

Who Controls the Public Sphere in an Era of Algorithms?

Mediation, Automation, Power

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Contemporary Issues and Concerns Primer

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Introduction¹

Can Facebook determine the outcome of the 2016 election? Evidence suggests that it could play a larger role than we may expect or would ever know. Since 2008, Facebook researchers have been experimenting with providing users with ways to inform their friends they were voting, and have studied how making that information available may boost turnout in U.S. elections.² What they found was that, through manipulating their algorithms and adding features like an “I Voted” button, users who were exposed to these messages were 0.39 more likely to vote than those in the control group, effectively mobilizing a potential total of 400,000 voters to cast their ballot in the 2010 midterm elections.³ From one perspective, Facebook’s ability to ‘nudge’ a percentage of users towards voting seems like positive civic engagement; however, question of *which* users receive that nudge – and thus which candidates benefit from that crucial bump – raises important questions regarding the potential power and impact that algorithms are having on civic life both domestically and abroad.⁴

There is a recognizable value in democratic societies in having mechanisms by which the public can come together to freely discuss and exchange ideas, identify problems and propose solutions. As the Internet reached a more popular audience in the mid-90s and more people were connected online, leading intellectuals, policymakers and technologists began to re-imagine the public sphere through a digital lens.

This 'digital revolution' made possible by computers and networked communication had the potential to make information more available and easier to distribute, and enable a greater number of more diverse individuals to participate in the political, economic, and cultural spheres.⁵ Ideally, people would become media producers as well as consumers, bypassing many of the hierarchical and concentrated media institutions that had come to dominate the political and cultural spectrum over the 20th century.

Some of these ideas have come to fruition. Platforms have quickly overtaken traditional media forms, becoming the main way that news and information of cultural, economic, social and political significance is being produced, disseminated, and interacted.⁶ Services like Google News, Facebook, Twitter, and Weibo all play a role in curating news through different algorithmic mechanisms of aggregation, dissemination, and curation, often under the banner of "personalization." Furthermore, social media and messaging apps enable the sharing of news information and serve as sites for public discussion and discourse about cultural and political events.⁷ A recent survey found the number of Americans who rely on Twitter and Facebook as a source for news is increasing,⁸ and they have quickly overtaken search engines as the main channel to find news and information (though search engines remain essential). What that means is that the mechanisms underlying this networked infrastructure, particularly big data and algorithms and the companies controlling these information flows, are having a profound affect on the structure and formation of public and political life.⁹

In the past, investigations into the power dynamics of global media and democracy have contrasted normative ideals of what role the media *ought* to play in democratic societies in creating an informed citizenry, with factors affecting the availability of information such as media ownership and concentration (by government or corporations), and homogeneity in a globalized media market.¹⁰ Framing, journalistic bias, and variables affecting the 'newsworthiness' of an event or set of information in any given time or place, also affect what and *how* information is filtered into public view. As media have become networked, researchers have pointed to additional set of processes and mechanisms that are shaping public life and the production, dissemination, and consumption of news and information – namely algorithms, data, and automation.

What is the role of algorithms in the public sphere?

There is a long-standing debate in media and cultural studies about the role news media plays in the production and dissemination of public opinion in democratic societies.¹¹ The starting point of this debate often focuses on the work of Jürgen Habermas, who provided an historical account of how the concept of the public sphere became institutionalized in contemporary democracies. According to Habermas, the public sphere is the "realm of our social life in which something approaching public opinion can be formed," and is the space which mediates between "society and state, in which the public organizes itself as the bearer of public opinion."¹² From commitments like freedom of the press,

information, and expression to legally defined relationships between governments and media institutions, many governments have formally recognized the role of media in informing citizenry for democratic aims.

Habermas's theory was a critique of mass media in late capitalism, which, he argued, had become dominated by government and corporate interests, leading to a top-down shaping of public opinion to meet the needs of those in power. He pointed to an ideal form of the public sphere, the "bourgeois public sphere" in early-stage capitalism – which he felt idealized the role media and forums should play in political life in democracies.³³ The ideal public sphere, according to Habermas, would contribute to democracy, and is not shaped by but is facilitated through media, greater access to information, and more robust discourse and debate about common issues in democratic societies. Of course, Habermas's theory was deeply flawed; critics from gender, race, and media studies note that his historical account is revisionary, and paints a picture of a public sphere that never existed. Even in its ideal form, this public sphere would have been exclusionary and homogenous, fraught with power dynamics that reflected early capitalism and broader cultural values, and does not take into account other public spheres, such as a growing suffragette movement, that also impacted the shape of political life.

As the Internet became more of a mass-oriented medium, early adopters and techno-libertarians continually brought it forward as a space that could solve many of the public sphere issues brought on by one-way communication systems that dominated the 20th century.^{34,35} Even critiques of Habermas could express optimism about this networked space for communication, as other public spheres (counterpublics) emerged on message boards and chat rooms where discourse could flourish without the need for *news media* to mediate and transmit messages.

Despite this, the Internet has proven to be no less immune to control than media systems that came before – surveillance, censorship, and retaliation for speech have arguably become *easier* as more communication has moved online. After a brief period when the Internet seemed to elude classification, and thus legal regulation, it has increasingly been integrated into government media policies.³⁶ The personalization of media through the use of algorithms and the rise of targeted advertising have raised questions about how algorithms serve to divide individuals, instead of uniting them through common concerns.³⁷ And though recent e-government policies point to the persistence of Habermasian bourgeois public sphere ideals that emphasize open information and public discourse in structuring online social policy, this proposed two-way communication between citizens and governments often take place on platforms controlled by companies that operate mostly without public oversight.

Most recently, a number of scholars and journalists have focused on the shaping of the public sphere through more covert means, beyond our awareness, through the design and iteration of algorithms and automated media. Algorithms, as an object of study, unite a variety of information systems that are currently crucial to our participation in the public sphere.³⁸ They shape what people see through

social media like Facebook and Twitter, which are quickly becoming a central source for news and information, and where individuals come together to publicly or semi-publicly debate concerns. Algorithms are also core to search engines, where the public searches for and navigates different sources of information. They calculate what is “trending” or “interesting,” highlighting what we may feel we need to pay attention to be a part of our wider communities.⁹ Furthermore, recommendation and ranking algorithms on sites as varied as Alibaba, Netflix, and Le Monde suggest what we might like to purchase, consume, and view next. According to media theorist, Tarleton Gillespie, algorithms are becoming a “key logic governing the flows of information on which we depend.”¹⁰ Because of this, understanding the relationship between algorithms and public life is becoming a well-established area of inquiry for scholars across many disciplines.

While the term “algorithm” has a precise technical meaning, it has entered everyday discourse as “the things computers do.” In computer science, an algorithm is a step-by-step set of operations to be performed. This description makes this process seem neutral, objective, isolated, and reflective of reality. In practice, however, engineers and other company actors must make countless decisions in the design and development of algorithms. Through those decisions and relationships, subjective decisions and biases get encoded into systems.

Despite increased interest in algorithms as an object of study, they present unique challenges. Algorithms are illegible to most, revised frequently, and often depend on data that might be flawed in countless ways. Those underpinning major technologies are proprietary and companies are often invested in keeping away from public eyes, both for competitive reasons and to minimize external manipulation. Most importantly, because most large systems involve algorithms that are connected to data and evolve based on input, studying them out of context does little to elucidate how one person’s search result or social media feed looks at any given time. Researchers studying the impact of algorithms and data-driven technologies on the public sphere are concerned about the opacity of technical systems, the convergence of media entities, and the limited recourse for accountability. These concerns stem from a broader anxiety about how algorithms can be used to shift and shape public opinion as more parts of society are quantified.

What follows are six concerns that have been raised about the role of algorithms in shaping the public sphere. It is important to highlight that most concerns stem from and reflect Western biases. While not surprising given who is creating, studying, and critiquing these systems, this is none-the-less a serious limitation.

Concern#1: Algorithms can be used to affect election outcomes and can be biased in favor of political parties.

- Two recent studies have shown that changes to an algorithm could have an effect on election outcomes (see examples 1 and 2 in the Case Studies) and have found that manipulations of algorithms on both Facebook and Google could affect voting patterns in the U.S. and India.

- Legal scholar Jonathan Zittrain has pointed to the Facebook study in particular as being indicative of a potential new phenomenon, which he termed as “digital gerrymandering.” This term denotes a potential for platform owners who control the underlying algorithms of networked communication and information systems to unconsciously or intentionally manipulate algorithms to serve their interests.
- The potential to use algorithms to potentially benefit one political party over another brings to mind broadcast policies that have been put in place (like the now defunct U.S. FCC Fairness Doctrine, and due impartiality policy’s enforced by the U.K.’s OfCom Broadcasting Code).²³

Concern #2: Algorithms are editors that actively shape what content is made visible, but are not treated as such.

- Algorithms, though automated, are used to classify, filter, and prioritize content based on values internal to the system, and the preferences and actions of users.²² Researchers have argued that algorithms are often now deployed as “gatekeepers,” functioning similarly to a newspaper editor, making decisions about what information is relevant to users in what context.^{23,24}
- For instance, Twitter’s trending topics is affected by its design – users are provided a public, real-time feed of accounts they follow, lending the platform more to unfiltered, breaking news that is organized into geographical regions.^{25,26} This is in contrast to the algorithm used by Facebook, for their “Trending” page, determined by personal preferences, and what topics are ‘spiking’ in the system relative to normal. This has meant that events with more widespread appeal – such as entertainment news and major cultural events – have tended to dominate “Trending Topics” over news.²⁷ Both systems have been gamed by a minority of users, which has prompted the companies to alter how they function, further complicating who defines the norms and values of a particular algorithm.

Concern #3: Algorithms can be used by states to achieve domestic and foreign policy aims.

- Governments have used the function of algorithms which rely on users spreading or sharing information, to detach messages from government sources making them appear as independent and coming from individual citizens.
- Relationships between governments and platform owners are potentially being used for other political advantages, such as shaping and controlling public opinion domestically and abroad. This has been seen most recently in conversations between the U.S. government and Silicon Valley where they have discussed the potential use of algorithms and technology to change and monitor ISIS-related discourse on social media (see case study 3 in Case Studies).

- In the United States, there are laws that prevent covert propaganda – materials prepared by government agencies and disseminated without disclosing the source. The implementation of this rule has been clear in cases when government agencies have asked followers to tweet out or retweet messages in support of a government message.³ It is unclear, however, whether a governmental pressure on a company to change algorithms to prefer some political content over other – as was discussed in the summit between U.S. government officials and Silicon Valley on ISIS – would fit into existing laws governing domestic propaganda and political communication.
- Censorship policies of large networked platforms and search engines increasingly reflect negotiations between platforms and states. Algorithms are being used to automate content to obey local norms and laws, through a complex system of user feedback (flagging), human reviewers, and algorithms⁴ (see case study 4 in Case Studies).

Concern #4: Automation and bots are being used by state and non-state actors to game algorithms and sway public opinion.

- Bots, defined by Phil Howard as “chunks of computer code that generate messages and replicate themselves,” are becoming a key part of political communication on social media platforms and on message boards.
- Bots can be used to flood a particular topic and make it appear more popular, affecting ‘trending’ algorithms, which further push political messages into public view. These automated processes can be used to shift conversation quickly and swiftly, through increasing “noise” and making it harder for interested individuals to find relevant information, or through inserting doubt and new questions into political conversations which posits two or more competing views against each other (see case study 8 in Case Studies).
- They can also be used to pad the follower count of a politician or organization.⁵ In settings where multiple and diverse sources are competing for attention among users of a platform (like Twitter), having more followers can add value to messages and increase feelings of trust and authority among followers. On some systems, algorithms also prioritize content coming from users with high follower count, allowing politicians and organizations to increase their actual influence on the system by obtaining fake followers.

Concern #5: The journalism industry and the role of the “fourth estate” have been affected by the logic of algorithms, and content is no longer serving reflexive, democratic aims.

- Changes to what algorithms decide to be ‘relevant,’ and the role of data in making those determinations, have had an effect on the journalism industry as a whole. Some argue that

algorithms promote and reward ‘clickbait journalism,’ used to refer to a brand of content designed to increase off-site referral traffic from social media platforms through attention-grabbing (and sometimes tabloid-worthy) headlines and photos.³¹

- Algorithms, and how they value data such as clicks, likes, and shares, have changed the work of journalism and the methods by which journalists are assessed.³²
- Algorithms and natural-language generators are increasingly being used to actually *write* the news – creating human-sounding stories through using code to parse data and add prose.³³ Bloomberg, the Associated Press, Forbes, and The Los Angeles Times have used algorithms or “robo-journalists” to generate news reports on stats-rich topics like finance and sports. In part, this has stemmed from increased demand for news that has resulted from algorithmic media, and a media industry that values clicks over substance, and a positioning of audiences as being more responsible for the shape of content than publications.
- Algorithms are also being used to blur advertising and journalistic content, as “content discovery platforms” like Outbrain and Taboola place ads in the form of recommended content (often algorithmically generated) onto media platforms, which, though automated, are used to classify, filter, and prioritize content based on values internal to the system, and the preferences and actions of users.³⁴ Researchers have argued that algorithms are often now deployed as “gatekeepers,” functioning similarly to a newspaper editor, making decisions about what information is relevant to users in what context.^{35,36}

Concern #6: Algorithms are being designed without consideration of how user feedback inserts biases into the system.

- Algorithms are a function of social interactions, and so are the users that interact with them. Particularly as machine learning becomes the dominant paradigm shaping data-driven technologies, understanding how user feedback can feed into existing biases or values and shape the spread of information, can enhance any systems-based approach to media technology.
- Bias can enter into algorithmic systems regardless of the intent of the provider, and can create a feedback loop that builds bias into the design of information processes like search and retrieval. In a study of Google searches conducted by Latanya Sweeney at Harvard, “significant discrimination” in the online ads served by Google were found in searches for black-identifying names versus white-identifying names. Searches for black names were much more likely to return advertisements for arrest records.³⁷ Sweeney argues this is a function of Google’s AdSense algorithm, which takes user feedback into account to determine which terms are more likely to attract user interest. In effect, Google learned society’s racism and fed it back to users.

- People and organizations with vested social, political, and economic interests can leverage the feedback loops that exist within these systems to actively and intentionally insert bias into recommendation systems and other algorithmic-based services. Initially developed for search engine optimization (SEO), many vendors exist to help politicians, activists, and companies push their interests by gaming algorithms to benefit their clients under the guise of marketing.

Tensions for Consideration

To better understand and address concerns about the role of algorithms in shaping the public sphere, it is important to grapple with the tensions that underpin those concerns. As discussed in the “Assumptions and Questions,” primer many of these tensions are rooted in existing assumptions, values, and questions about the role that media has played within different political systems historically. Is democracy the ideal form of governance? What role should media play in shaping the public sphere? What are the implications of a capitalist-influenced public sphere that pre-dates the concerns being addressed here?

Critics of Habermas have challenged the bourgeois public sphere that he articulates, arguing that he imagined an ideal that never was. In many ways, the same can be said of those seeking an Internet-enabled public sphere. Technology has reconfigured aspects of the public sphere, but perhaps not always in the way that many would like. Yet, it is important to consider who is included in this new configuration, who is not, and how this is like or unlike previous instantiations.

The publics that are shaped by technical systems introduce and make visible various logics and tensions that are both new and not new. This section describes four different classes of tensions, which raise serious questions about what ideal we should be seeking as we address emerging concerns.

Tension #1: Universality, Diversity, Personalization

National newspapers, public radio, and broadcast television have, in the past, worked to unite citizens across a common set of issues, and have arguably contributed to democracies that used these common threads for public discourse and debate.³⁸ Over the course of the twentieth century, these traditional media forms also became more consolidated and hierarchical, and provided access to a very limited set of issues and perspectives, which narrowed the field to one set of universal ideals often reflecting the values of those who were empowered to define them. Underrepresented and marginalized communities often rejected these universal ideals, highlighting the way their voices, priorities, and issues were excluded from the mainstream.³⁹ The push for diversity in representation, and a broader spectrum of media that include more diversity, affected news media throughout the mid-20th century, through cable networks and indie media. The rise of the Internet was viewed as an opportunity to empower more diverse voices, sources, and content (especially those who could not ‘break’ into

traditional media or produce their own channels) and, subsequently, expose individuals to a greater selection of information and expand their views.⁴⁰ The celebration of plurality and diversity was unquestionably at the expense of universality.

The rise of algorithms as curatorial mechanisms has complicated this tension in a new way. Rather than focusing on who gets to produce media or whose voices are included in media, “personalization” systems are focused on what media any given individual wants to consume.⁴¹ As people turn to media and topics that they find of interest, not ones deemed to be of interest to the public good by those by cultural elites, this often produces a rejection of both universality *and* diversity. Algorithmic personalization and the move towards metric-driven reporting has led to tensions about the role that media ought to play within democratic discourse, the balance that must be struck between individual rights and the public good, and how capitalist-owned and oriented media plays in weighing the rights and needs of individuals against the beliefs and commitments of powerful actors and interests. Due to the role algorithms and data-driven technologies are playing in the flow of news and information, many of these philosophical tensions and social concerns are being played out behind an opaque screen, with the results presented to individuals as the function of mechanistic processes, instead of social and political ones.

The homogeneity of how the dominant digital platforms are constructed - by primarily American companies operating under consumer rather than citizenship-centric logic - shapes the very architecture of these technical systems. While capitalism has shaped many publics - especially those in contexts where media is structured by capitalism - the consolidation of power has raised new concerns.

Tension #2: A Change in Gatekeepers?

Access to political information has always been brokered through gatekeepers. Traditional news media centralized production and scaled dissemination, which in turn made its editorial decisions extraordinarily powerful in shaping the information available to the public.⁴² The Internet reconfigured those dynamics by decoupling production, dissemination, and curation. Many Internet advocates relished the ideal of a leveled playing field in expression. Yet, as became quickly noticeable, the ability to gather an audience and disseminate content was not evenly distributed.⁴³ Furthermore, the flood of available information was often overwhelming for those seeking to consume information, leading to what was being termed “information overload.”⁴⁴ Thus, it was not surprising to see new tools and techniques emerge to curate and filter information. Early on, people began curating what they saw on the Internet, gaining fans for their ability to bring together a set of interesting links and provide commentary. With the rise of search and social network sites, algorithms were deployed to take on that curatorial role and, increasingly, personalize information based on feedback loops culled from active and passive use (e.g.: clicking a link, “liking” a post, retweeting).

While news media in many countries have been capitalist in nature, the tech companies who build search engines and social media services have introduced different commitments, values, and agendas, which underpin concerns about who is serving the gatekeeping role. Furthermore, because the algorithms being deployed are designed to either give users what they want or learn from some users to influence others this brand of gatekeeping looks fundamentally different from editorial gatekeeping that was historically more common. Even the more participatory-oriented value of “user engagement” has drastically re-oriented what content is deemed as ‘valuable’ or not.⁴⁶ Given this shift, it’s not always clear who suffers and who benefits from this reconfiguration of gatekeepers, or how the shift in gatekeeping alters the function of the public sphere.

Tension #3: A Collapse/Re-emergence of Boundaries and Borders

Media and publics have long been bounded by nation-states, language, culture, and history.⁴⁴ As broadcast media grew during the 20th century, news media started flowing around the world. Newspapers were disseminated more broadly while radio and TV were broadcast to larger audiences. The control of those media was still tethered by boundaries, laws, and localized values that provided mechanisms of control.⁴⁷ The Internet was designed to move across geographic boundaries, even if key parts of the architecture involve cables and data centers that sit within nation-state boundaries. Yet, because of both technical relays and the ease with which people can share content, information has become more porous, which is both celebrated and troublesome. On one hand, this allows for activists and thought leaders to share content easily; on the other, it allows for violent and hateful speech to also spread quickly with little means of control.

The softening of boundaries is also uneven. Even as translation services make it possible to read content produced in other languages, this does not mean that people around the globe have the context necessary to understand *what* is being said. Algorithms also introduce new boundaries within networks – national laws become written into algorithms, and geographic location, and one’s own personal network, strongly influences search results and Facebook News Feeds. It has become evident that access to the Internet is not enough to combat inequality in access to information.⁴⁸ Discussions on “illusions of a borderless world” that focused on infrastructure and geography now have to take into account how algorithms are becoming sophisticated enough to re-insert borders without need for outright blocking of websites.⁴⁹ Platforms can now support both more increased global access to information, while modifying local content – i.e. a Facebook user in France and a user in Turkey can comment on each other’s posts without any awareness about how their specific feeds reflect local laws, politics, and norms. Moreover users have no access to any of the corporate/state negotiations and decisions that led to those feeds – which can be even more opaque and harder to understand than the algorithms themselves.

Tension #4: Power and Accountability

As networks reconfigure the power dynamics around publics, questions of governance and norms emerge. Freedom of expression, assumed within the United States and projected onto algorithmic systems by American companies, is not a universally accepted value.⁵⁰ Concerns around problematic speech get compounded when algorithms are designed to feed people's digital acts back into the system to inform and shape what others see. For example, racist attitudes in society can get fed back into systems that influence what the entire public sees.⁵¹

Although many idealists hoped that Internet-based developments would decentralize or radically shift the locus of power and control over public discourse, a small number of companies currently control significant portions of the architecture, attention, data, and revenue.⁵² These companies, predominantly American and shaped by dominant American and capitalist logics, seek accountability through the market even as they build the infrastructure of contemporary publics and become the marketplace itself.

Tension #5: Visibility, Accessibility, and Analysis

Underlying questions about “who controls” are assumptions about how *visibility* and *accessibility* of inner-workings of algorithmic and automated media work to limit or expand the public sphere, as well as the potential field of critique and analysis. Over the course of the 20th century, philosophical schools and disciplines emerged to understand how media worked to shift and shape political and cultural life (which in turn shaped media).⁵³ Through that a set of methodologies developed that enabled deeper and comparative analyses of media systems and content, and have fed into media professions, as well as educational programs through calls for media literacy.

These methodologies and frames for analysis are still important and necessary – traditional media has moved onto the Internet and continues to exert a powerful influence. But, algorithms and data have brought new questions to old frames for analysis. For example, how do you unveil bias through algorithms that rely heavily on personal networks and relationships and that, due to the logic of the technology, cannot be compared? Are “algorithms” the right level of analysis for these discussions – i.e. when we ‘unlock the black box’ how much can we actually see by looking at the code? And if not, what is the ‘content’ for analysis? What relationships and power structures are not visible through this and other frames more tailored to online media, and how can these analyses be translated to a broader public that can use them to understand how their world is being shaped and by whom?

iv. Proposed Remedies to Algorithmic Shaping of the Public Sphere

Theorists who have acknowledged that algorithms can have a powerful effect on public opinion and the public sphere have proposed a number of solutions to algorithmic manipulation. These solutions highlight how intervening in media systems in an era of algorithms is often a complicated process,

and can entail different ideas about the role that different stakeholders (governments, corporations, citizens) should have in shaping the media system. They also highlight how *algorithmic accountability* – un-black boxing the ways that algorithms exert power through how they prioritize, filter and categorize information – can introduce new concerns, the result of competing value systems and interests that feed into the design of technologies.⁴

Proactive Transparency

A number of advocates are calling for algorithmic transparency, the public release of algorithms or code, particularly in cases when data-driven technologies have been shown to affect the public in potentially adverse ways.⁵ This is in response to the ‘hidden’ nature of algorithms – transparency is intended to bring to the surface code that exists and influences from beneath. Arguments in favor of it stem from existing freedom of information laws viewed as fundamental in democracies, and the duty of citizens to become informed and oversee their government.⁶ They often accompany calls for open data, on the basis that, though making data more publicly accessible can lead to greater oversight, it does little to advance our understanding of how algorithms can use data in practice.

Calls for transparency often come into conflict other values like privacy, accessibility, and legibility, because, even if the code and data were made available, only a small segment of the population has the technical capacity to understand code and untangle complex algorithms and making data available would violate other commitments to users. Critiques of algorithmic transparency highlight the interactivity of machine learning algorithms, and argue that it will do little to highlight how bias enters systems.⁷ Algorithms, which often take into account variables like individual preferences, past actions, time, location, and relationships, make little sense out of context; their results reflect the data they use, which almost certainly encodes biases of its own. On their own, making algorithms more accessible does little to unveil other negotiations – such as between states and corporations – that may have affected the algorithm’s design. These policies also prioritize accountability-after-the-fact versus more a priori regulation; transparency may occur after harms have already been introduced into systems that, due to the logic of machine learning, learn and are shaped by past actions.

Reverse Engineering, Technical and Investigative Mechanisms

In recognition of the potential limitations of transparency for accountability, reverse engineering of algorithms has been proposed as an alternative that could achieve many of the same aims while taking into account inputs and outputs that give algorithms their contextual shape.⁸ Nick Diakopolous has been one proponent of this type of solution – particularly as a tool that can be used by data journalists serving as a ‘check to power’ investigating data-driven technologies. Diakopolous says this technique has been effective in his own investigations analyzing censorship and defamation in search-engine algorithms.⁹ As a methodology, he has two main steps: (1) Identify the algorithm to be held accountable; and (2) Observe the phenomenon to be reproduced, and sample the input-output

relationship.

Reverse engineering suffers from many of the same challenges as transparency policies. It relies on corporations and governments being more open with algorithms and data, and is a method that can be used after harms have been introduced. It also requires significant skill and education, which has been acknowledged by Diakopolous in his recommendation of this technique for professional data journalists. More recently, scholars like Christian Sandvig, have been working to understand how technical mechanisms and tests can be used to audit or evaluate algorithmic systems.⁶⁰ These methods can be used in service of understanding how processes like search and recommendation may reflect conscious and unconscious bias of algorithm owners and users, and point out existing and potential algorithmic harms.

Design/Engineering Solutions

A priori solutions have been proposed in the form of values, and ethics-based education for algorithm designers that could expose them to how values enter into the design process. This school of thought, referred to as *values-in-design* or *value sensitive design*, is a theoretically grounded approach to the design of technology that has proposed that designers need to be made more aware of and critically examine how their own values shape the technologies they work on or produce.⁶¹ Acknowledging that human values will always accompany human technologists (and human users), this theory advocates that designers actively intervene within the design process, systematically building other, more “positive” values into technologies, such as privacy, freedom from bias, informed consent, environmental sustainability, and so on. This theory and its related methodologies have increasingly entered into the syllabi of engineering and related programs like information science, human computer interaction, and user experience/interface design.⁶² In that sense, it is similar to the professional codes of conduct that have been built into the journalistic profession.

As a tool to critically examine values influencing the design process, values-in-design is useful as a method, and can be used to highlight relationships of power that can become embedded into networked systems. However, building values into design does introduce new questions and concerns, not unlike those introduced by codes of ethics for professional journalists (see “Assumptions and Questions” primer).⁶³ In its ideal form, it is a virtue-based approach that relies on a small group of individuals to hold or uphold the ‘right’ or ‘morally-correct’ position, building those values into the design of platforms, unmotivated by other interests such as money or power.⁶⁴ To some degree, it could be construed as a rationalist solution that re-introduces questions about “who controls” and creates the expectation that designers and engineers hold significant power, responsibility, and blame in shaping the world through technology. In reality, data-driven technologies are interactive and reflect multiple stakeholders, including individual users, platform owners, and governments.

Computational/Algorithmic Literacy

Improving computational literacy across demographics is central in several of these solutions, particularly transparency efforts. Computational literacy is increasingly being stressed as computers, and code, have a greater influence our lives – both in the types of jobs that are available, and as it becomes necessary to know how computational logic structures news and information. According to Cathy Davidson, being able to read, write, and understand algorithms and have computational skills should be integrated into educational philosophy, as the fourth ‘R’ (“reading, ‘riting, ‘rithmetic, and ‘rithms).⁶ This solution is the converse or correlate of values-in-design – teaching humanities to engineers and teaching computational skills to non-engineers attempts to bridge divides created by specialized, siloed educational models, and teach alternative ways to “think.”⁶ The argument being that dominant modes of communication, including code, can leave many individuals feeling silent and thus create or perpetuate inequalities. When it comes to the algorithmic manipulation of news and information, a wider understanding how algorithms can be used to personalize content may help individuals to assess how their content may reflect the choices of algorithm owners, as well as their past actions, however, does little to elucidate the network of relationships affecting those decisions or help individuals to keep track of how changes in algorithms may affect information production and distribution in the future.

Governance and Public Interest Frameworks

In past media eras, the recognition that media plays an important role in democracy and shaping public opinion led to the formation of government agencies and independent bodies to regulate communications infrastructure. These bodies, such as the FCC in the U.S. or OfCom within the U.K. have, at times, also led to the development and enforcement of rules and policies for news production and dissemination deemed to be within the public interest and supportive of democratic principles. As mentioned above, the FCC’s now-defunct Fairness Doctrine principle, and OfCom’s rules of Due Impartiality recognize the value of promoting fair and unbiased news to inform citizens within democracies. The EU’s Right to be Forgotten does recognize that search engines can act as editors and make decisions about what information should no longer be accessible in search results.⁷ The U.S. recognizes a similar role for search engine or social media-as-publisher but has taken the opposite position, arguing that Google’s search results are protected under free speech laws in the U.S. and can be organized in whatever way the company sees fit.⁸

Policy researchers, like Phil Napoli, have argued that similar public interest principles have not been adequately built into regulatory frameworks in western democracies governing search engines and social media.⁹ Instead, this responsibility has been shifted onto users, who should independently fulfill their civic duty through seeking out and weighting diverse viewpoints. The recognition that platforms can shape what news and information comes into user awareness, and thus political attitudes and beliefs, has not yet been reflected by public interest media policies.

Decentralization in Markets and Technology

A more fundamental approach to distributing the impact of a small number of company's algorithms on the public sphere is decentralization – either of technology, via emerging tools like the Blockchain, or of markets, via anti-trust action against monopoly platforms. Both approaches are fraught; entrenched interests weigh heavily against their potential success.

From the technology angle, “open” challengers to social networks – like Ello or Diaspora – have fallen by the wayside quickly, unable to compete with the incumbent network effect and the existing market share that these platforms already command and continue to grow. That said, an increasingly organized community of developers and activists, and recently, researchers at the MIT Media Lab's Digital Currency Initiative, continue to explore the possibilities of alternative infrastructure that (re)decentralizes the Internet with a dual aim of creating both encoded trust networks and distributed power in shaping discourse.⁷⁰

Anti-trust challenges to large platforms in Europe and Canada have met with some success, specifically in cases against Google in which search result manipulation was shown to have a deleterious effect on consumers.^{71,72} In the United States, there has been less sympathy for an anti-monopoly stance against any of the major players, although the Authors' Guild of America is currently advocating the American Department of Justice to make an anti-trust complaint against Amazon. While this challenge is framed as a move against Amazon's monopoly power in setting book pricing, algorithmic control plays heavily into the questions of discovery and perceived consumer choice.

v. Conclusion and Open Questions

All systems of power are manipulated and there is little doubt that public spheres constructed through network technologies and algorithms can be manipulated, both by the architects of those systems and by those who find techniques to shape information flows. Yet, it is important to acknowledge that previous genres of media have been manipulated and that access to the public sphere has never been universal or even. As we seek to redress concerns raised by technical systems and work towards a more ideal form, it is essential to recognize the biases and assumptions that underpin any ideal and critically interrogate who benefits and who does not. No intervention is without externalities.

These varying tensions raise significant questions about who controls - and should control - the public sphere in an era of algorithms, but seeking solutions to existing concerns requires unpacking what values, peoples, and voices should have power.

- If democracy is a broadly accepted value (which is by no means guaranteed), should we be

looking to representative approaches or direct democracy? One might argue that the feedback loops that help shape the organization of information presented by Google are a form of direct democracy enabled by algorithms. Yet, this construction of democracy is deeply disconcerting to many who feel as though there is no way to push for public interest over individual desires given who controls the architecture upon which the algorithms sit.

- If diversity of perspective and broad inclusion are seen as ideal, how do we reconcile serious contradictions in values and commitments? Is the goal to produce a universal public sphere or to enable a plethora of publics? Who gets to control those boundaries and what happens when they come into contradiction? Are those contradictions necessary, and what happens when values are assumed into the design of companies who have monopolies that may dampen those contradictions?
- The design decisions that companies make when they build systems and use algorithms to shape information flow have serious ramifications for the topology of the public sphere. Many people feel powerless to influence or hold accountable the architects of those systems. At the same time, many people also feel powerless in relation to their governments and media industries. To what degree is the reconfiguration of power disturbing or consequential to those who have traditionally had power in controlling the public sphere versus those in the broader public?

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