Ideological Homophily and Echo Chamber Effect in Internet and Social Media

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[Abstract] Echo chambers are one of the most relevant themes in modern life. Despite always existing in mild form, current situations in politics and society are greatly affected by the psychological and social elements that create echo chambers because of the internet and social media. Therefore, the extent to which echo chambers affect modern discourse is an increasingly important topic, which has effects on subjects as political issues, public health concerns, environmental issues, spreading of misinformation, and spreading miscommunication.

[Keyword] echo chamber, social network, political discourse, polarization, amplification, ideological segregation, cognitive dissonance, filter bubbles, information cascade, confirmation bias, homogeneity

“Six blind men attempt to determine what an elephant looks like by feeling different parts of the elephant’s body. To the blind man who feels a leg, the elephant is like a pillar; to the one who feels the tail, the elephant is like a rope; to the one who feels the trunk, the elephant is like a tree branch; to the one who feels the ear, the elephant is like a hand fan; to the one who feels the belly, the elephant is like a wall; and to the one who feels the tusk, the elephant is like a solid pipe.” – Jain proverb

[1] Introduction
Over the last decade, social networks have become a fundamental way of life to many people in developed countries. Web 2.0 technologies, those with social aspects, “have facilitated the involvement of audiences in the observation, selection, filtering, distribution and interpretation of events” [10]. The filtering, selection, and distribution aspects are especially relevant because they suggest that people who receive information through social media are receiving information which was first filtered “by their social circles” [10]. Echo chambers function by making general population like the proverbial blind man.

[2] What Are Echo Chambers?
Echo chambers are descriptions of situations in news media that exhibit signs of a “closed” system of information, which affects the current and future information that enters the system. Echo chambers are well-known in various fields such as political science, journalism, media studies, and sociology, but have not received equally serious scientific treatment in psychology. Inside echo chambers, individuals will most be exposed to conforming opinions [14]. This characteristic results from the tendency of individuals to consume content that matches previously held beliefs [14]. As a result, naturally information, ideas, beliefs which match will survive, and other views are either censored or underrepresented. Lack of plurality also encourages lack of debate, as well as tribalism (“us and them” mentalities), encouraging a majority core group of beliefs [13]. In more extreme cases, tribalism also creates censorship and punishment of heretical thoughts or actions, leading to echo chambers become a sounding board of people “who think and act and say things” alike. Over time, existing ideas recirculate within the closed system, and gain further development among members of the enclosed system. Therefore, one consequence is another characteristic effect of echo chambers, which is not only reinforcement of previously held beliefs, but the amplification of preexisting beliefs to become more extreme over time.
The concept of echo chamber effect has existed well before existence of modern media. The echo chamber effect exists anywhere where information is spread through enclosed systems. Religions, especially cults, form on the basis of the echo chamber effect, relying on a combination of controlled medium of information, homophilic ideology, confirmation of received information, social desirability, and other psychological principles to shape access and interpretation of information.

The role of technology aids amplification of the echo chamber. Before internet and social media, communication technology of printing press, radio, television, and other forms existed to theoretically spread ideas. These contributed to diversity of ideas and democratization of information, but could also be used to influence information flow and interpretation. With each new form of information diffusion, information could spread faster and reach wider audiences than before. In cases of enclosed systems, however, technology functioned by accelerating spread of information, which reinforced the preexisting ideas.

In recent years, effects of modern technology has greatly accentuated the range and effect of the echo chamber effect. While social interaction has always affected dissemination of news [3], spread of internet usage, online publishing, social networks, and search engines led to dramatically lowered costs to produce, distribute, and discover news, now virtually free for users to create and disseminate content [4], and to reach many people [20]. Especially, the open nature of the internet and social media and wide availability of user-provided content allows people to find others with common interests, worldviews, and narratives [7].

The expansion of information sources erodes the “monolithic” nature of information from several outlets and spreads it across so information can be both provided and consumed by the same source (through sharing information). The decreased barriers also increased range of use from all population, which created many opportunities for businesses and organizations. For example, news organizations are rushing into social media, viewing services like Facebook and Twitter as opportunities to market and distribute content [10].

A crucial factor in the modern echo chamber effect is that social media are becoming central to the way people experience news [3]. Basis of social media suggests intrinsic difference from previous forms and also more powerful is because of personalization of content. Networked media technologies are extending the ability of users to create and receive personalized news streams [3]. The new media is driven by machine learning [3]. Machine learning operates through algorithms and is used by search engines, news aggregators, and social networks. The algorithm is engineered to recommend content (information) automatically, often with the specific purpose of gaining users to stay on the website or application. The content which is recommended is specifically content which individual is likely to agree with, driving users to subject to confirmation bias and creating “filter bubble.” Therefore, algorithms, through automatic recommendation of content and machine learning, can amplify ideological segregation. It is suggested in this paper that scarcity of information bandwidth in the human mind is exceeded by modern information climate, so the human mind must rely on heuristics which are appropriate to pre-information era architecture. These heuristics aid in the formation of echo chambers.

Multiple studies have established existence of echo chamber effect in social media [5][17]. Social networks are characterized by strong attitude-based homophily and segregation, and show clear tendency for conversation to become polarized [11]. This phenomenon is generally established as interactions occur more often between users who share the same sentiments and less often between users who do not [9]. General population, without external agents, interacts only with like-minded others, which over time creates communities dominated by a single uniform view [17]. Homogeneity appears to be the primary driver for the diffusion of contents [7]. This selective
exposure to content is the primary driver of content diffusion and generates the formation of echo chambers [7]. Communication becomes positive and reinforcing, and pushes strongly into polarization [17]. Combined, homogeneity and polarization are main determinants for predicting size of information cascade [7].

However, recent studies have suggested that magnitude of the social network effects are relatively modest [04]. Vast majority of online news consumption is accounted for by individuals simply visiting home pages of favorite news outlets, which are usually mainstream, which results in tempering of consequences, both positive and negative, of recent technological changes [04]. Also, effects of polarization and echo chamber are less and communities may form where attitudes are mixed, defined by people who disagree with others and express negative attitude toward other opinions, but only slightly, leading to “open forum” situations [17]. In open forum situations, mixed-attitude communities have shown to reduce polarization and stimulate debate [17]. In minority of cases, social media can lead to greater ideological diversity by increasing in individual’s exposure to material, especially in political matters [04]. Similarly, social media platforms facilitate exposure to messages from those to which individuals have weak ties, which increases likelihood that individuals are exposed to novel information, even more than through offline [16]. Because weak ties usually exist between people who are politically heterogeneous, not in citizens’ immediate personal networks, diverse exposure can reduce overall political extremism [16].

Contrary to conventional understanding of echo chambers, there is evidence that social media usage, in certain cases, reduces mass political polarization, since most social media users are embedded in ideologically diverse networks [16].

Current research suggests that polarization, which determines formation of echo chambers, open forums, or mixed-attitude communities, is format dependent [20], meaning each social media echo chamber has its own cascade dynamics [7]. On Twitter, exchanges take place among people of similar ideological preferences but only on political issues [20].

Mixed-attitude communities and bipartisan attitudes typically form exchanges on current events of non-political nature [20]. These divisions are not static, and polarization levels vary significantly as function of time and topic [20]. Certain events can be dynamic, starting as bipartisan but shifting to polarized, suggesting that certain events which contain political elements can be filtered. The reverse situation also applies, some others start as polarized exchange but evolve over time into bipartisan conversation [20].
How Do Echo Chambers Affect Discourse?

Currently, the “echo chamber” effect has been analyzed in the context of two major areas: mainly in politics and political participation, and also social issues of environment and health.

In politics and political participation, new media (social networks, internet-based publications) have increasing importance in politics, especially in young people [12]. This situation has occurred in politics because peer-based, interactive, non-hierarchical nature of politics online encourages participation from young generation and because the ability to reach large audiences and mobilize others via social network in easy, efficient, inexpensive manner [12]. Online social media and social networks become increasingly important forum for public debate [11], setting and shaping agendas, giving participants ability to exert greater agency and giving greater creativity [12]. Internet and social media overall increase sources of information, circumventing traditional gatekeepers of information and influence (newspaper editors, political parties, interest groups, large institutions) [12]. End result is lack of deference to elite institutions [12]. In addition, traditional gatekeepers, responding to changing power dynamics, facilitate negotiation of political power and control with traditional political entities that wish to engage participants [12]. With combination of factors, this effect has been accentuated.

In general, exposure to political diversity leads to positive effect on political moderation. In some cases, effects of social media have been found to have positive. Social media has shown limiting effects of “spiral of silence,” which was the theory to explain why the view of a minority is not presented when the majority view dominates the public sphere and isolates the minority view [5]. This is viewed as consistent with “overall reduction of monolithic information output” [5]: “the proliferation of social networks has allowed people to exchange views online, with concealed identities, to limit “spiral of silence” behavior and increase diversity of minority opinions by removing fear of identification that prevents minority opinions from expression” [5].

Ideology has been shown to make a difference as well when forming echo chambers [20]. Regarding both political and non-political issues, liberals were more likely than conservatives to cross ideological boundaries for discussion [20]. This point highlights an important asymmetry in online communication that is consistent with psychological theory. Specifically, conservatives strongly favor, compared to liberals, to minimize uncertainty and threat and social discord. This psychological neediness may be a motivating factor to cause conservatives to seek familiarity which exists in echo chamber [20].

Outside of political issues, echo chamber effect has also been studied through network analysis in context of general information diffusion and flow, specifically in health field and climate change [9] [17]. Echo chamber effect has been observed in spread of negative vaccine sentiments [9]. Generally, the character of online social media creates environments that allow misinformation to spread easily [7]. First, it allows for unsubstantiated information (rumors, conspiracy theories) to spread quickly, often causing “rapid, large, but naïve social responses” in response to news [7][9]. This effect has been seen in dynamics of health behaviors in social networks, when rumors of conspiracies about novel vaccines led to negative vaccine sentiments in clusters of areas of the United States [9]. Because of clusters of negative sentiments, increased clusters of unprotected individuals increased likelihood of disease outbreaks, which becomes public health concern [9]. Similar to this situation, echo chamber has been evidence for rejection of global warming evidence [17].

Issues Concerning Echo Chamber Effect

Understanding how information is distributed and disseminated in the 21st century requires greater critical thinking [19]. However, most current media models encourage methods of information exchange that actively discourage greater critical thinking. For example, creation of communities through internet forums, discussion groups, Facebook groups, and Twitter follows is fundamentally driven by and encourages the wide availability of user-generated content (memes, viral content) [7]. Twitter has artificial 140-character limit built
into the model, while other information sources shift their layout to better match “sharing” and “viral” models. Also, sheer volume of information may discourage active engagement with longer material, creating “tl;dr” culture (based on internet acronym “too long; didn’t read,” which is used to dismiss shared information which is too long and time consuming). Sharing information in this format sacrifices complexity, which accentuates the problem because increased simplification over time becomes oversimplification.

Currently, another important social aspect of echo chamber effect can be seen in fake news, which can spread virally and find support in ideological filter bubbles. Fake news can be created while sharing elements of truth, but created to catch attention and to be shared virally [21].

In a study of information shared on Twitter, Barber noted that “the less truthful the content, the more frequently [the content] was shared” [19]. While scientific information can often be traced, the origins of conspiracy theories are difficult to identify [7].

More people are using social networking websites, such as Facebook and Twitter, not just as primary, but often sole entry into social and current events [3][10]. In some instances, social networking users report twice as likely to receive news from people they follow on social media than from news organizations or individual journalists [3]. Also, because traditional barriers and authorities of information are growing weaker, younger generation are “looking to their peers instead of parents, teachers, or other adult figures” [11]. As the flow of information is more broadly distributed and more sources are possible for acceptance, the quality of information distributed is less easily verified. Also, every piece of information is saved digitally, creating large archives of data. Combining flat hierarchy of information quality with increased amount of information and increased acceptance of simplified content, this is an environment allows for plurality of narratives to form.

An individual who is caught in an echo chamber may find reinforcement of existing beliefs through large volume of information, making the individual more easily exposed to the possibility of confronting conflicting evidence with explanation that preserves existing beliefs. This may be done to avoid cognitive dissonance, because it is easier to commit than abandon reinforced beliefs. Once the individual is committed, the lowered barrier for information may work in the other direction. Additional evidence which does not conform to preexisting belief can be easily dismissed as rumor or conspiracy theory, and dismissal is encouraged by the echo chamber.

[6] Conclusion
Closed ideologies and lack of plurality are part of human society and have been around for all of history. However, these qualities in any given field can be a dangerous trend because they allow wrong and extremist ideas to flourish and become more extreme because they are unchallenged, providing distorted view of reality. Although the internet and social media have allowed plurality of unorthodox perspectives, they have also increased opportunity for creation of closed ideology echo chambers to trap people who prefer nice, simple environments without debate and dissent, where opinions can be manipulated consciously and subconsciously by the group and then reinforced. Ideology-based information segregation is a serious concern because “functioning democracies depend critically on voters who are exposed to and understand a variety of political views” [14]. Therefore, greater research is necessary due to proliferation and spread of fake news which can destabilize democracy, spread false information which people act on, which could have negative consequences to health and society, as well as economics and other areas of human life. Investigating how networked publics are reframing the news and shaping news flows in context of psychology would deepen evolving relationship between media and audience [3]. Much of research into social media, especially for social networking websites, focuses on the United States, and mainly about the younger demographic [10]. There has been limited
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research outside the United States into the effects of social media on news consumption [10]. Broader, more quantitative and qualitative research should be continued outside of the United States, especially as more users come online in Asia, Africa, and other parts of the world.

While there has been increased literature in recent years that explores various aspects of social media use (incivility of online discussion, the homogeneous nature of views learners are exposed to online, ability of individual and corporate actors to manipulate online content), it is necessary for more research.

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