent to which they would actively seek out ranked results, if given a choice. Future research may extend these results to more organic settings and general content spaces. Still, our results may speak to general concerns raised regarding the growing role of algorithms in our lives 21, 22).

Algorithmic ranking, based on popularity, users' previous searches, clicks, and other factors, is an integral part of search engines, social media, and other online

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2 There were no statistically significant patterns for female opinion leaders in our sample.

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environments. Ranking of results has been shown to have a major influence on user choices (23), has the potential of introducing biases (10), and these impacts easily go unnoticed, as users are largely unaware of the black-box mechanisms determining their search results and news feeds (10, 24, 25).

The null effect we find for the relationship between ranking and user enjoyment, while limited to curated content, indicates that the user experience does not necessarily suffer when ranking is removed. Regulators may use this as support for the case for diversifying search results, at least in domains of national importance, such as news and elections.

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Links to this work are online here.

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