

Assess the Evidence for and Against the Existence of ‘Filter Bubbles’

Yuzhuo Xie

University of Glasgow, Glasgow, G12 8QQ, UK

ABSTRACT

This paper critically assesses the evidence for and against the existence of "filter bubbles"-a phenomenon where algorithmic personalization limits users' exposure to diverse information. Drawing on theoretical discussions and empirical studies, the paper explores how user behavior, platform algorithms, and business models contribute to the formation of filter bubbles. While personalization can enhance user experience, it may also reinforce confirmation bias and lead to ideological homogeneity, particularly in political contexts. However, opposing views highlight the lack of consensus on definitions and insufficient empirical support for widespread filter bubble effects. The study concludes that although filter bubbles exist, their impact varies across platforms and users. Active user behavior and cross-platform engagement can mitigate negative consequences, suggesting that filter bubbles are not inevitable or irreversible.

KEYWORDS

Filter Bubbles; Algorithmic Personalization; Information Diversity; Confirmation Bias.

1. INTRODUCTION

In this digital age, where algorithms are increasingly shaping our online experiences, the concept of the ‘filter bubbles’ has sparked extensive academic and public debate [1]. It was firstly coined by Eli Pariser [2], which was initially used simply to describe the phenomenon of algorithms in search engines selectively recommending content to users based on their preferences. Many scholars have since refined its definition as the digital age has progressed, for example Arguedas et al [3] pointed out, a filter bubble is an echo chamber formed by a ranking algorithm through passive personalization, often as a result of online news and information dissemination. They also mentioned [3], filter bubbles that consistently push personalised content can narrow the user's horizons, thus trapping them in environments that are more homogenous in terms of information.

As highlighted in Figure 5 produced by Areeb et al., who summarized and analyzed multiple studies [4], research on filter bubbles has proliferated, with many studies analyzing their prevalence and impact. However, despite this growing interest, the existence and social impact of filter bubbles remains highly controversial [5]. At the same time of its conceptualisation by Pariser [2], he noted that it had a very positive impact on people's lives, such as shortening the time it took people to find what they wanted. Additionally, with the passage of time and the continuous improvement and upgrading of algorithms, the existence of filter bubbles has not only raised questions about the algorithmic design of digital platforms, but also raised concerns about the privacy and fairness of information dissemination [1, 6]. In an information age that is highly dependent on technology, the question of whether the filter bubble is real and whether its impact is as serious as some of the studies portray it to be has become worthy of in-depth exploration.

Through a comprehensive analysis of empirical research and theoretical dissertation, this paper not only analyses the causes of filter bubbles, but also critically discusses whether filter bubbles really exist. The appearance of a thing has necessary conditions and causes, and analysing its causes can better understand whether it exists. Meanwhile, the question of whether filter bubbles exist or not is not only a technical issue, it also reveals the complex interactions between technology and social information dissemination. More importantly, it also reflects the profound interplay between socio-cultural and individual behaviour and algorithm design. User preferences in selecting information, the logic of algorithms optimised to attract attention, and the shaping of information dissemination by the social environment all combine to influence the formation and performance of filter bubbles. Thus, exploring this issue can help the public to gain a more comprehensive understanding of how platforms influence information dissemination through algorithmic design in the digital age.

2. THE CAUSE OF FILTER BUBBLES

The formation of filter bubbles is the result of a combination of factors, the most central of which is the mechanism by which recommendation algorithms operate [6]. Modern digital platforms (e.g. social media, video applications and search engines) often rely on recommendation algorithms to optimise the users experience. These algorithms push personalised content to users by analysing their behavioural data, such as viewing history, likes, commenting and sharing behaviours, as well as speculating on their interests and preferences [7]. In this process, the algorithms tend to prioritise the content presented to the user that is most in line with their interests and excludes other content that the users are not interested in [8]. This algorithmic logic, while satisfying the short-term needs of users and helping them to filter useful information effectively, inadvertently limits the diversity of information [2]. The constant matching of users with such pushed content will eventually lead to a high degree of homogeneity in the information sent by platforms and received by users, thus narrowing the scope of users' exposure to information, and finally the users will be trapped in the 'information cocoon' constructed by the algorithm [9].

More importantly, algorithmic recommendation not only meets users's needs, but also continuously strengthens the platform's judgement on users' behaviours. As pointed out by Geschke et al. [8], recommending algorithms analyse users 'clicking and interacting behaviours', and regard these behaviours as the 'confirmation signals' of users' interests. When a user frequently clicks on a certain type of content, the algorithm may assume that the user is more interested in this type of content, and thus prioritises the recommendation of more similar content. This mechanism creates a self-reinforcing feedback loop that exposes users to more and more homogeneous information, while heterogeneous information is gradually excluded [4]. This algorithmic logic is not only present in video platforms, but is also prevalent in news recommendation systems. For example, a study by Areeb et al. [4] found that implicit personalisation has a particularly significant impact on information diversity. Implicit personalisation refers to recommendation logic automatically generated by algorithms through user behavioural data, rather than personalisation settings actively chosen by the user. Implicit personalisation is more likely than explicit personalisation to 'lock' a user into a specific circle of information, as it is based solely on the user's pre-existing behavioural patterns and ignores areas that may be of potential interests to the user, but which they have not yet been exposed to [10]. This algorithmic design further enhances the formation of filter bubbles.

At the same time, the algorithm designs of different platforms has significant influence on the strength of filter bubbles. For example, Google News tries to increase the diversity of information by recommending news that does not fully match users' interests [4]. This design does not completely eliminate the follicles, but it alleviates the problem of information isolation to some extent. On the contrary, some entertainment-oriented platforms, whose profit models rely more on high-frequency user interaction, tend to be more personalized recommendation, resulting in a more obvious filtering bubble phenomenon.

On the other hand, user behaviour and attitudes are key to the formation of filter bubbles [11]. Spohr noted in a 2017 study [6] that users subconsciously choose content that aligns with their own views when exposed to information, thus avoiding exposure to different views, and that this subjective choice to expose themselves to information may also lead to a lack of awareness of the filter bubbles in which they find themselves, as avoidance of discrepant information is also a subconscious choice for individuals. This is what Garrett pointed out in his 2009 study [8], that people tend to exhibit 'confirmation bias' when selecting information. As users unconsciously exclude differentiated information over time, algorithms will and do gradually intervene and cater to their selection preferences, which promotes the formation of filter bubbles [6].

It is worth noting that this individual behaviour is particularly evident in the social media environment. Users are free to construct their own circles of information exposure, further reinforcing individual preferences. On Facebook, for example, algorithms prioritise content that aligns with the user's viewpoints, making information more consistent with the user's prior position, and users are more inclined to engage with ideologically aligned content and friends (Bakshy et al., cited in)[8]. In turn, the content shared by these friends is usually in line with the user's ideas, and this homogeneous social network makes the user's exposure to heterogeneous information even more scarce, which can lead to social polarisation and extreme negative attitudes among people [6]. Even if users are occasionally exposed to information from different viewpoints, they tend to selectively ignore it due to 'confirmation bias'. Another argument is that the selectivity of social networks further exacerbates this phenomenon. Bimber & Davis [12] have suggested that the internet gives users the right and the means to choose content, while inadvertently allowing them to choose among the content they offer as they see fit. This is a precondition for the role of confirmation bias on the internet, and this individual behaviour inadvertently lays the foundation for the formation of filter bubbles. A number of empirical studies have followed to confirm this theory [12].

Finally, the platform's business model is an important driver of filter bubble formation. The main goal of digital platforms is to generate more advertising revenue by extending user dwell time and increasing the frequency of interaction. Therefore, in order to compete for users' attention, platforms need to ensure that the content they recommend to users is highly relevant to their hobbies and interests in order to increase click-through rates and engagement [2]. This 'attention economy' logic makes platforms more inclined to prioritise content that matches users' preferences rather than diverse information [8]. This also means that different platforms will push things according to the different needs and information of users according to the difference in goals, for example, the purpose of social media platforms is to retain users, and the purpose of shopping platforms is to let users buy goods, so the data used by their algorithms is different [7]. So in a way, it also expands the diversity of content that users are exposed to. For example, users may see products outside their interests on the shopping platform and search on other platforms to broaden their knowledge.

3. CRITICALLY ANALYSIS OF EVIDENCE FOR THE PRESENCE AND ABSENCE OF FILTER BUBBLES

Filter bubbles have always been a controversial topic and there are many different voices on the existence of filter bubbles in the online usage of people daily life. Before defining filter bubbles, Pariser did a very small-scale experiment [2] where several different people searched for the same keywords in Google and got completely different results displayed. However, his analysis and discussion is limited to search engines, scholars in different countries have done several different scales studies on filter bubbles in search engines, and their results show that the presence of filter bubbles in search engines is not significant and there is a lot of overlap in the content searched by different people so that the personalisation of search engines has very little impact on the diversity of content [5]. In fact, filter bubbles do exist in search engines and they can have some degree of impact on the lives of the public. More than a decade ago, the executives of many websites, including Netflix,

Amazon, Facebook, and others, admitted that they use algorithms to predict user preferences[2]. Furthermore, Ćurković mentions in his article [13] that filter bubbles in search engines influenced the Biswas study on assessing malnutrition among women in South and South-East Asia, and that the results were extremely heterogeneous, even though the authors used rigorous screening and exclusion criteria. It is also like filter bubbles as defined by Pariser [2], where the Internet's algorithmic systems infer user preferences based on their behavioural habits. In other words, search engines like Google, because their algorithms recommend search results based on users' history and interests, may leave users with limited content. It may even affect the scientific and comprehensive nature of academic research.

With the development of time and the gradual maturity of technology, filter bubbles are not only present in search engines, but people are more concerned about all the platforms in the Internet where filter bubbles may be present [5]. However, Spohr (2017, p.150) noted in his study that filter bubbles in social media are very evident in political events, such as the US presidential election and the referendum on European Union (EU) membership in the U.K. Meanwhile, another study made by Garimella & Weber of Twitter users in the U.S. [8] found that they become increasingly attentive to their own ideologically homogeneous figures and media content during their use of Twitter, and that political polarisation in the US becomes progressively more severe with time spent using Twitter. Vaccari [12] also points out in the study that people who prefer to interact and communicate with others who share the same interests or ideologies in offline activities, or who frequently exchange political information on social media, are more likely to be confined to a single social environment.

The existence of filter bubbles can be evidenced on another level by some of the campaigns against filter bubbles. Guo and Gan [14] mentioned in their study that after the definition of filter bubbles emerged, there was a 'burst your bubble' movement in society to break the limitations of the filter bubble. For example, the Guardian newspaper in the United States brought different partisan comments to the public, and many other platforms have taken corresponding measures, such as Facebook removing the personalised content section, BuzzFeed setting up 'Outside your bubble', and even there were some new software to against filter bubbles. Guo and Gan [14] also mention that these actions do allow people to access diverse information and broaden their knowledge. The success of the 'burst your bubble' campaign also proves the existence of the filter bubbles.

In recent years, there are some scholars [10] have analysed large anonymised user-object interaction datasets from three levels of stratification. New users of social media platforms are exposed to a wider range of information categories, but as algorithms analyse users' habits, they will gradually narrow down the range of categories, refining content in categories of interest to users and providing richer subcategories of content, and this phenomenon was called deep filter bubbles by them.

Opposition to the existence of filter bubbles has always existed, and Bruns [5] points out the difficulty of studying filter bubbles in his study, as there is a lack of a clear and unified definition of 'filter bubble', therefore, studies on the exist of filter bubbles may have completely different results due to different definitions, which makes it difficult to compare the results. In addition, most of the current studies on the existence of filter bubbles are based on modelling and literature studies. Due to the large number of web platforms and users, as well as the difficulty of algorithmic data collection and the lack of a unified experimental method to obtain complete data, it is very difficult to prove the real existence of filter bubbles [11].

There is no conclusive empirical research to support the prevalence of 'filter bubbles' [5]. Moreover, Bruns also points out in this page, the content on search engines and social media tends to be more 'neutral', avoiding extremes while maintaining a certain degree of diversity rather than uniformity. At the same time, the users of search engine and social media are likely to be exposed to a wider range of information than those who do not rely on these technologies for information [5]. This means that the process of accessing information through these platforms may not separate users into a single circle of information, as described by the 'filter bubbles' theory, but rather provide them with a

relatively abundant choice of content. In other words, the personalised recommendation mechanisms of search engines and social media do not necessarily lead to homogeneity of information, and may expand to some extent the domain of information to which users are exposed.

Users' media consumption habits and behaviours can also influence the presence of filter bubbles. Even highly homogeneous circles aggregated by common interests or political topics on the same social platforms usually maintain some degree of connection to larger social networks [5]. While the presence of filter bubbles amplifies inside information, today's users' media consumption is also characterised by diversity, they have a wide range of media choice, and even if there is a filter bubble effect on some platforms, people's behaviour on different platforms may reduce the information segregation and thus weakens the filter bubble effects. Information is not completely separate from different viewpoints, which proves that filter bubbles cannot be identified by data or behavioural analysis on a single platform, [3]. Bruns' study [5] also refers to a term, 'context collapse', which describes how the users of social media are not confined to information silos, but can access a wide range of information and intersect with different groups through their diverse interests and the plurality of social networks. This phenomenon directly challenges one of the key assumptions of the 'filter bubble' theory, namely that individuals are trapped in a single information environment. Furthermore, experiments by Sukiennik et al. [10] have demonstrated that while the presence of filter bubbles is stable, their impact varies from person to person, with some groups being more susceptible to algorithmic influences that lead them into information cocoons.

Some scholars have also argued that the negative impact of filter bubbles has been exaggerated. Haim et al. [7] mentioned that in a test of Google News, there was no strong evidence that personalisation algorithms significantly reduced the diversity of information. However, in Areeb's systematic and comprehensive study of the filter bubble literature [4], dozens of papers were analysed through rigorous and meticulous criteria, of which only two denied the existence of filter bubbles. Most of the studies in which filter bubbles do not exist or have been exaggerated are user-oriented questionnaire studies [15]. This may be because not only do users not perceive a filter bubble, but alternatively, the bubble does not give them a negative experience.

4. CONCLUSION

Based on the above analyses, it can be concluded that the filter bubbles do exist, but the extent of its impact varies by platform and algorithm. At the same time, although filter bubbles play a role in exacerbating social polarisation, they are not as irreversible or serious as described in some studies. Users' active choices, cross-platform usage, and offline exposure to information can significantly diminish the negative impact of filter bubbles.

First, the recommendation algorithms of different platforms directly determine the intensity and manifestation of filter bubbles. For example, on some video platforms (e.g. Tiktok, Youtube), algorithms constantly recommend similar content based on users' viewing history and liking behaviour. This mechanism which aims to prolong the user's stay narrows the user's interests, it makes users are easily 'locked' into a particular circle of interest, and over time, their exposure to other types of content becomes extremely limited. In contrast, some platforms have adopted more diverse recommendation strategies. This algorithmic design mitigates the impact of filter bubbles to some extent. Therefore, the intensity and negative effects of filter bubbles are actually closely related to the design logic of platform algorithms. Some platforms have more pronounced filter bubbles, while others take more proactive measures to promote diversity of information.

Secondly, filter bubbles do contribute to some extent to social fragmentation and polarisation, especially in the political sphere. Through personalised recommendations, platforms may allow users to see only views that support their position, while blocking out other potentially antagonistic or critical voices. This phenomenon can further reinforce users' pre-existing biases, creating a lack of

bridges between groups with different positions and exacerbating antagonism in society. However, this effect is not irreversible. Many users are not passive recipients of a single platform, but actively access information through multiple channels. For example, some people will use short-video platforms to get entertainment content while keeping up with political and social events through traditional news websites, newspapers or radio. This cross-platform behaviour effectively extends users' exposure to information and reduces the limitations of the single-platform filter bubble. In addition, the diversified content strategies of certain platforms can, to a certain extent, help users to be exposed to more diversified viewpoints and reduce the reinforcing effect of single-position information.

At the same time, users' initiative plays a key role in breaking the filter bubble. While it is true that algorithms influence users' access to information on the internet, people are not entirely "slaves" to algorithms. Users have the ability to access a wider variety of information through proactive behaviour. For example, a user may only be exposed to content that aligns with their interests on social media, but they can still be exposed to the wider world through their real-life activities. Human subjective choices can break through the limitations of algorithms.

In addition, some social factors are limiting the impact of filter bubbles. For example, offline interactions and discussions between people are often an important source of diverse information. Even if users are exposed to more homogeneous information online, they can still gain access to information from different perspectives by interacting with friends, family or colleagues. Especially when faced with complex social issues, offline discussions can often provide individuals with more comprehensive cognitive support. Such person-to-person interactions provide an important complement to the diversity of information, further diminishing the negative effects of filter bubbles.

In conclusion, the existence of filter bubbles is a complex phenomenon. It does have an impact on users' access to information and on the polarisation of society, but this impact is not absolute or irreversible. The algorithmic design of different platforms determines the strength of the filter bubble, while the active behaviour of users and the way they access information offline further diminish its effect. To address the challenge of filter bubbles, platforms can improve their algorithm design and introduce more diverse recommendation mechanisms, while encouraging users to actively engage with diverse information sources. Ultimately, the relationship between humans and algorithms should not be a one-way control, but rather a balanced choice made by users through proactive behaviour in a diverse information environment. Initiative is always the key to breaking through information segregation.

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