

# The Reinforcing Loop: An Exploration of Filter Bubbles in Social Platforms

Kadriann Pikkat

MSc in Information Systems and Digital Innovation  
Department of Management  
London School of Economics and Political Science

## KEYWORDS

Social media  
Social platforms  
Filter bubbles  
Echo chambers  
Facebook

## ABSTRACT

A 'filter bubble' – a term originally coined by Internet activist Eli Pariser – denotes the dynamic in which people are only exposed to a small subset of ideas and perspectives. More alarmingly, there is the threat of an extrapolated version of reality where individuals only see content that is already familiar and accepted by them. This paper seeks to analyse the creation and development of such filter bubbles in social platforms by conceptualising the phenomenon within the theories of encoding and computed sociality. Using the example of Facebook News Feed, it will be shown that personalisation can, through the algorithmic process of filtering, lead to a situation in which the bubble becomes reinforcing and ever narrowing. The filtering system, therefore, becomes a cycle that both shapes and is shaped by user behaviour. Further, it is argued that the starting point in this cycle is already a heavily mediated state.

## Introduction

Social media platforms were once welcomed as harbingers of a free and networked world in which the power lies with the users. Recently, however, the illusion of disintermediation in the newly empowered networks appears to have started to fade. In light of recent electoral shocks in Europe and the US, the influence of social platforms both on and off the Web has been widely questioned. There has also been a growing recognition of the way such platforms can shape knowledge and behaviour. Chamath Palihapitiya, a former senior executive at Facebook, has recently accused the platform of 'ripping apart the social fabric of how society works' (Stanford Graduate School of Business, 2017). One of the aspects debated in this 'techlash' (Rajan, 2017) is whether social platforms can create online filter bubbles – a dynamic in which an individual is only exposed to a small subset of ideas and perspectives. More alarmingly, there is the threat of an extrapolated version of reality where users only see content that is already familiar and accepted by them. If this pattern is reinforcing, users could experience a continuously narrowing spectrum of information. Without being exposed to opposing views, social media becomes a metaphorical echo chamber of the self. Filter bubbles are powerful both at the level of the individual, shaping user practices and beliefs, as well as society, possibly leading to ideological segregation and harming democracy itself.

This paper seeks to explore the processes through which filter bubbles can be created and sustained.

By examining the case of Facebook, perhaps the most well known social media platform, it will be shown that the circular logic embedded in its News Feed algorithm can lead to a reinforcing and narrowing bubble. The rest of this paper is structured as follows. First, a literature review will connect the key concept of personalisation to filter bubbles. Next, this is conceptualised using the theories of encoding and computed sociality. Finally, this theoretical framework is applied to the case of Facebook News Feed to illustrate the dynamics of a filter bubble.

## Literature Review

### 1. Personalisation

The rapid growth of social networks has resulted in a struggle to manage the constant stream of information that users have access to. Adam Mosseri, Facebook's senior executive, has recognised that there is simply 'far too much information for any one person to consume' (Newsroom, 2016b). In this new 'attention economy', human attention is a resource in limited supply (Davenport & Beck, 2001). In an attempt to make the experience more enjoyable for the user and thus catch a larger share of their attention, platform providers have turned to personalisation through algorithmic filtering. In this context, the filter is a software-based tool that operates based on an algorithm specified by the platform owner (Parker, Van Alstyne & Choudary, 2016). The aim of a filter system is to ensure that out of the vast quantities of content available, each individual user will be presented with information that is most relevant and valuable to them. The technical process behind filtering is explained in more detail in the third section using the example of Facebook News Feed.

Corresponding Author  
Email Address: k.pikkat@lse.ac.uk (K. Pikkat)

Naturally, there is no single metric to determine what constitutes ‘relevant’ or ‘valuable’, making it a fundamentally subjective judgement. Twitter, for example, identifies certain topics that are ‘trending’ at any given moment. The process behind this, however, is a less straightforward calculation than one would perhaps expect. Instead of being a universal measurement of popularity, trends in this context are tailored to an individual user based on, for example, their interests, location, and the users they ‘follow’ (Gillespie, 2014). Twitter also maintains the power to ‘consider the newsworthiness’ and whether or not it is ‘in the public interest’ (Twitter, 2018). These judgements, whether embedded in Twitter or Facebook, as will be seen, are as subjective as they are fluid.

## 2. Filter Bubbles

‘Filter bubbles’ – a term coined by Internet activist Eli Pariser – denote the dynamic in which an individual is only exposed to ideas and perspectives confirming those that they already hold. Homophily, that is the process of selecting the people and information that appeal to one’s interests, is a natural and inevitable part of human lives – both online and offline. It has, for example, been found that individuals are more likely to select and read news stories that are anticipated to support their own positions (Garrett, 2009; Iyengar & Hahn, 2009). Looking specifically at social platforms, one could reasonably expect that in the digital world – free from the geographical constraints that exist in the real world – there is greater exposure to a wider variety of information. Online filter bubbles, however, introduce three new characteristics: they are ‘individual’, ‘invisible’ and ‘involuntary’ (Pariser, 2011). The individual aspect means that due to personalisation, people are alone in the metaphorical bubble that has been curated for them. That bubble is invisible because users do not knowingly and consciously select the criteria according to which information is either selected or ignored. As Eli Pariser puts it, ‘from within the bubble, it’s nearly impossible to see how biased it is’ (ibid., p. 10). Finally, it is involuntary as users do not choose to enter or exit the bubble. To some extent, these characteristics can also be apparent in an offline setting. For instance, one can recognise an involuntary filter bubble when thinking about the likelihood of children following their parents’ political or religious leanings. In an online scenario, however, these factors can fundamentally alter the way individuals obtain and interact with information, effectively representing a shift away from the individual to the platform in terms of selective power. The threat at the individual level is an entirely familiar and comfortable world in which there is nothing to learn or disagree with; at the society level, it is one with no common baseline of facts.

Some empirical evidence exists to support the existence of filter bubbles. Yet, the findings are often inconclusive and constrained by methodological issues, such as the difficulty measuring existing beliefs. The matter is further complicated by the interplay of two separate filtering mechanisms: personalisation

and self-selection. The former denotes the content curated for and displayed to a user by the platform’s filtering algorithm, whereas the latter refers to the user’s decision of which content to interact with. In a rare attempt to separate the effect of self-selection from personalisation, Bakshy, Messing and Adamic (2015) find that algorithmic ranking on Facebook resulted in users being shown 15% less cross-cutting content (personalisation), of which they clicked on 70% less than like-minded content (self-selection). Other studies offer a less convincing account. For instance, Vicario et al. (2017) find that in the lead up to the Brexit referendum in the UK, news consumption on Facebook was polarised into two distinct groups. However, they do not distinguish between the effects of personalisation and self-selection. Nikolov et al.’s (2015) finding of a narrow spectrum of information on social platforms is also subject to this limitation. Similarly, Flaxman, Goel and Rao (2016) find that news stories found through social platforms and search engines are narrower in ideological stance than those read when visiting news sites directly. Although this seems to suggest the presence of a filter bubble, the authors also report that social platforms and search engines do, in principle, expose individuals to a wider selection of information. Heatherly, Lu and Lee (2017) find evidence of social media facilitating both cross-cutting and like-minded interactions, but fail to consider how filtering affects the content that the user is even able to interact with.

Despite the lack of concrete empirical evidence, a sufficient theoretical base has been established which allows for conceptualisation of filter bubbles and the mechanisms through which they may arise. One can reasonably expect that alongside the emerging debate in society, the empirical evidence too will shed more light on the concerns about filter bubbles that have been expressed to date.

## Conceptual Framework

In order to conceptualise the creation of filter bubbles in social platforms, the theories of ‘encoding’ (Alaimo & Kallinikos, 2016; 2017) and ‘computed sociality’ (ibid.) are utilised.

### 1. Encoding

There are different types of data produced on social platforms. In order to understand the theory of encoding, it is necessary to distinguish between two types: ‘user-generated content’ and ‘social data’ (Alaimo & Kallinikos, 2017). In the context of social platforms, user-generated content refers to content – including text, photos, videos and comments – created, as the name suggests, by users themselves. Social data, on the other hand, denotes the act of this content creation. It is generated as the unconscious by-product of users’ (hopefully) conscious actions on a website, effectively capturing their behavioural data footprint. As will be seen, however, this behaviour itself is shaped and moderated by the platform. This distinction is necessary because although the former type of data is more visible to the user, it is the latter that is typically more valuable to the platform owner

(Alaimo & Kallinikos, 2016).

The translation of social interactions into data is made possible by encoding. This is a way of structuring information inherent to social platforms, which can be defined as ‘the technological codification and stylization of social activities into particular clusters or classes’ (Alaimo & Kallinikos, 2017, p. 177). By standardising activities and social interactions, aspects of user behaviour are rendered countable, with individual users essentially becoming the sum of their performed clicks. The behavioural footprint on social platforms, therefore, is highly structured and moderated. As Van Dijck (2013, p. 12) puts it, the term ‘social’ in this context appears to denote ‘both (human) connectedness and (automated) connectivity’.

## 2. Computed Sociality

Encoding, therefore, effectively allows platform owners to engineer social interaction which adheres to computational logic and fits pre-conceived structures. The sociality captured online is not a direct reflection of offline behaviour and thus does not record reality as such (Van Dijck, 2013). This intermediated social interaction has been called ‘computed sociality’ (Alaimo & Kallinikos, 2016, p. 78; 2017, p. 177) or ‘sociality coded by technology’ (Van Dijck, 2013, p. 12). In the context of filter bubbles, personalisation – enforced through algorithmic filtering – effectively adds another layer on top of this engineered sociality. Algorithms, in the broadest sense, are ‘encoded procedures for transforming input data into a desired output, based on specified calculations’ (Gillespie, 2014, p. 167). The specification of these calculations, however, requires initial human input. Thus, despite the ‘carefully crafted fiction’ suggesting otherwise (ibid., p. 179), algorithms appear to be neither automatic nor neutral but rather represent ‘opinions embedded in code’ (O’Neil, 2017). Hence, social platforms are not neutral, but socio-technical ensembles in which human input is shaped by computed output, and the same would apply conversely (Van Dijck, 2013, p. 13-14).

In the following section, the conceptual framework of personalisation, encoding and computed sociality will be applied to the case of Facebook News Feed to illustrate the dynamics of a filter bubble.

### Case Analysis: Facebook

For some time now, Facebook – the dominant social media platform – has been in the media spotlight over its wider societal influence. At the behavioural level, the platform has been claimed to be addictive in nature (Embury-Dennis, 2017) with the power to manipulate moods (Griffin, 2014). At the political front, the issues of ‘fake news’ (Connolly et al., 2016) and election tampering (McCarthy, 2017) have surfaced. All of these matters can, to some extent, be connected to filter bubbles and conceptualised within the framework introduced earlier. This section seeks to analyse how the logic of encoding and the process of personalisation through algorithmic filtering can

create filter bubbles on Facebook.

## 1. Methodology

Data was collected through two primary methods: author’s own observations as a user of the platform and a review of the relevant updates posted on Facebook’s press website (Facebook Newsroom). In addition, interviews with Facebook executives were read to gain further insight. Data was collected in March and April 2018 and, given the fast evolving mechanics, focused on the most recent statements. In some cases, however, the author has sought to demonstrate how these factors have changed over time.

## 2. Personalisation

For users, News Feed is the central element on Facebook. It is the list of user-generated content on the home page, visible immediately after logging in. This News Feed is individual to users in two ways. First, the majority of the information displayed – that is, everything apart from paid advertorials – is limited to content generated by those users and pages which the user has connected with on the platform. Secondly, the content is filtered by Facebook’s algorithm in an attempt to offer the user a better experience. In 2014, Facebook estimated that News Feed displays each user approximately 300 stories out of the more than 1,500 they would see without the filter (Facebook Business, 2014). What populates this landing page, and in what order, is tailored to each individual user. The News Feed, therefore, is not a *news feed* in the intuitive sense, but a personalised collection of content curated by an algorithm.

Facebook’s original News Feed algorithm was called EdgeRank, and its relevance calculations were based on three elements: ‘affinity’, ‘relative weight’ and ‘time’ (Pariser, 2011). Affinity means that the more User A interacts with User B, the more likely User A would be to see User B’s updates in News Feed. Interaction in this context can take various forms, including visiting someone’s profile, commenting on photos, or exchanging messages. Of course, if the interaction is mutual then the effect will be the same for User B. Relative weight refers to a pre-defined ranking for different types of content, determined by previous behaviour recorded for the user. For example, a person who spends a lot of time looking at photos would be shown more of them. Finally, the time element implies that recent posts would be weighted higher.

Over time, this algorithm has evolved and Facebook has, in fact, stopped referring to it as EdgeRank, using the term ‘ranking’ instead (Newsroom, 2018a). An algorithm still exists, and is likely to include the three original factors, but has grown considerably more complex. In 2013, Facebook’s Engineering Manager for News Feed Ranking claimed that over 100,000 factors were used in these calculations (McGee, 2013). Since then, Facebook has introduced several additional factors. These include, to name a few, the device used and the speed of Internet connection

(Newsroom, 2015), the loading time of linked websites (Newsroom, 2017b) and, in case of videos, how much of it is watched, and whether that is in full-screen or with the sound on (Newsroom, 2017a). Another recent announcement claimed that Facebook would, going forward, prioritise ‘posts that spark conversations and meaningful interactions between people’ (Newsroom, 2018a). Among other changes, this value-laden proposition means that content by close friends and family is ranked higher than public content:

News and video will always be an important part of Facebook. But when people are spending so much time passively consuming public content that it starts taking away from the time people are connecting with each other, that’s not good (Facebook, 2018).

In an apparent attempt to address the ‘fake news’ accusations, Facebook has also announced prioritising news that are ‘trustworthy’ and ‘informative’ (Newsroom, 2018b). Naturally, the use of such loaded language suggests that these decisions are bound to be subjective judgements based on arbitrary data points. As demonstrated by the seeming contradiction between Facebook’s corporate mantra of building a ‘global community’ (Facebook, 2017) and the recent decision to prioritise news from local sources (Newsroom, 2018c), these values are also fluid in nature. Therefore, what users see on their News Feed is determined by both their participation on the platform as well as a myriad of other factors entirely independent of their behaviour.

### 3. Encoding

The environment hosted by Facebook is highly organised and includes features unique to a digital environment. ‘Tagging’, ‘liking’, ‘following’ and ‘sharing’, for example, have no real equivalents in an offline scenario. Further, ‘friends’ in this context denote both strong and weak ties, including family, close friends, acquaintances, and possibly even strangers. The ‘like’ button introduced by Facebook allows users to interact with content using a single click. The number of ‘likes’ and the list of users who have ‘liked’ a post are then displayed under it. This simple feature, however, is not neutral. For instance, it can favour positive posts over negative. Further, the action does not convey a single, straightforward meaning. A person pressing the ‘like’ button on a Facebook post about war crimes could, for example, signal that they enjoyed reading the story, recognition for covering the topic, approval of these crimes, or perhaps something completely different. In 2016, Facebook extended this feature to cover other types of reactions, comprising five pre-defined emotions: ‘love’, ‘haha’, ‘wow’, ‘sad’ and ‘angry’ (Newsroom, 2016a). In the race for users’ finite attention, these features are designed to encourage participation. Chamath Palihapitya provocatively refers to them as a ‘short-term dopamine fuelled feedback loops’ (Stanford Graduate School of Business, 2017).

Taina Bucher (2012) has compellingly presented the ‘threat of invisibility’ as a powerful perception

governing user actions on social media. As Facebook’s recent News Feed tweak towards ‘meaningful content’ demonstrates, a good user does not passively consume content produced by others, but actively reacts to it (Facebook, 2018). Encoding allows for these actions to be counted and used for filtering. For instance, after a user has pressed ‘like’ on a post, the algorithm assumes that they would like to see more of similar content from similar users, and their News Feed will be adjusted accordingly. As every additional action will re-adjust the personalised News Feed, a kind of ‘informational determinism’ emerges in which past actions determine the content that will be visible in the future (Pariser, 2011, p. 16). But these past actions also restrain future actions – in order for users to react to something, the content must be visible to them in the first place. This ‘circular logic’ embedded in the filter (Bucher, 2012, p. 1169) presents the risk of producing an ever narrowing loop of content in which users inevitably reinforce the assumptions. When navigating the personalised News Feed, users are likely to react to these stories – chosen for them – thus involuntarily decreasing the material scope of their personalised content. The filtering system, therefore, becomes a reinforcing cycle that both shapes and is shaped by user behaviour. Figure 1 below visualises these dynamics.

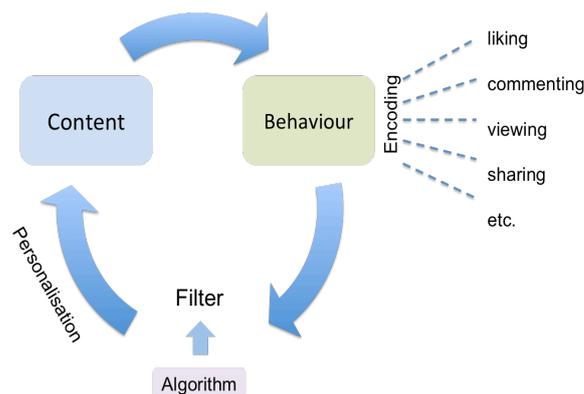


Figure 1. The circular logic of a filter bubble

By reducing the complexity of social interaction to its bare minimum, this moderated version of reality portrays users as a simplified version of themselves. Further, it ignores the likely gap between what users seem to like, what they actually want to see, and what they should see. Being exposed to differing opinions is necessary in order to facilitate healthy debates in society. Further, it is inevitable that some stories require more cognitive effort to process than others and are thus less likely to be clicked on, particularly in a social media environment where news consumption is perhaps not users’ primary focus. Compare, for example, a story about the war in Syria against one about a talking parrot saying funny and inappropriate things. In most traditional media, this gap is bridged by displaying a combination of ‘want’ stories with ‘should’ stories – even if someone is more likely to read certain stories, they will still be made aware of the others. The Facebook News Feed, however, curates the content for its users largely in

secrecy.

## Discussion

Historian Niall Ferguson has compellingly argued that the expectation of a hyperconnected world as a safe and stable place is not supported by the historical proposition that networks eventually and inevitably become polarised systems (Ferguson, 2017a; 2017b). By connecting the theoretical framework of encoding to the mechanics of algorithmic filtering, the technical basis on which such polarisation can emerge has been demonstrated. Using the example of Facebook News Feed, it was shown that personalisation can lead to a situation in which each user exists in an individual universe of information – a filter bubble – carefully curated for them by the platform. This is likely to lead to a reinforcing and ever narrowing bubble. Personalisation implicitly assumes that identity shapes one's choice of information (Pariser, 2011). Yet, what if the reverse causality also holds true? If the choice of information also shapes identity – as can be reasonably expected – the filtering forces at play effectively select and reinforce only parts of this identity. Further, following the theories of encoding of computed sociality, the starting point in this cycle is already a heavily mediated state.

The contribution of this paper comes with some limitations. First, the components of Facebook's current News Feed algorithm are largely surrounded by secrecy and therefore difficult to unpick. Perhaps like Netflix (Madrigal, 2014), even Facebook itself does not fully understand the forces at play in their entirety. However, the information available tends to show the complexity and ever-evolving nature of this algorithm. Secondly, this paper does not attempt to prove or quantify filter bubbles, but provides a theoretical account to deepen the understanding of the underlying processes. Finally, due to the limited scope of the paper, the paper has been largely focused on the theory of encoding. The issue could also be fruitfully conceptualised within other frameworks; commensuration, for example, may represent an opportunity in this regard.

## References

Alaimo, C. and Kallinikos J. (2016). Encoding the Everyday: The Infrastructural Apparatus of Social Data. In C. R. Sugimoto, H. R. Ekbja & M. Mattioli (Eds.), *Big Data is Not a Monolith* (pp. 77-90). Cambridge, MA: MIT Press.

Alaimo, C. and Kallinikos J. (2017). Computing the everyday: Social media as data platforms. *The Information Society*, 33(4), 175-191. doi:10.1080/01972243.2017.1318327

Bakshy, E., Messing, S. & Adamic, L. A. (2015). Exposure to ideologically diverse news and opinion on Facebook. *Science*, 348(6239), 1130-1132. doi: 10.1126/science.aaa1160

Bucher, T. (2012). Want to be on the top? Algorithmic power and the threat of invisibility on Facebook.

*New Media & Society*, 14(7), 1164-1180. doi: 10.1177/1461444812440159

Connolly, K., Chrisafis, A., McPherson, P., Kirchgaessner, S., Haas, B., Phillips, D., Hunt, E. & Safi, M. (2016). Fake news: an insidious trend that's fast becoming a global problem. *The Guardian*. Retrieved from: [https://www.theguardian.com/media/2016/dec/02/fake-news-facebook-us-election-around-the-world?CMP=fb\\_gu](https://www.theguardian.com/media/2016/dec/02/fake-news-facebook-us-election-around-the-world?CMP=fb_gu)

Davenport, T. & Beck, J. (2001). *The Attention Economy: Understanding the New Currency of Business*. Boston, MA: Harvard Business School Press.

Embury-Dennis, T. (2017). Man who invented 'like' button deletes Facebook app over addiction fears. *The Independent*, 6 October. Retrieved from: <https://www.independent.co.uk/life-style/gadgets-and-tech/facebook-like-inventor-deletes-app-iphone-justin-rosenstein-addiction-fears-a7986566.html>

Facebook. (2017). Building Global Community. Facebook post, 16 February. Retrieved from: <https://www.facebook.com/notes/mark-zuckerberg/building-global-community/10154544292806634/>

Facebook. (2018). 'We just announced our quarterly results and community update. [...]'. Facebook post, 31 January. Retrieved from: <https://www.facebook.com/zuck/posts/10104501954164561>

Facebook Business. (2014). Organic Reach on Facebook: Your Questions Answered. Retrieved from: <https://www.facebook.com/business/news/Organic-Reach-on-Facebook>

Ferguson, N. (2017a). The False Prophecy of Hyperconnection. How to Survive the Networked Age. *Foreign Affairs*, Sep/Oct 2017, 96(5), 68-79.

Ferguson, N. (2017b). *The Square And The Tower: Networks, Hierarchies And The Struggle For Global Power*. New York: Allen Lane.

Flaxman, S., Goel, S. & Rao, J. M. (2016). Filter bubbles, echo chambers, and online news consumption. *Public Opinion Quarterly*, 80(S1), 298-320. doi: 10.1093/poq/nfw006

Garrett, R. K. (2009). Echo chambers online?: Politically motivated selective exposure among Internet news users. *Journal of Computer-Mediated Communication*, 14(2), 265-285. doi: 10.1111/j.1083-6101.2009.01440.x

Gillespie, T. (2014). The Relevance of Algorithms. In T. Gillespie, P. J. Boczkowski & K. A. Foot (Eds.), *Media Technologies: Essays on Communication, Materiality, and Society*. Cambridge, MA: MIT Press.

Griffin, A. (2014). Facebook manipulated users' mood in secret experiment. *The Independent*, 29 June. Retrieved from: <https://www.independent.co.uk/life-style/gadgets-and-tech/facebook-manipulated-users-moods-in-secret-experiment-9571004.html>

- Heatherly, K. A., Lu, Y. & Lee, J. K. (2017). Filtering out the other side? Cross-cutting and like-minded discussions on social networking sites. *New Media & Society*, 19(8), 1271-1289. doi: 10.1177/1461444816634677
- Iyengar, S. & Hahn, K. S. (2009). Red Media, Blue Media: Evidence of Ideological Selectivity in Media Use. *Journal of Communication*, 59(1), 19-39. doi: 10.1111/j.1460-2466.2008.01402.x
- Madrigal, A. C. (2014). How Netflix Reverse Engineered Hollywood. *The Atlantic*, 2 January. Retrieved from: <https://www.theatlantic.com/technology/archive/2014/01/how-netflix-reverse-engineered-hollywood/282679/>
- McCarthy, T. (2017). How Russia used social media to divide Americans. *The Guardian*, 14 October. Retrieved from: <https://www.theguardian.com/us-news/2017/oct/14/russia-us-politics-social-media-facebook>
- McGee, M. (2013). EdgeRank Is Dead: Facebook's News Feed Algorithm Now Has Close To 100K Weight Factors. *Marketing Land*. Retrieved from: <https://marketingland.com/edgerank-is-dead-facebooks-news-feed-algorithm-now-has-close-to-100k-weight-factors-55908>
- Newsroom. (2015). News Feed FYI: Building for All Connectivity. Retrieved from: <https://newsroom.fb.com/news/2015/10/news-feed-fyi-building-for-all-connectivity/>
- Newsroom. (2016a). Reactions Now Available Globally. Retrieved from: <https://newsroom.fb.com/news/2016/02/reactions-now-available-globally/>
- Newsroom. (2016b). Building a Better News Feed for You. Retrieved from: <https://newsroom.fb.com/news/2016/06/building-a-better-news-feed-for-you/>
- Newsroom. (2017a). News Feed FYI: Updating How We Account For Video Completion Rates. Retrieved from: <https://newsroom.fb.com/news/2017/01/news-feed-fyi-updating-how-we-account-for-video-completion-rates/>
- Newsroom. (2017b). News Feed FYI: Showing You Stories That Link to Faster Loading Webpages. Retrieved from: <https://newsroom.fb.com/news/2017/08/news-feed-fyi-showing-you-stories-that-link-to-faster-loading-webpages/>
- Newsroom. (2018a). News Feed FYI: Bringing People Closer Together. Retrieved from: <https://newsroom.fb.com/news/2018/01/news-feed-fyi-bringing-people-closer-together>
- Newsroom. (2018b). News Feed FYI: Helping Ensure News on Facebook Is From Trusted Sources. Retrieved from: <https://newsroom.fb.com/news/2018/01/trusted-sources/>
- Newsroom. (2018c). News Feed FYI: More Local News on Facebook, Globally. Retrieved from: <https://newsroom.fb.com/news/2018/03/news-feed-fyi-more-local-news-on-facebook-globally/>
- Nikolov, D., Oliveira, D. F. M., Flammini, A. & Menczer, F. (2015). Measuring online social bubbles. *PeerJ Computer Science*, 1(34). doi: 10.7717/peerj-cs.38
- O'Neil, C. (2017). The era of blind faith in big data must end. [Video file]. Retrieved from: [https://www.ted.com/talks/cathy\\_o\\_neil\\_the\\_era\\_of\\_blind\\_faith\\_in\\_big\\_data\\_must\\_end#t-100996](https://www.ted.com/talks/cathy_o_neil_the_era_of_blind_faith_in_big_data_must_end#t-100996)
- Pariser, E. (2011). *The Filter Bubble: What the Internet is Hiding from You*. Penguin: London.
- Parker, G. G., Van Alstyne, M. W. & Choudary, S. P. (2016). *Platform Revolution. How Networked Markets Are Transforming the Economy and How to Make Them Work For You*. New York: W. W. Norton & Company, Inc.
- Rajan, A. (2017). Do the technology giants finally face a backlash? *BBC*, 15 March. Retrieved from: <http://www.bbc.co.uk/news/entertainment-arts-39280657>
- Stanford Graduate School of Business. (2017). Chamath Palihapitiya, Founder and CEO Social Capital, on Money as an Instrument of Change. Retrieved from: <https://www.youtube.com/watch?v=PMotykw0SIk>
- Twitter. (2018). Twitter Trends FAQs. Retrieved from: <https://help.twitter.com/en/using-twitter/twitter-trending-faqs>
- Van Dijck, J. (2013). *The Culture of Connectivity: A Critical History of Social Media*. Oxford: Oxford University Press.
- Vicario, M. D., Zollo, F., Caldarelli, G., Scala, A. & Quattrocioni, W. (2017). Mapping social dynamics on Facebook: The Brexit debate. *Social Networks*, 50, 6-16. doi: 10.1016/j.socnet.2017.02.002