NEWS BY ASSOCIATION:
Designing a way out of the echo chamber

by Ania Medrek

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Abstract

This thesis is an investigation of the echo chamber phenomenon in news consumption on social networking sites. It incorporates elements of actor-network theory, Bruno Latour's 'matters-of-concern' and Participatory Design methodology to identify and unpack contributing factors to the formation of echo chambers. As part of the research, a web tool called *Echology* was conceptualized in a series of workshops with news industry professionals. This paper describes the making of *Echology*, from ideation to actualization. The goal of this document and its accompanying design piece is to challenge readers to think critically about the forces at play in an online news experience.

Keywords: actor-network theory, participatory design, social networking sites, news feeds, journalism

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Introduction

With its extensive reach, the Internet seems like the ideal medium for people with different viewpoints to have rational discussions, find common truths and build collective knowledge. But instead, we often find ourselves stuck in 'echo chambers' — online communities where an individual is presented with beliefs and opinions that jibe with their own, and rarely exposed to different viewpoints. Echo chambers are particularly noticeable in the way news circulates online. Many have pointed fingers at the selective algorithms behind sites like Facebook and Twitter, but they are only one part in a web of factors that together contribute to the echo chamber phenomenon on social networking sites. This master's thesis is a work of media and communications studies, and borrows from the fields of journalism studies, political science, sociology and epistemology. This interdisciplinary approach reflects the socio-technical nature of the project's research questions:

> *What are the key factors contributing to the formation of echo chambers in news consumption on social networking sites? How might designers address the echo chamber phenomenon?*

The importance of these questions is apparent in the sheer number of people that are affected by its answer. Facebook boasts 2.07 billion monthly active users worldwide; Twitter's numbers are on the rise, last reported by the company to be 330 million.[1] In a radical shift from the not-so-long-ago days when television broadcasts and printed newspapers reigned the news industry, social networking sites are widely used for the diffusion of articles, analysis and opinions. As this shift continues, public leaders, scholars, technologists and journalists must ask

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[1] *"Company Info." Facebook Newsroom. September 2017. https://newsroom.fb.com/company-info/.*
"Earnings Press Release" Investor Relations, Twitter. October 26, 2017, https://investor.twitterinc.com/results.cfm.

the hard questions about how social networking sites are changing news consumption by addressing any potential benefits and consequences — and many are. Over the months spent developing this project, 'echo chamber' became more and more of a buzzword. In a radio interview, former U.S. president Barack Obama told Britain's Prince Harry: "One of the dangers of the Internet is that people can have entirely different realities. They can be cocooned in information that reinforces their current biases."[2] Even the Pope questioned how news is disseminated on social networking sites in a message to the public: "Disinformation thus thrives on the absence of healthy confrontation with other sources of information that could effectively challenge prejudices and generate constructive dialogue; instead, it risks turning people into unwilling accomplices in spreading biased and baseless ideas." He likened the spread of fake news to the serpent in the Garden of Eden hissing in Eve's ear.[3] While this public dialogue is important, short interview clips and press releases often fail to acknowledge the complexity of the matter.

This project uses elements of actor-network theory (ANT) to identify and unpack various contributing factors to the echo chamber phenomenon. One sub-section of ANT in particular, Bruno Latour's 'matters-of-concern', was incorporated into a series of Participatory Design (PD) workshops with news industry professionals. The goal of the workshops was to broach the latter of the project's two research questions — how might designers address the echo chamber phenomenon? — and the result was the creation of Echology, a Twitter extension that challenges users to step out of their personalized news feeds and think critically about their online news experience. The title chosen for the extension, Echology, is inspired by the word 'ecology'

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2 *Yeginsu, Ceylan. "When Harry Met Barry: The BBC Obama Interview." (The New York Times, Dec. 27, 2017)*
3 *Pope Francis. "Fake news and journalism for peace." (Libreria Editrice Vaticana. Jan. 24, 2018).*

(the study of organisms and their relations to one another and to their physical surroundings)[4] because of its congruence with ANT, which aims to track objects and their relations to one another, as well as the obvious nod to the word 'echo'. Looking at relationships between actants,[5] both human and non-human, is integral to a study of echo chambers. Like an ecologist might study ties between an animal and its ecosystem, an ANT scholar might trace the assembly of factors surrounding a matter, and describe how they abet and impact each other. An echo chamber doesn't form due to a singular cause-and-effect event — it is the result of seemingly separate elements entangling in such a way that impacts an individual's news consumption practices. Many news readers are engaged in deep-rooted, close relationships with various actants, such as misinformation and algorithms, without even realizing. This thesis project works to bring some of these hidden associations into the spotlight.

Specific boundaries and limitations were set to maintain scope throughout this project. While more than a dozen papers were combed for qualitative and quantitative data about echo chambers, this area of study is under constant investigation and new developments in scholarship and industry are on the horizon. The outcome of the participatory workshops is a product of specific circumstances: three workshops with five news industry professionals conducted over a two-month period. A developer was brought on board to program the back-end of Echology and budget and time constraints played a role in production decisions. The objective of this written document and its accompanying design piece is not to propose a grand solution, but to contribute to a larger scholarly initiative of applying actor-network theory to contemporary news practices. It does so by probing one corner of the area: the echo chamber phenomenon in news consumption on social networking sites.

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[4] *Oxford English Dictionaries definition*
[5] *'Actant' is a term used in actor-network theory to describe any agent - human or non-human.*

This document begins with a scan of the field, providing an overview of previous research on echo chambers and news consumption. Next, the theoretical review explains the decision to apply elements of ANT, specifically Latour's 'matters-of-concern' — a constructivist take on how designers should approach public matters. The *Methodology* chapter explains how a list of factors was extracted from the findings of the literature review and subsequently integrated into the design of three workshops. Finally, the chapter titled *Documenting Participatory Design* details the methods used at each workshop and offers insight into which techniques generated rich discussions and ideas, and which ones left room for improvement. Here, design researchers can read about the unfolding of a series of workshops that were lively, challenging, and ultimately productive. The nuts and bolts of the project can be found in the Appendices, including ready-to-print copies of the workshop plan and the deck of cards used for ideation.

Literature Review

The Study of Echo Chambers

The formation of echo chambers on social networking sites is a contemporary issue, playing out at present, and under continual analysis by scholars and journalists alike. The term 'echo chamber' entered common lexicon as a way to explain the unexpected results of the 2016 U.S. presidential election[6] and Britain's vote to exit the European Union[7], and triggered a long list of bleak news headlines. "Your echo chamber is destroying democracy," declared *Wired.com* in 2016; 'Danger in the internet echo chamber,' warned *Harvard Law Today* months later; 'Social media's threat to democracy' was splashed across a 2017 cover of *The Economist*, accompanied by an image of a hand holding Facebook's 'f' logo as if it were a gun. In academia, scholarship on social networking sites is continuously "emerging from diverse disciplinary and methodological traditions, addresses a range of topics, and builds on a large body of computer-mediated research."[8] Self-presentation and identity, social relations and privacy concerns are some of the many topics that have been studied from a social network perspective since the early days of MySpace and Friendster.[9]

Recent studies on echo chambers often begin by acknowledging homophily — the tendency to associate with people similar to ourselves. This tendency infiltrates people's digital lives, where individuals choose who to friend, follow, and engage with. Here, at the intersection of homophily and social networking sites, is where many researchers have found that sameness is

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[6] Cambre, J., S.R. Klemmer, and C. Kulkarni. "Escaping the Echo Chamber: Ideologically and Geographically Diverse Discussions about Politics" (Conference on Human Factors in Computing Systems, 2017). 24.
[7] Olhede, Sofia, and Russell Rodrigues. "The Computer Ate My Personality" (Significance 14, no. 3, 2017): 7.
[8] Conole, Grainne, Rebecca Galley, and Juliette Culver. "Frameworks for Understanding the Nature of Interactions, Networking, and Community in a Social Networking Site for Academic Practice." (International Review of Research in Open and Distance Learning 12, no. 3, 2011) 219.
[9] Ibid.

being amplified to problematic extremes. Different terms are used in literature to describe a similar concept: group polarization, filter bubble, closed ideology, tribalism, and homogeneity, to name a few. A medley of papers has debated just how pervasive the echo chamber effect is. The topic has been approached through mixed methods; analyzing a variety of user data sets including political associations, web browsing histories, consumption patterns, messages, and hashtags. The results are therefore varied, each methodology yielding slightly different outcomes. Studied together, one can see patterns emerge and find that a majority of studies concur — echo chambers are real.

Cass Sunstein, law professor and former member of U.S. president Barack Obama's administration, is a leading voice sounding the alarm on echo chambers. In Republic 2.0 (2007) he stated: "This phenomenon raises serious questions about any system in which individuals and groups make diverse choices." Studies of the last decade widely support Sunstein's assertion. One massive report by Schmidt et al. (2017) analyzed the news consumption habits of 376 million Facebook users and 920 news outlets over the course of six years and found evidence that most users visit a limited number of pages, resulting in distinct polarized communities. Other qualitative and quantitative studies have had similar findings.[10]

Some research has generated conflicting results; Flaxman et al. (2016) found that social networking sites are linked to the formation of echo chambers but that, at the same time, these sites expose users to cross-cutting content. They conclude that the problem is relatively modest. In a survey of 1600 Canadians, Hermida et al. (2012) found that a diverse news diet is important to social media users, but that users count on their social circles — not trusted journalists or news

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[10] *Anagnostopoulos et al. "Viral Misinformation: The Role of Homophily and Polarization." (2014);*
Grevet, Catherine, Loren G. Terveen, and Eric Gilbert. "Managing Political Differences in Social Media." (CSCW Conference, 2014) 1400–1408;
Williams, Hywel T.P., James R. McMurray, Tim Kurz and F. Hugo Lambert. "Network Analysis Reveals Open Forums and Echo Chambers in Social Media Discussions of Climate Change." (Global Environmental Change, 2015) 126–138.

organizations — to supply that diversity. One notable outlier, Barbera et al. (2015), claimed that other researchers have exaggerated the impact of echo chambers and found that social networking sites actually reduce polarization through weak ties. Weak ties — online acquaintances an individual may not know personally — are also suggested by Grevet et al. (2014) as one way of fending off homophily in social networks. But Grevet et al. said relations between weak ties are not yet well-enough supported by social networking platforms. They see a design opportunity: help bridge a connection between users and their acquaintances with alternate viewpoints and the echo chambers may stay at bay.

Most striking is how many studies link the echo chamber phenomenon to dysfunctionality within a democratic society. Feldman (2015) investigated the influence of social media on knowledge construction and democratic participation, and argued that social networking sites have a direct impact on adults' understanding of reality. He warned that a lack of diverse views, manipulated content, misleading headlines and viral misinformation may inhibit productive democratic discourse and knowledge creation. Just and Latzer (2017) investigated how algorithms impact social order. Their paper gives a comprehensive explanation of how algorithmic selection (the computational method used by Facebook and Twitter) can influence individuals' perception of the world. Metaxas and Mustafaraj (2012) looked at the electoral facet in their assessment of social networking sites' impact on democracy: "Even more than in previous elections, we should expect that all candidates and political parties will use social media sites to create enthusiasm in their troops, raise funds, and influence our perception of candidates (or our perception of their popularity). We should be aware of how that works and be prepared to search for the truth behind the messages."

Sunstein, from a mixed background of law, politics, and behavioural economics, speaks broadly about echo chambers and democracy in his many books and papers. As he explained in

Republic 2.0 (2007), Sunstein believes that there are "two distinctive requirements" for how a democratic society should function: "First, people should be exposed to materials that they would not have chosen in advance. Unplanned, unanticipated encounters are central to democracy itself. Such encounters often involve topics and points of view that people have not sought out and perhaps find quite irritating. They are important partly to ensure against fragmentation and extremism, which are predictable outcomes of any situation in which like-minded people speak only with themselves." Sunstein foresaw what studies show is happening on social networking sites today — homophily and polarization. His second requirement is that many or most citizens should have a range of common experiences. "Without shared experiences, a heterogeneous society will have a much more difficult time addressing social problems. Common experiences, emphatically including the common experiences made possible by the media, provide a form a social glue. A system of communications that radically diminishes the number of such experiences will create a number of problems, not least because of the increase in social fragmentation."[11]

As this overview shows, the echo chamber phenomenon is not an isolated occurrence relegated to the digital world. It travels with us after we log off and shut our laptops; it seeps into larger happenings like knowledge creation, elections and social experience. Recent scholarship has honed in on specific ways it does so, and the following sections will closely examine noted factors that might be contributing to the echo chamber phenomenon in news consumption on social networking sites.

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[11] *Sunstein, C R. Republic.com 2.0 (Princeton University Press, 2007) 6.*

Virality and Misinformation

In early 2017, the BBC asked a panel of experts about the greatest challenges we face in the 21st century. The spread of misinformation was named a leading concern: "If the status quo of ubiquitous fake news remains, how will that shape how people see the world? If individuals spend months, years, even decades of their life exposed only to unreliable news sources, it does not augur well for civilized society and debate."[12] It's nothing we haven't been warned about before — five years before the World Economic Forum listed massive digital misinformation as one of the main threats to society, stating: "The global risk of massive digital misinformation sits at the centre of a constellation of technological and geopolitical risks ranging from terrorism to cyber-attacks and the failure of global governance."[13]

Studies have linked misinformation to the echo chamber phenomenon by looking at a variety of data sets. One established research method is the comparative analysis of scientific and conspiracy news. Here, scientific news refers to content that is verifiable — content supported by data and methods that are readily available. Conspiracy news refers to unsubstantiated rumours which "tend to reduce the complexity of reality by explaining significant social or political occurrences as plots conceived by powerful individuals or organizations."[14]

Vicario et al. (2015) found that both scientific and conspiracy stories have similar diffusion patterns; in both cases, posts circulate between friends within a homogenous cluster. In an analysis of 1.2 million Facebook users, Anagnostopoulos et al. drew a similar conclusion: the driving force behind engagement with content is having friends with similar consumption patterns. The spread of rumours (colloquially called trolling or fake news) can be politically

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[12] Lufkin, Bryan. "10 grand challenges we'll face by 2050." (BBC Future, July 2017)
[13] Howell, Lee. "Global Risks 2013 Eighth Edition." (World Economic Forum, 2013)
[14] Anagnostopoulos et al. "Viral Misinformation", 2014.

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motivated, or simply designed to cause confusion in the public. For example, one conspiracy post cited in the study was shared on Facebook 132,000 times. It claimed that October 2013 had 5 Tuesdays, Wednesdays, and Thursdays, "a very rare event that Chinese people call the glory shu tan tzu." The truth is that the days of the week align this way every seven years, and the phrase in the post is nonsensical in Chinese.[15]

Often, the lies spread by posts are more consequential than an incorrect translation. Politically-motivated trolling has caught the attention of traditional mass media and scholars alike. In Fall 2017, the U.S. House Intelligence Committee announced that Russia had financed the spreading of misinformation about Hillary Clinton and the Democratic Party ahead of the last presidential election. The misleading advertisements circulated on a number of social networking sites, some directly targeting Clinton (one insinuated that Jesus did not want her to win, for example), while others worked subtly to stoke division in U.S. society on a number of hot-button issues. "We basically have the brightest minds of our tech community here and Russia was able to weaponize your platforms to divide us, to dupe us and to discredit democracy," California Democrat Jackie Speier said on the matter, as reported by the New York Times.[16]

In some cases, misinformation can be a matter of life and death. According to a 2017 UN report, more than 600,000 Rohingya, a Muslim minority group, fled Myanmar for Bangladesh after violent military-sanctioned attacks on their homes in the province of Rakhine. Weeks after the report was released, a state official from Myanmar said, "There is no such thing as Rohingya. It is fake news."[17] Reported by just a few local news outlets, this verbal erasure of a minority group may not have impacted the public opinion of the country. But in the small Southeast Asian

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[15] *Ibid.*
[16] Shane, Scott. *"These Are the Ads Russia Bought on Facebook in 2016." (The New York Times, Nov. 1, 2017)*
[17] Beech, Hannah. *"'No Such Thing as Rohingya': Myanmar Erases a History." (The New York Times, Dec. 2, 2017)*

nation, Facebook has experienced a boom in recent years and hateful messages posted by anti-Rohingya figureheads reach hundreds of thousands every day.[18]

Whether misinformation diffuses during an election, a military crackdown or a more trivial situation, studies show that homophily is a main contributing factor. Hermida et al. showed that many Facebook and Twitter users trust news shared by personal connections more than they trust traditional news organizations. This means that when users share misleading posts, their close friends are likely to trust it.

Williams et al. focused on the formation of echo chambers in Twitter discussions of climate change. By analyzing user attitudes through hashtags (#climate, #climatechange and #globalwarming), researchers found evidence that climate change discussions on social media are highly characterized by homophily and segregation. They found that the more active a user is, the more polarized they become; this may be the result of confirmation bias — "the tendency to interpret new evidence as confirmation of one's existing beliefs or theories."[19] As Grevet et al. observed, "displaying opposing views can polarize people even more strongly towards their original position." The unpredictable nature of how a piece of information (or misinformation) can circulate and spread makes virality one area of study closely connected to the echo chamber phenomenon. The next section, Technology's Role, will examine how selective algorithm and mediation of the public fit into the puzzle.

[18] *Specia, Megan, and Paul Mozur. "A War of Words Puts Facebook at the Center of Myanmar's Rohingya Crisis." (The New York Times, Oct. 27, 2017)*
[19] *Oxford English Dictionaries definition*

Technology's Role

Two ways that scholars have assessed technology's role in the formation of echo chambers on social networking sites have been to examine 1) the impact of algorithms, and 2) social media as public mediator. *The computer ate my personality,* a paper by researchers at the University of College London, linked the rise of selective exposure algorithm to polarization. Selective algorithms can be mutually beneficial, wrote UCL's Olhede et al., driving business for technology giants and providing users with personalized content — "but what are the implications for us as humans if we continuously consume the content our technology serves us, and less frequently discover things for ourselves?"

Algorithmic Selection

Selective exposure algorithms, also known as algorithmic selection, recommendation algorithms or personalization algorithms, is described in *Governance by algorithms: reality construction by algorithmic selection on the Internet* as "a process that assigns (contextualized) relevance to information elements of a data set by an automated, statistical assessment of decent rally generated data signals."[20] In other words, it's an online computational system that executes a variety of functions such as matching and filtering. The paper said that we exist in an age of governance by algorithm. They argued that in information societies, algorithmic selection plays a governing role by "co-producing and allocating" information (such as news posts). They described the function of an algorithmic selection application as an input-throughput-output process. The input sources vary between applications, but could be a user request or big data source, for example. The throughput phase is "the assignment of relevance and respective selections, based on a multitude

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[20] *Just, Natascha, and Michael Latzer. "Governance by Algorithms: Reality Construction by Algorithmic Selection on the Internet." (Media, Culture and Society 39, no. 2, 2017) 241.*

of different codes and operating modes." The output materializes in different forms, such as rankings, recommendations, or text. Through this process, algorithms are acting as secondary gatekeepers to news content. The paper compared the role of algorithmic selection to the role of traditional mass media and finds that in comparison, algorithmic selection "tends to increase individualization, commercialization, inequalities, and deterritorialization and to decrease transparency, controllability, and predictability." Olhede et al. concurred, arguing that selective exposure on social networking sites may be influencing the ways in which we perceive ourselves and others — and even shaping aspects of our personalities.

Many research papers have identified the personalization of news streams as a contributing factor to the rise of echo chambers. As observed by Anagnostopoulos et al., "news undergoes the same popularity dynamics as videos of kittens and selfies." Facebook self-admittedly shows people what they want to see.[21] Even if a user chooses to follow individuals who present a diversity of voices, selective algorithms have the ability to override these choices and present what it calculates to be what the user most-likely wants to engage with. These findings echo what Cass Sunstein predicted 10 years ago: "We are not so very far from complete personalization of the system of communications."[22]

Another concern is that personalization algorithms are owned and operated by private companies for profit. "The prevalence of private algorithmic governance based on proprietary big data tends to strengthen selection criteria oriented on special interests concerned with profit maximization."[23] In allowing social networking sites to decide how, when, and where to expose us to news content, how much agency over reality construction are users handing over to profit-

[21] Zhang, Cheng, and Si Chen. "News Feed FYI: Using Qualitative Feedback to Show Relevant Stories." (Facebook, Feb. 1, 2016)
[22] Sunstein, C R. "Republic.com 2.0" 2007. 4.
[23] Just and Latzer. "Governance by Algorithms" 2017.

oriented algorithms? Many of the most popular algorithmic selection applications are 'black-boxed' — hidden from their users — making them difficult to analyze. The same concern applies to the inner workings of traditional mass media, but that selection process is arguably more transparent. The manual selection of news content by professional editors catering to a geographically-situated audience is likely in accordance with high standards of social responsibility. "Now, in the case of algorithmic reality construction, the selection happens automatically through customized software and services mostly developed and dominated" by private companies.[24]

Social Media as Public Mediator

Many scholarly works link the echo chamber phenomenon to a change in how and where public discourse takes place. Hermida et al. referred to users of social networking sites as 'mediated publics' — groups of users gathering "through mediating technology." According to Williams et al., users exchange views in a "decentralized, fragmented" way, "with very large numbers of participants each making a relatively small contribution." Sunstein sees this as a dramatic shift from how we shared news pre-selective algorithms. He associates the descent of general-interest intermediaries (like newspapers and TV broadcasts) to the rise of personalization. "People who rely on such intermediaries have a range of chance encounters, involving shared experiences with diverse others, and also exposure to materials and topics that they did not seek out in advance."[25]

On the other hand, Bakshy et al. speculated that technology may not be at fault. The study, titled *Exposure to ideologically diverse news and opinion on Facebook*, examined data from 10.1 million

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[24] *Ibid.*
[25] Sunstein, C R. *Republic.com 2.0. 8.*

American Facebook users and found that the algorithm was not the greatest cause of news echo chambers — that it's actually individuals' personal choices that have a greater impact. Albeit, the paper (published in *Science Magazine* in 2015) was written by data scientists employed by Facebook, and promptly criticized by scholars for burying their findings, "using a mix of convoluted language and irrelevant comparisons" and diverting attention away from the algorithms.[26] Still, individuals' choices undoubtedly do play a part in the formation of an echo chamber, although by how much is debatable.

Grevet et al. called coexisting online a "constant negotiation" for users of social networking sites. They studied the conditions of homogeneity in political discussions on Facebook and found that people engage less on Facebook when confronted with friends holding different viewpoints. In the wake of the 2016 U.S. election, Cambre et al. launched a new online platform that facilitated political discussions and analyzed the quality of those conversations. They suggested ways that design can support conversations between diverse citizens online: having a live moderator, a video chat option, and using narrowed topics, may result in higher levels of effective participation.

Feldman (2015) suggested that "several features of the social media landscape pose roadblocks" to productive communication between those with different viewpoints. These roadblocks include false arguments, anonymity, and brevity of posts. The shape and length of posts is a concern raised by literary critic Katherine Hayles in her works on hyper reading. As she described in *How we think: digital media and contemporary technogenesis* (2012), "digital media pushes us in the direction of faster communication, more intense and varied information streams, more integration of humans and intelligent machines, and more interactions of language with code.

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[26] *Tufekci, Zeynep. "How Facebook's Algorithm Suppresses Content Diversity (Modestly) & How the Newsfeed Rules the Clicks." Medium. May 7, 2015.*

These environmental changes have significant neurological consequences."[27] Hayles compares hyper reading to close reading — a method which "prefers a single information stream, focuses on a single cultural object... and has a high tolerance for boredom." In contrast, Hayles' definition of hyper reading could double as an explanation of how social networking sites function: "skimming, scanning, fragmenting, and juxtaposing texts... a strategic response to an information-intensive environment, aiming to conserve attention by quickly identifying relevant information, so that only relatively few portions of a given text are actually read."

There is a positive side to many of these "roadblocks" — anonymity and brevity have become tools in the activist's handbook, and many studies have examined circumstances in which social networking sites have enabled large-scale civil movements. A 2011 report on Facebook and Twitter's role in what has become known as the Arab Spring, shows that 9 out 10 Egyptians and Tunisians used social networking sites to organize protests and spread awareness.[28] During the uprising, many Middle Eastern countries including Algeria, Egypt, Syria, and Libya blocked access to social networking sites or even the Internet altogether. But still, Mourtada and Salem found that "all but one of the protests called for on Facebook ended up coming to life on the streets."[29] The trouble with celebrating social networking sites as facilitators of activism is that they can also be used in reverse, as tools of propaganda. Metaxas and Mustafaraj (2012) outline how Twitter can be easily manipulated, a common occurrence "underappreciated by the press and the general public." The paper says propaganda efforts target our "trust network" — the network acquaintances that help an individual decide what information to believe and what to reject. Web spamming, Twitter bombs and trolling[30] are

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[27] Hayles, N. Katherine. "How We Think: Digital Media and Contemporary Technogenesis" (The University of Chicago Press, 2012)
[28] Mourtada, R, and F Salem. "Civil Movements: The Impact of Facebook and Twitter." (Arab Social Media Report 1, no. 2, 2011)
[29] Huang, Carol. "Facebook and Twitter key to Arab Spring uprisings: report." (The National, June 6, 2011)
[30] Web spammers exploit metadata to manipulate search engine rankings; Twitter 'bombers' send innumerous amounts of tweets and replies to unexpecting users to bring attention to their cause; Trolling is the act of being deliberately offensive and spreading rumours in online exchanges.

some of a few propagandist techniques that Metaxas and Mustafaraj say can influence our perception of politicians.

This overview has shown how the echo chamber topic has been approached in previous scholarship. It's a matter of various sociological and technical factors: human relationships, virality, misinformation, selective algorithm, mediating qualities, politics and profit. The next chapter suggests how elements of actor-network theory and Bruno Latour's 'matters-of-concern' can offer a fresh perspective to approaching this topic, which above all else is a socio-technical public matter.

Theoretical Review

The previous chapter described how the echo chamber phenomenon has been studied and shed light on a number of contributing factors to the issue. If the literature review is the 'what' of this project, this chapter, the theoretical review, is the 'how'. The fingerprints of French philosopher and professor Bruno Latour are all over this chapter, with quotes from many books and papers he's written at different times during his influential career in academia. It has been argued that principles of actor-network theory, the theoretical approach Latour is best-known for, are well-suited to the study of newswork. The first section of this chapter, *Actor-Networking News*, reviews those arguments, and proposes how they can be applied to the study of echo chambers in particular. The second section, *A Matter of Concern*, looks at a specific ANT-related concept called 'matters-of-concern', which proposes a shift of emphasis from a positivist approach to public matters and toward a more constructivist one. The final section, *Latour's Design Challenge*, explores how designers can apply 'matters-of-concern' to their projects, offering

practical guidelines. The findings from the theoretical review were integrated into a series of

Participatory Design workshops, as the subsequent *Methodology* chapter explains.

Actor-Networking News

Which theory is best suited to explore the question: What are the key factors contributing to the

formation of echo chambers in news consumption on social networking sites? The question

weaves together many academic fields and could be approached in a number of ways that would

each generate very different results. I considered an Information Studies perspective. After all,

news stories streaming into social networking sites fits neatly into the category of big data; it's just

asking to be explained by theories about spreading cascades, frequency metrics and diffusion

patterns. I considered an epistemological approach — how can a society build collective

knowledge and participate in democratic practices if citizens are increasingly skeptical and

distrusting of news? Perhaps I should have focused on the end-product, Echology, and followed

User-Centered Design methodology. At the beginning of the thesis process I knew I wanted to

make an app that addressed the echo chamber phenomenon — why not write about iterations

and development? All of these options, I felt, would not do justice to the urgency and complexity

of the issue.

 I began to read more about actor-network theory (ANT), particularly papers calling for

researchers to use ANT for investigating journalism as a socio-technical hybrid; an entanglement

of human and non-human factors. Here I found a theory that allowed, and in fact encouraged,

researchers to dispel hierarchies of study and approach a research question as a black box

waiting to be opened without discrimination to any of the objects inside.

Traditionally, journalists and researchers have focused on actors that "generally come in three flavours: sources, journalists and audience members. All are human."[31] In today's technology-oriented world, this normative way of approaching the field fails to address the very things at the centre of the explosion rocking the industry: non-human actors. As Domingo et al. wrote:

> *"Journalism studies struggle to capture the diversity of actors, discourses and relationships, and evaluate their implications for the future of professional news production and the quality of public communication. Journalists have lost the (relative) monopoly of news gathering and distribution, but news media organizations are still producing most of the news we consume today, even those that circulate through social media and aggregators."[32]*

The importance and agency held by non-human actors is undeniable; emotions, smartphones, robots, geography, ideology, Wi-Fi (to name a few) — these are all entangled in a web that together forms the gigantic entity we so casually call 'the news.' This approach mirrors the interdisciplinary nature of my research question. What are the key factors contributing to the formation of echo chambers in news consumption on social networking sites? One may start to answer by recognizing that a mosaic of heterogeneous actors is at play.

In *An actor-network perspective on changing work practices,* Ursula Plesner, an associate professor at Copenhagen Business School, proposed that ANT can be used as a framework for analyzing changing practices in newswork. She calls the theory an exciting new perspective for journalism researchers because it asks that "people, ideals, symbolic constructions, and material elements are seen as equally important elements to analyze." Plesner emphasized how important it is for the researcher to refrain from essentializing technology's role and views ANT's materialist

[31] Turner, Fred. "Actor-Networking the News." (Social Epistemology 19, no. 4, 2005) 322.
[32] Domingo, David, Pere Masip, and Irene Costera Meijer. "Tracing Digital News Networks: Towards an Integrated Framework of the Dynamics of News Production, Circulation and Use." (Digital Journalism 3, no. 1, 2014) 53.

orientation as an ally for the task. Plesner outlined a methodological framework for using ANT in studies of newswork, first describing basic ANT terminologies. "ANT proposes the neutral concept 'actant' to refer to the human and non-human participants that the researcher can trace through their actions, without prejudging their qualities."[33] When various actants are associated, they make up 'actor-networks.' This concept is meant to describe "concrete connections that are physically traceable." Plesner also touts the importance of recognizing 'translations.' Actors and actor-networks meet and associate through translations. "A successful process of translation generates a shared space, equivalence and commensurability in an actor-network. It aligns actors who otherwise have different agendas." Similarly, in *Tracing Digital News Networks,* Domingo et al. (a group of European communications researchers) suggested that elements of ANT can help researchers by allowing them to "problematize and trace the diversity of actors involved in changing news production." They appreciate the theory because it requires all *a priori* expectations of how news is supposed to be generated and circulated be dismissed, allowing research of various actants to occur on an even playing field. In describing actants and their relationships to each other, researchers are able to challenge traditional ideals of what journalism is and how it is circulated.

Critics have accused ANT of being no more than glorified description-writing and of "not being sensitive to power relationships." To this, Domingo et al. say that "if we understand power as a trail to discover, we may not only be able to explore how journalism as a practice is maintained with the repartition of roles that professionals strive to keep" but to "follow how actants struggle to assemble themselves in ways that challenge the existing configurations of the news network."

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[33] *Domingo et al. "Tracing Digital News" 2014. 55.*

An echo chamber is one example of an 'actor-network.' It is the result of various actants aligning in such a way that a shifting, powerful hybrid arrangement is formed. Fred Turner, an assistant professor of communications at Stanford University, argued that ANT serves to address these shifts more directly. "From a traditional point of view, new media simply offer new channels for the distribution of information. From the point of view of ANT, however, they and their human partners collaborate in the creation of new socio-technical formations." Although an ANT analysis of 'the news' — a large, complex web of entangled actor-networks — is a huge and daunting undertaking, Domingo et al. suggest that it's a collective one. Together, researchers can "open the black boxes of normative definitions of journalism and democracy." But where to begin? Even with guidance from journalism-ANT enthusiasts, the steps toward a finished project are fuzzy. This may be because "Latour has repeatedly argued that ANT is not a theory in the traditional sense of the word, but rather a protocol or a guide about how to avoid imposing our scientific *a priorisms* on to our object of study. In this, it is not bound to a specific methodology, even if most ANT studies could be described as ethnographies."[34]

The next step in my theoretical search was to follow a more specific sub-section of ANT, and I found it in Latour's many papers calling for a second empiricism, a return to a "stubbornly realist attitude" by addressing public matters from a fresh perspective. Counterintuitively, Latour says it all begins with a step away from 'matters-of-fact' and the myth of absolute truth. Latour suggests we replace 'matters-of-fact' with a new term, 'matters-of-concern.' Before tossing this thesis document aside and misinterpreting Latour's theory as a rejection of scientific fact, read the next section which explains why this constructivist approach is well-suited for the echo chamber dilemma. The polemic climate in which news lives on social networking sites is the

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[34] *Domingo et al. "Tracing Digital News" 2014. 64.*

perfect example of how providing indisputable proof is "a messy, pesky, risky business... to offer a public proof, big enough and certain enough to convince the whole world of the presence of a phenomenon or of a looming danger, seems now almost out of reach — and always was."[35]

A Matter of Concern

"The world is not a solid continent of facts sprinkled by a few lakes of uncertainties, but a vast ocean of uncertainties speckled by a few islands of calibrated and stabilized forms."[36]

Before learning more about Latour's dislike of the term matters-of-fact, a check-up of our personal epistemological and ontological assumptions is in order. Do you lean toward the belief that there are hard, absolute truths 'out there' — attainable if only the scientists dig deep enough discover them? Or do you believe that reality is subjective? That knowledge is not absolute, that there is no 'out there' but instead only one, holistic reality co-created by scientists, researchers, people and Latour's treasured objects? There are many other research paradigms besides positivism and constructivism to consider, but the stark contrast between these two is what occupies Latour's attention in his many works on democracy and politics.

In *What is The Style of Matters of Concern?*, Latour asserts that the public has been led down a path to believing that there are two realities, one "made of primary qualities for which there is no ordinary language but that of science — a language of pure thought that nobody in particular speaks and which utters law from nowhere" and another that "deals with secondary qualities which have no reality." He explains that in the first of these two realities "there is nature which is real, but is a "dull and meaningless affair, the hurrying of material endlessly"; and in the other,

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[35] *Latour, Bruno, and Peter Weibel. "Making Things Public: Atmospheres of Democracy" 2005. 19.*
[36] *Latour, Bruno. "Reassembling the Social" 2006. 245.*

"there is the lived world of colours, sounds, values, meaning, which is a phantasmagoria of our senses but with no other existence than in the circumvolution of our brain and the illusions of our mind." Latour suggests that there is only one reality in which scientific and experiential qualities are entangled — both real, valid and worthy of consideration.

This is why Latour believes that describing a public issue as a matter-of-fact does the fact in question a disservice. It implicates a hierarchy of qualities by suggesting there are 'primary' qualities more valuable than experiential 'secondary' ones. As he explains in the following passage, issues are rarely as simple and scientific as we present them to be in the public sphere:

> *"Matters-of-fact are the end-product of complex networks of alliances of humans and non-humans, of matters and scientific apparatuses, of instrumental inscriptions in labs, factual statements in journals, and evidence provided to government. Matters-of-fact gain ontological weight the more 'universal' they become. This happens through trials of forces and through the extensions of the scale and reach of the networks and alliances between humans and non-humans with whom they associate."[37]*

As it is presented on the bottomless lists of Facebook and Twitter feeds, news posts appear ahistorical, as if they stand alone in the form of a couple hundred characters and then disappear into the digital abyss without a trace. How might social networking sites present the rich web of associations behind a news post? And might this approach help reduce polarization? The studies in the literature review chapter show that no matter what cross-cutting 'indisputable' facts show up on one's news feeds, a polemic climate forms. "There might be no continuity, no coherence in our opinions, but there is a hidden continuity and a hidden coherence in what we are attached to"[38] — this leads us to matters-of-concern.

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[37] *Tsouvalis, Judith. "Latour's Object-Orientated Politics for a Post-Political Age." (Global Discourse 6, no. 1–2, 2016). 33.*
[38] *Latour. "Making Things Public" 2005. 15.*

Latour is asking that we identify the issues, values, disputes that connect us — the matters that draw citizens to a town hall meeting, to the ballot box, to assemble on Twitter or Facebook, and to care for them.[39] In *Pandora's Hope*, this is what Latour says an object-oriented democracy might look like: "Each object, — each issue —, generates a different pattern of emotions and disruptions, of disagreements and agreements… Objects — taken as so many issues — bind all of us in ways that map out a public space profoundly." One thing social networking sites do spectacularly well is gather citizens around a matter. In unpacking the issue of polarization, it is too easy to point the finger at 'the masses' — too many voices, too many opinions, can we not just have the experts do the posting? Latour points out that this leads us back to a matters-of-fact attitude:

> *"Politics is about dealing with a crowd of "non-experts", and this situation cannot possibly be the same as experts dealing with experts in the recesses of their special institutions… In a democracy, this means everyone. In the agora, there is never any echo, but rumours, condensations, displacements, accumulations, simplifications, detours, transformations."[40]*

There is no easy way to address a public matter, Latour admits. But a path to harmony does not begin by "thumping on the table and saying: 'the dispute has ended because the facts are there.'"[41] The reality is that "matters-of-facts are there and the dispute has to go on until closure is obtained. It is fair to say that the whole first wave of empiricism has an odd way of conceiving democracy and was rather a clever way of escaping controversies by putting a premature end to them."[42]

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[39] *Ibid.*
[40] Latour, Bruno. *"Pandora's Hope: Essays on the Reality of Science Studies" (Harvard University Press, 1999). 250.*
[41] Latour, Bruno. *"What is the Style of Matters of Concern?" (Spinoza Lectures at the University of Amsterdam, 2005) 47.*
[42] *Ibid.*

So how exactly does a researcher-designer incorporate matters-of-concern into a project? And the philosopher, anthropologist, sociologist inventor of the term does see it as a potential method for design projects. In a 2008 address to the Design History Society, Latour extended a challenge: "Here is the question I wish to raise to designers: where are the visualization tools that allow the contradictory and controversial nature of matters-of-concern to be represented?"[43]

Many designerly thinkers have considered the parametres of this challenge and in the next section, I discuss the specific techniques proposed in *Designing Matters of Concern (Latour): A Future Design Challenge?* by Peter Friedrich Stephan and *Making Public Things: How HCI Design Can Express Matters of Concern* by DiSalvo et al.

Latour's Design Challenge

How can a 'design thing' express matters-of-concern? Latour offers little specificity, but says a designer should: "… provide for things, that is for matters-of-concern, a visual, publicly inspectable space that is as remotely rich, at least as easy to handle and as codified as what has been done over four centuries for objects conceived as matters-of-fact…. To imagine that a political ecology of the magnitude being anticipated by all of the experts can be carried out without new innovative tools is to court disaster. New innovation will be absolutely necessary if we are to adequately represent the conflicting natures of all the things that are to be designed."[44]

In hopes of developing more practical guidelines, Peter Friedrich Stephan, a professor at the Academy of Media Arts Cologne, dissects Latour's challenge; first recognizing that the concept of matters-of-concern is embedded in the framework of actor-network theory. Stephan

[43] Latour, Bruno. "A Cautious Prometheus? A Few Steps Toward a Philosophy of Design." (Design History Society, 2008) 2.
[44] Ibid.

points out that the question for designers becomes "how complex the visualizations he calls for can be made before they begin to overtax cognitive capacities and so become counterproductive for practical use." He critiques Latour's "omission of any contemporary field of professional activity that could potentially contribute to meeting that challenge." Stephan reinterprets matters-of-concern into methods, three of which I incorporated into this project's methodology: accept that objects have agency too, build appropriate repertoire to record operations (data visualization), and find translations and breaks between values, concerns, needs and issues.

Stephan suggests the matters-of-concern approach can help to integrate the following perspectives with design: emergent technology, psychological dynamics and social interaction. He notes: "Taking up Latour's challenge of visualizing matters-of-concern means creating proper scenographies for matters-of-fact while keeping in mind that they are always subject to rhetorical considerations. However, the ultimate goal is to define visual and functional standards on the level of today's powerful media and the conceptual frameworks of argument visualization and online deliberation."

In *Making Public Things: How HCI design can express matters of concern*, DiSalvo et al. find that "the use of design to express matters-of-concern resonates with reflective, critical and speculative design." They look to Latour's 2005 book of essays, *Making Things Public: Atmospheres of Democracy* for clues on how designers can best interpret matters-of-concern in their projects. *Making Things Public* elaborates on objects' role in contemporary democracy; arguing that "democracy is about matters-of-concern: contentious issues and their consequences." DiSalvo et al. describe matters as "perceived situations and their consequences; they are subjective experience that constitute political conditions." Lived experience or lived qualities are central to the suggested methods. "Acting effectively in a democracy requires engaging with topics as matters-of-concern, with lived

qualities of political conditions… does not mean abandoning rationality. But it does mean placing the experiential, the affective and the desired alongside the presumed objective."

How might designers engage with the echo chamber phenomenon as a matter-of-concern? Perhaps by addressing the lived qualities of political conditions, and by acknowledging that design things are made from traceable process. DiSalvo et al. offer examples of public design projects that successfully express matters-of-concern. One was a media installation called *Smog is Democratic* commissioned as part of an exhibition shown at the museum of the Centre for Disease Control and Prevention in 2009. The series of visualizations sought to "explore the issues of scientific representation" by presenting "the lived qualities of particulate matter with common forms of technical representation of pollution." The purpose of the piece was not to "establish or prove facts" but instead, strove to be "interpretive and expressive." In order to express air pollution a matter-of-concern, the designers "began by considering how the sources and measurements of particulate matter might be displayed in order to generate reflection and debate." Another design example in *Making Public Things* is *The Political Grid,* a Twitter-based service where people can view tweets by politicians running for office side-by-side, vote on whether they agree with a tweet, and indicate how important it is to them. Addressing the criticism that matters-of-concern is somehow a turn away from facts, DiSalvo et al. again confirm that it is not. It is a call to lean deeper into a matter. "It is not a reactionary or naive rejection or manipulation of data. Nor is it predicated on maintaining rigid distinctions between the so-called subjective and objectives qualities of a condition.... The challenge and opportunity for designers is to make this messiness accessible in experiential form."

Elements of each section in this chapter contributed to the unique methodology of this thesis project. In the next chapter, I describe how elements of ANT (as recommended by journalism scholars) were injected into a series of Participatory Design workshops I organized for

the purpose of creating a web tool that addresses the echo chamber phenomenon in news consumption. Latour's themes of matters-of-concern and object-oriented democracy as well as techniques from the papers by Stephan and Disalvo et al., were introduced to workshop participants and guided the group's collective thinking.

Methodology

The methodology of this project was crafted to tie together underlying themes of the research: heterogeneity, unacknowledged associations, public matters, social-technical hybrids. The more I read about echo chambers, the more it became clear that any creative process needed to involve other people — stakeholders in the game of news presentation. From the get-go, the goal was to conceptualize and actualize a web tool that addressed the echo chamber phenomenon in news consumption on social networking sites. Knowing the intended output, I invited people working in the news industry to participate in the conceptualization phase. While many ideas came out of the workshop's activities and discussions, the one I had developed by a programmer is called Echology — a Twitter extension that inspires critical thinking about news feeds. This chapter speaks to the broad methodology of the project, and the next chapter, *Documenting Participatory Design*, describes how each step of the research played out and ways it could be improved in future research.

Clay Spinuzzi's *The Methodology of Participatory Design* served as the backbone of the series of workshops held with five news industry professionals who collectively brought to the table years of experience in news production and management. Three workshops were held to reflect the

three stages of Participatory Design research as described by Spinuzzi. The first stage is exploratory. At this stage, participants work to create a common language, examine related technologies and, borrowing from ethnographic methods, participate in open discussions. The second stage is about discovery processes. Participants "employ various techniques… to clarify the users' goals and values and agree on the desired outcome of the project." The third stage involves prototyping and user testing. This can be paper or digital prototyping, and occurs with the goal of "iteratively shaping artifacts."

Actor-network theory principles and Latour's 'matters-of-concern' concept were incorporated into each method accomplished during the workshops, and played a role in the creation of Echology. Both ANT and Participatory Design can be described as 'loose' methodological approaches. Both are founded on constructivism, and share the notion that knowledge "is situated in a complex of artifacts, practices, and interactions; it is essentially interpretive, and therefore it cannot be decontextualized and broken into discrete tasks."[45] United by this project, the two approaches proved complementary. The Participatory Design component highlights the importance of heterogeneity in human perspectives. "Since users' tacit knowledge is highly valued, participatory design focuses on exploring that tacit knowledge and taking it into account when building new systems."[46] The ANT component, on the other hand, highlights the agency of non-humans.

In designing the research process, my first step was to begin exploring the actants entangled in my research questions. I realized that the many papers detailed in my literature review were rich with actants; things that researchers had previously pinpointed as contributing factors to the echo chamber phenomenon. By sweeping through each paper, my result turned out as Latour

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[45] *Spinuzzi, Clay. "The Methodology of Participatory Design" (Technical Communication 52, no. 2, 2005.: 165.*
[46] *Ibid*

may have predicted — a heterogeneous list of actants. I turned this list into a deck of cards (see

Appendix D) that was used as a research tool during the workshops. Participatory Design

methodology emphasizes the need to generate interactivity and interpretation opportunities for

participants, while ANT calls for actants to be traced and examined thoroughly. The deck of

cards was created to acknowledge both criteria. Each card shows the name of an actant and a

short summary that indicates how that actant might contribute to the echo chamber

phenomenon. The deck was used in the workshops as part of an ongoing card sorting exercise.

Participants were given 24 actant cards (including two blank ones to use as they saw fit) and

asked to sort them into categories of their choosing. Each participant sorted the cards in different

and creative ways, as detailed in the *Documenting Participatory Design* chapter.

Besides card sorting, other research design techniques were implemented during the

workshops, including: examination of key technologies, open discussion, brainstorming, flow

models and paper and digital prototype analysis and development. *Unpacking the notion of*

participation in Participatory Design by Tone Bratteteig and Ina Wagner, helped determine the

practical limitations of the workshops. The two researchers from the University of Oslo argue

that "a focus on decision-making is necessary for understanding participation in design."[47] The

meetings were guided by Bratteteig and Wagner's four design 'moves': create choices, selecting

among them, concretizing choices and evaluating choices. Throughout the iterations of these

moves is where the researchers say "participants' knowledge from experience is most valuable."

Bratteteig and Wagner suggest that users do not have to participate in all moves to contribute to

a participatory result, they are instead loose guidelines for the purposes of managing group

dynamics. The next chapter provides documentation of how this mesh of methodological sources

[47] Bratteteig, Tone, and Ina Wagner. "Unpacking the Notion of Participation in Participatory Design." (CSCW: An International Journal 25, no. 6, 2016) 425.

worked out and details how participants interpreted each exercise, the challenges and limitations of the process, and the final result.

Documenting Participatory Design

Stage 1: Exploration

After gaining approval from OCAD University's Research and Ethics Board, I proceeded to invite news industry professionals to lend their knowledge and expertise to three Participatory Design workshops, with the goal of together conceptualizing a web app that addresses the echo chamber phenomenon in news consumption. Five people signed on: Amanda C., Aileen D., Brice Hall, Jane Switzer, and Paolo Zinatelli; each bringing knowledge gained in their many former and current positions as journalists, designers, artists and editors. Forming an interdisciplinary group was important because the topic at hand required thinking outside the box of the traditional journalist-editor-audience model. As workshop facilitator, I led each exercise and often participated alongside the group. Researchers who'd like to facilitate a series of similar workshops can find an instruction sheet in Appendix C.

Building a Common Language

I began the first workshop with a short presentation about my research questions, an introduction to components of ANT, Latour's matters-of-concern, and an overview of the project
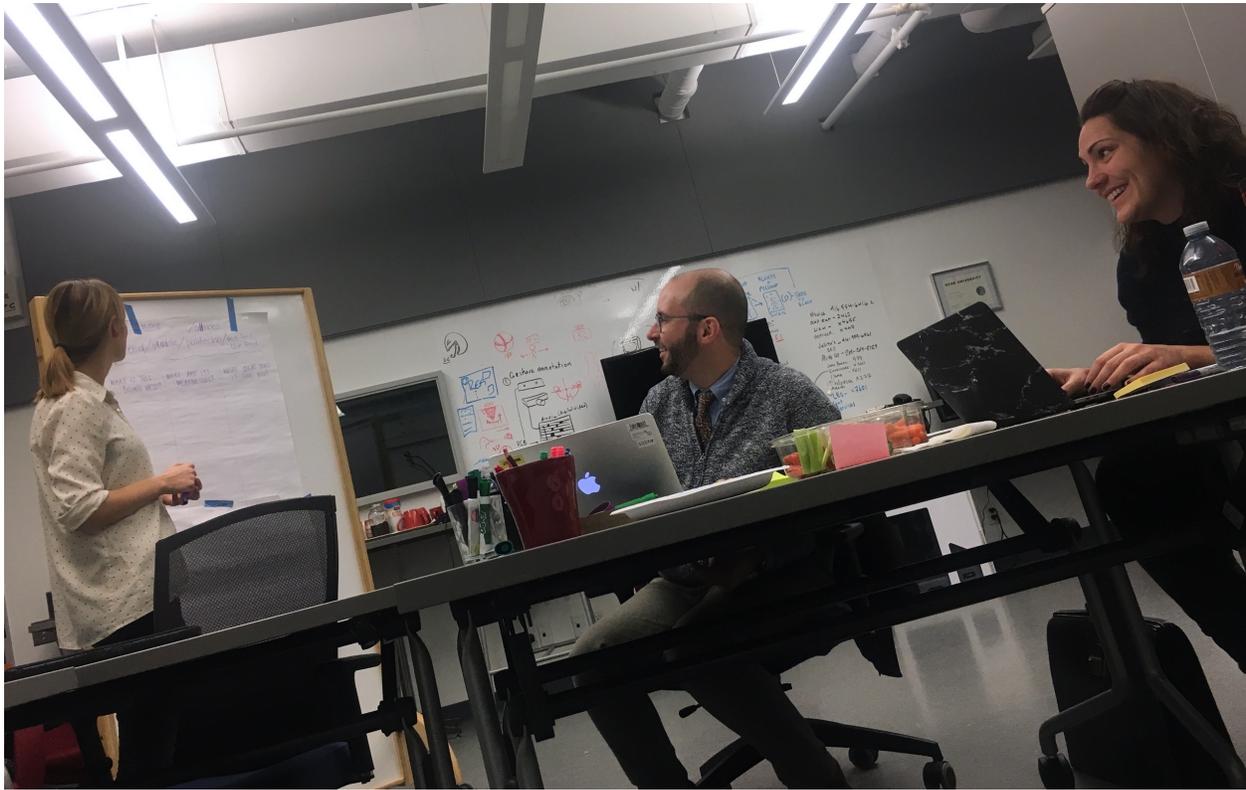
Fig. 1: Participants evaluate related creative works.

timeline. The presentation was the beginning of developing a common language — terms like actant, matters-of-concern and lived qualities were explained. I emphasized the importance of avoiding binary thinking throughout the sessions. News is often imagined to come in two types — left and right — but beginning with the assumption that everyone 'picks teams' in the public sphere does not reflect the everyday experience of participating in a democracy. Sunstein (2007) discussed this grey area: "On many issues, people are really not sure what they think, and their lack of certainty inclines them toward the middle." Becoming polarized is, in fact, a process: "Agreement from others tends to increase confidence and for this reason like-minded people, having deliberated with one another, become more sure that they are right and thus more extreme."[48]

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[48] Sunstein. "Republic 2.0" 2007.

Fig. 2: Screen grabs of related creative works, clockwise from top left: AllSides, Blue Feed, Red Feed, Vubble, FlipFeed and PolitEcho. Accessed March 16, 2018.

To scan the field and see how web apps have previously applied binary thinking (or successfully avoided it), I asked participants to user-test five creative works that address the echo chamber phenomenon: AllSides, Blue Feed, Red Feed, Vubble, FlipFeed, and PolitEcho.[49]

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[49] Links to related works tested at the first workshops: www.allsides.com, http://graphics.wsj.com/blue-feed-red-feed/, https://www.vubblepop.com/, https://flipfeed.media.mit.edu/ and http://politecho.org/
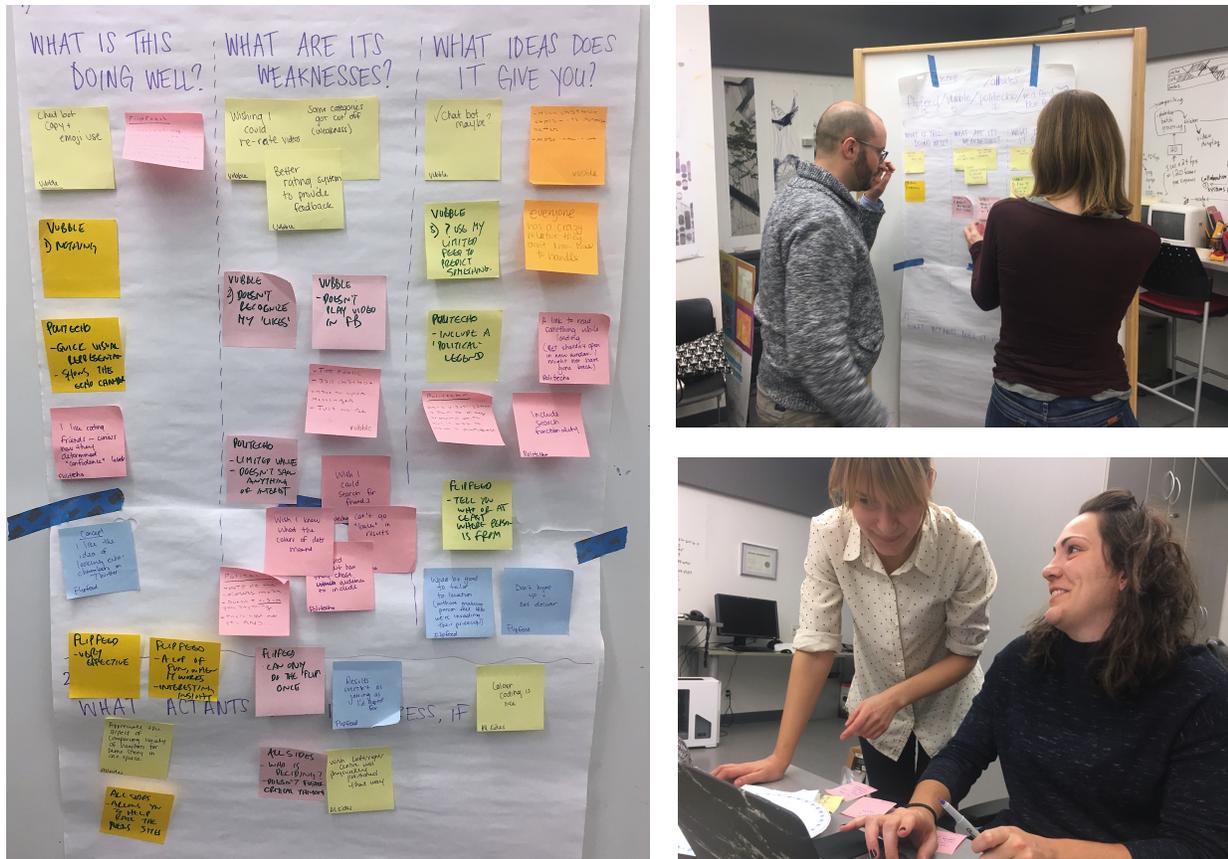
Fig. 3: Participants share observations of related creative works.

Scanning the Field

While user-testing each creative work, each workshop participant jotted down answers to the following questions: 'What does this do well?', 'What are its weaknesses?', and 'What ideas does it give you?'. Answers were written on sticky notes, discussed aloud, and posted on a large sheet of paper. In the 'What does this do well?' category, participants appreciated graphic components of the apps. One participant liked PolitEcho's colourful visualization of the user's Facebook friends' political affiliations, another liked FlipFeed (an extension that replaces the user's Twitter feed with someone else's) for its stark representation of others' views. AllSides (a news aggregator that categorizes stories by political biases) was appreciated for placing headlines from across the political spectrum side-by-side. Another participant liked the casual demeanor and emoji use of

Vubble (a Facebook chatbot that befriends the user and sends them links to videos they may not be exposed to otherwise).

In the 'What are its weaknesses?' category, participants noted that Vubble's chatbot service feels invasive — it asks personal questions and appears to be collecting data about its users. Some participants had technical concerns: Vubble doesn't allow users to change previous responses and PolitEcho's colour coding doesn't have legend to follow. AllSides posed an interesting concern: Who is deciding what qualifies as liberal, conservative and centre news? More specifically, how does the algorithm work? Participants wondered if forcefully categorizing headlines may only worsen polarization.

In the 'What ideas does this give you? category, chatbots, data visualization, colour coding and geo-location were all suggested as potential ideas to incorporate into a new web app. The ideas were vague, but the next exercise helped the group begin to narrow down and focus on specific concepts. The actant cards described in the *Methodology* chapter were distributed, and participants were asked to note which actants were addressed by FlipFeed, Vubble, AllSides, PolitEcho and Blue Feed, Red Feed — and which were left out. The 'Scanning the Field' exercise served as an assessment of precedent design efforts on the echo chamber phenomenon, and a way for workshop participants to see where there might be gaps, or unaddressed actants. We found that many of the apps shed light on political partisanship, social circles, and cross-cutting content, but none directly addressed hyper reading, conspiracy news or algorithmic selection, to name a few. Introducing the actant cards at the first workshop was a teaser to the second, in which they played a more central role.

Fig. 4: Participants categorize actant cards.

Stage 2: Discovery

Card Sorting

At the first workshop, participants were introduced to the topic, theoretical frameworks and the project timeline. They explored five related creative works, took note of their strengths and weaknesses, and began brainstorming ideas for a new web app. They became familiar with the term 'actant' and the cards inspired by the findings of the literature review. The deck of cards was re-introduced at the second workshop for an interactive Card Sorting exercise. Each participant received their own deck and was asked to organize them into categories of their choosing (see Fig. 4 and 5). For example, categories could have been: Which actants were least addressed by the apps we tested last week? Which actants inspire you most? Which could be easily addressed by a simple web function? No one opted to use the categories I suggested as
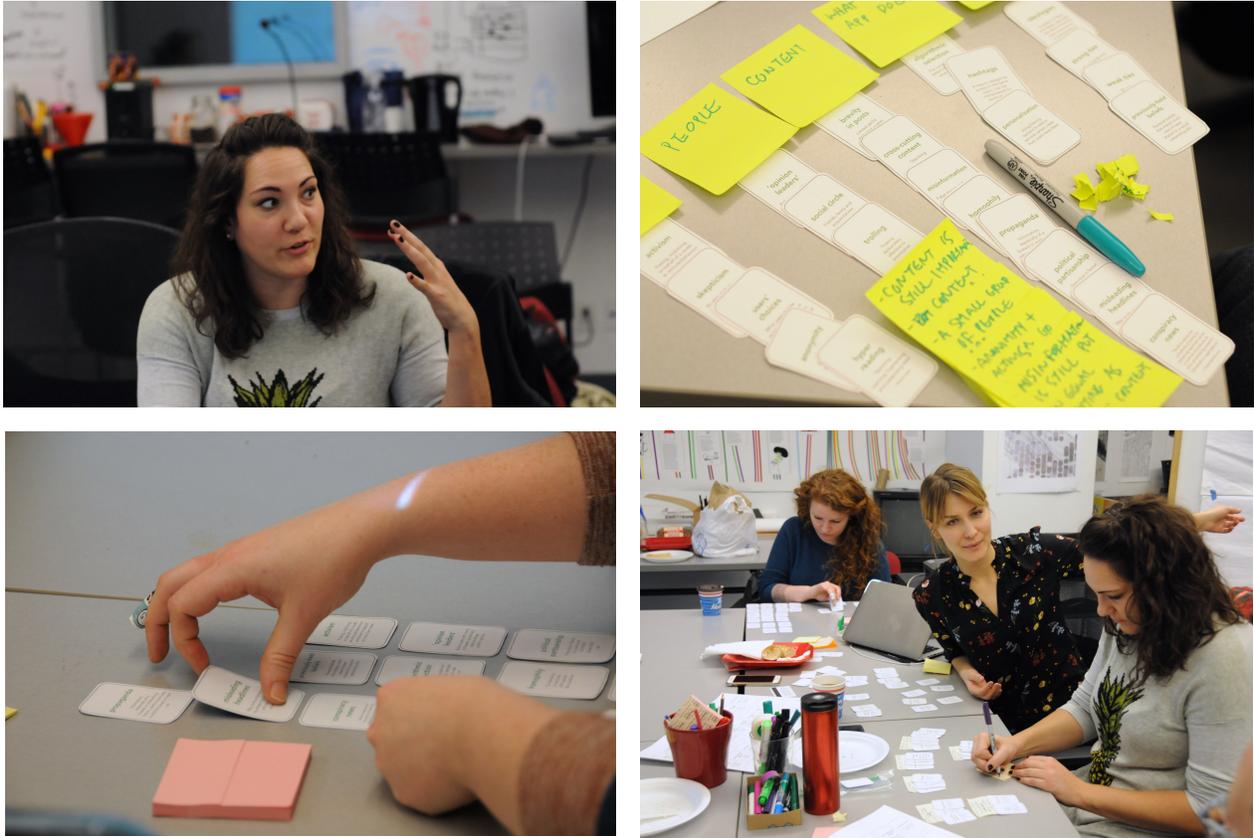
Fig. 5: Participants share results of card sorting exercise.

examples. Each participant perceived the actant cards in a different way and created completely

unique categories (see Appendix A).

Participants took turns presenting their findings to each other. We discovered patterns

within our treatments of the cards, and began to brainstorm ways a web app could potentially

highlight the lived qualities of one or more of the actants. The 'hashtag' card sparked a discussion

about how some hashtags carry biases, for example, environmental activists might use

#ClimateAction, while climate change deniers might use #FakeGlobalWarmingFacts. The idea

of a 'hashtag barometer' was born — a Twitter extension that visualizes the ways a hashtag has

been previously used. Another idea came from the 'homophily' card. Paolo recalled a group

activity about privilege he had once participated in. Paolo and other participants were asked to

drop a bead into a bowl if, for example, their parents had paid for their university tuition, or if they'd ever been asked to work on a religious holiday. Paolo remembered the impact of hearing dozens of beads drop, question after question. Could a web app replicate the impact of the 'bead drop' sound on an online platform about news and homophily?

A third idea came from the 'selective algorithm' and 'personalization' cards. The group wondered how we could possibly tackle the daunting mechanics behind Facebook and Twitter. Amazon's recommendation system came up in discussion and we wondered if we could flip the idea of 'recommending' based on an individual's preferences. What if we reverse-engineered the recommendation bar? Instead of "People who viewed this also viewed this…", what if we created an app that proposed: "People who read this *didn't* read this…" and then listed news items the user would not have been exposed to otherwise?

I came away from the second workshop with this short list of three ideas: hashtag barometer, bead drop platform and reverse-recommendation bar. The next step was to weigh feasibility, budget and time constraints against each idea's complexity and potential. I started an online group chat for the participants and shared initial ideas, a mockup (see Fig. 7), and early algorithmic planning. After consulting workshop participants, friends and advisors, I decided to move forward with the third idea.
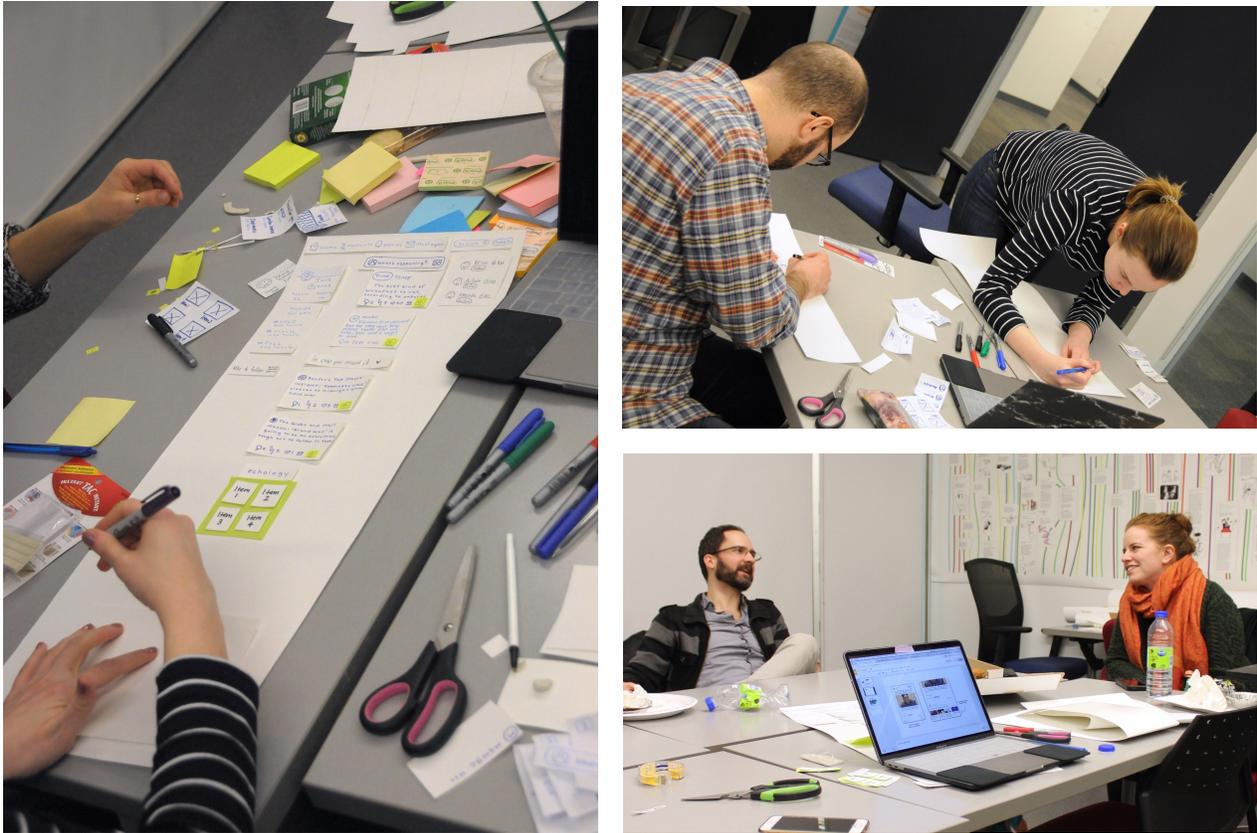
Fig.6: Paper prototyping session.

Stage 3: Prototyping

Between the second and third workshops, I hired Moiz Ali, a full-stack developer and computer science student at York University, to work on the back-end programming of Echology. I provided Moiz with initial parametres for the extension's algorithm. The third workshop was run twice in order to accommodate all participants' schedules. At the first third workshop, Paolo, Jane and I created a preliminary paper prototype (see Fig. 6). We recreated the Twitter news feed with paper and acted out how the user might interact with the Echology extension, from downloading it from the Google Chrome store, to accessing news articles they wouldn't have
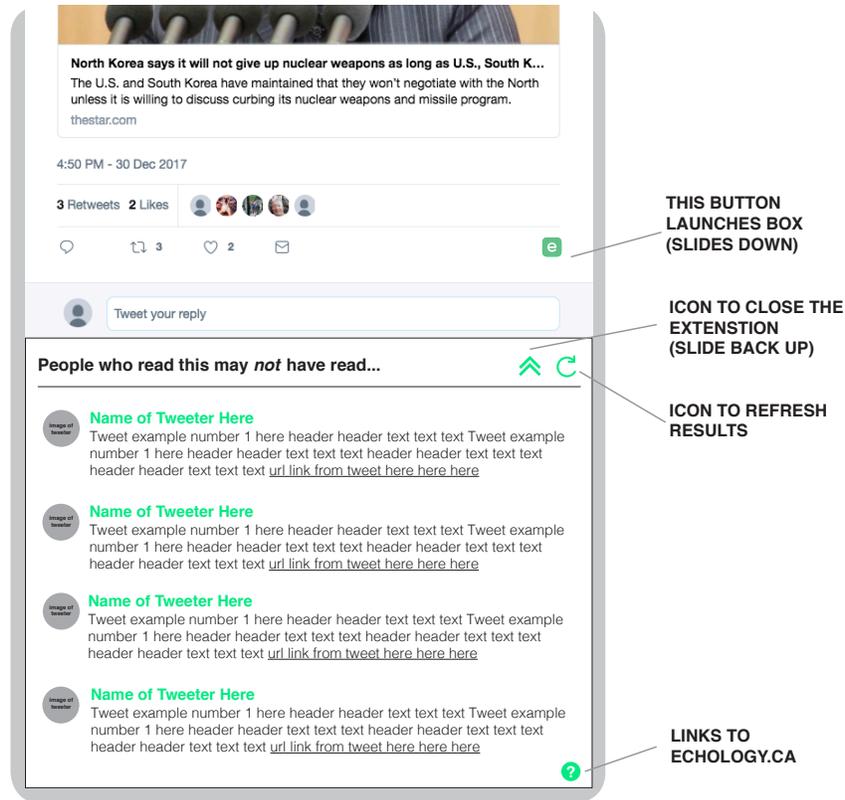
Fig. 7: Early mock-up of Echology app.

seen otherwise. We tested Echology's usability and discovered that adding a 'refresh' button, an

option to hide the Echology bar, and an 'info' button would greatly improve the experience.

These buttons were added to the final digital prototype. At the second third workshop, Brice,

Amanda, Aileen and I discussed one major design challenge at hand: How to create an app

inclusive of a variety of news outlets, but still avoid spreading 'unscientific' news.[50] Inspired by

Wikipedia's crowd-sourcing model and the neutral approach of news aggregator AllSides, we all

agreed that Echology should be as inclusive and transparent as possible; any news outlet on

Twitter that shows a commitment to fact-checking would be welcome to have its news posts

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[50] *As described in the literature review chapter, 'scientific' news refers to articles reporting verifiable facts as opposed to conspiracy theories.*

appear in the Echology extension. Echology's master list of news outlets is public knowledge —

it's the list of 'friends' its Twitter handle follows. If a news outlet wanted to be included, it could

simply tag @echologyapp and ask to be added to the list.

Subverting Echology

At the final workshops, I asked participants to think about ways Echology could be subverted by

a user. Potential subversive acts are limited by the simplicity of Echology — its main function

rests on pressing a single button to launch the software. But the fact that Echology's algorithm is

openly available means that users could use that information to undermine the service. Paolo

noted that a user could potentially follow all the same news outlets as @echologyapp, rendering

Echology useless. This would mean one less user for Echology, but would also cause that Twitter

user to be exposed to more views than ever — a success in itself. Jane suggested Echology could

be hacked or be subject to the same manipulations described by Metaxas and Mustafaraj in *Social

Media and the Elections* (2012). A user could spam Echology's Twitter handle and offend other users

in online exchanges. Similarly, Brice and Aileen speculated that Echology could be used by

'trolls' to quickly identify news agencies they disagree with and bombard them with offensive

commentary, instead of the web app's intended purpose, which is to hear them out.

The most likely subversive acts (albeit unintentional) would come from Twitter itself.

Shortly after creating Echology's account, I noticed Twitter was auto-following or 'friending'

other users on Echology's behalf. The auto-follow feature undermines the carefully-curated

master list of 'friends' referenced by Echology's source code. I was able to turn off auto-follow,

but future updates released by Twitter could have a large impact on Echology. To keep the app

functioning long-term, a developer would have to stay on top of all Twitter updates and adjust Echology accordingly.

This chapter described each stage of the Participatory Design workshops (exploration, discovery and prototyping) and how participants contributed to the concept of the Echology web app. In the following section, I offer candid reflections on the overall process.

Reflections

The process of designing and executing a set of Participatory Design workshops was illuminating and engaging, but it also presented challenges along the way. Deciding who the participants would be was the first challenge — should I have invited casual news readers instead of (or as well as) experts working in the field? I chose to include only news industry professionals, thinking that their prior knowledge would keep the workshops agile and focused — after all, the echo chamber phenomenon and its surrounding factors are nothing new to practitioners in the field. On the other hand, casual news readers may have voiced perspectives that news 'insiders' are unlikely to consider. Future PD research should carefully consider who the workshop participants are and how their perspectives might shape the outcome. In a future iteration of the Echology workshops, I would include non-experts, either as part of the conceptualization phase or in a second process where casual Twitter users would have the opportunity to install the extension on their personal computers, test it over a long-term period of time, and track their personal relationship to polarization.

A second challenge was to negotiate how much to inject myself into group discussions and activities. As facilitator, it was difficult to gauge when I should jump in and contribute, and when I should stand by and support the participants. I had planned so thoroughly what the participants

would be doing each step of the way, I forgot to pre-establish my own boundaries. This leads me to a third challenge faced at the workshops — running out of time. The workshops would have benefitted from being longer than two hours each; we often had to end a session halfway through an interesting discussion.

Many components of the workshops worked out better than intended. I initially created the actant cards as a way to share the research from my literature review and introduce ANT concepts to the group, but they ended up being a central tool for idea generation. As user experience designers increasingly integrate digital brainstorming tools into their creative process, the success of the actant cards shows that having a tangible paper tool can help bring weight to a creative exercise. The cards allowed participants to play, compare, and reflect with more ease in a group setting than a digital program would have.

Allowing unstructured discussion was another success of the research. At each workshop, participants felt comfortable with pausing from an activity to sit back and hash out a thought collectively. Having a whiteboard nearby to cover in sticky notes or scribble down ideas helped me, as facilitator, to keep notes of each conversation. For example, one realization that came from a discussion during the third workshop, was that Echology could be used as an educational tool for media literacy. The group was discussing whether or not, by presenting all these differing viewpoints on a news topic, Echology may lead a user to become more confused. Jane commented that Echology is about deciding what level of media literacy you want as an online reader. A potential user of Echology wants to be aware and be exposed to more perspectives — they have a growing awareness of the echo chamber phenomenon and want Echology to facilitate increased critical thinking while they consume news on Twitter. The group agreed that, in this case, complicating the news experience is a virtue.

As explained in this section, I suggest to future PD researchers, particularly ones addressing the news practices, to choose their participants thoughtfully. Whether you invite experts in your field of study, non-experts, or a combination of both, will greatly impact the output. As facilitators, plan ahead what you will be doing while the group is engaged with activities — how much will you contribute your own ideas and risk swaying the group's thinking? Make the sessions long enough — better to wrap up early then curtail an interesting conversation because you've run out of time.

This chapter, *Documenting Participatory Design*, described the research techniques used during a series of workshops held with news industry professionals. It showed how the group went through each stage of PD research; exploration, discovery and prototyping, and came up with the idea for Echology, a web tool that challenges readers to think critically about the forces at play in an online news experience. The next chapter will review the findings from the literature review, the frameworks discussed in the theoretical review, and how they were tied together and applied to the participatory workshops. I will also suggest how future researchers might approach news practices, specifically the echo chamber phenomenon, and what might happen if scholarship and industry fail to address the implications of news consumption on social networking sites.

Conclusion

Each chapter of this thesis work, *News by association: Designing a way out of the echo chamber,* pushes forward into the next, working together to answer the questions introduced at the beginning of the document:

> *What are the key factors contributing to the formation of echo chambers in news consumption on social networking sites? How might designers address the echo chamber phenomenon?*

The project incorporates elements of actor-network theory, Bruno Latour's 'matters-of-concern', and Participatory Design methodology to identify and unpack contributing factors to the formation of echo chambers. As part of the research, a series of participatory workshops were held with a group of news industry professionals. A web app was conceptualized in the workshops and a prototype was created with the help of a full-stack developer. The web app, called Echology, is a Twitter extension that challenges users to think critically about the selective algorithms governing their online news experience by proposing news posts from outside their 'friends' list.

The research behind Echology began with a thorough literature review. This review yielded interesting findings: researchers are not unanimous in their condemnation of the way news is consumed on social networking sites. Contrary to most other echo chamber studies, Barbera et al. (2014) argued that platforms like Facebook and Twitter actually increase incidental exposure to different viewpoints, therefore reducing polarization, not generating it. Similarly, Flaxman et al. (2016) argued that the magnitude of the effects of echo chambers is still relatively modest. On the other hand, Anagnostopoulos et al., Grevet et al., Williams et al., and others,

directly linked social networking sites to the formation of echo chambers. How might researchers address a topic with so many moving pieces?

The theoretical review proposes principles of actor-network theory (ANT) and Latour's 'matters-of-concern' concept as ways to investigate the echo chamber phenomenon. The two approaches are complementary for more reasons than that they share a founder. To acknowledge the complexity of a news item is difficult and daunting; ANT's focus on highlighting non-human actants[51] can help researchers move away from looking solely at the human factors — sources, journalists and audiences[52] — and toward understanding the issue as a socio-technical hybrid. 'Matters-of-concern' — Latour's epistemological approach to public matters — invites researchers to reject the positivist implications of the phrase 'matter-of-fact', and embrace the view that scientific and experiential qualities are entangled.

Put into the context of a larger map of research into the echo chamber phenomenon, it becomes clear that each study examined in the literature review addressed only one or two contributing actants. Standing alone, each echo chamber study might appear to be leaving out important factors: Barbera et al. studied weak ties, but not viral misinformation; Williams et al. focused on open discussion forums, but not political partisanship. Instead of creating a false polarity between the studies, I propose that viewing them (and future studies) from an ANT perspective helps to contextualize, validate and situate them as pieces of a larger puzzle.

As explained in the *Methodology* chapter, these concepts were applied throughout this thesis work. By sweeping through each paper cited in the literature review, I created a list of contributing factors and turned the list into a deck of cards (see Appendix D). Each card shows the name of an actant and a short summary that indicates how that actant might contribute to

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[51] *'Actant' is a term used in actor-network theory to describe any agent - human or non-human.*
[52] *Turner, Fred. "Actor-Networking the News." 2005*

the formation of echo chambers on social networking sites. The deck was used in a series of Participatory Design workshops as tools for idea generation. The actant cards were central to developing Echology. In future studies, the deck can be improved and expanded as new actants emerge.

If future research fails to examine the actants contributing the echo chamber phenomenon, what might be the consequences? What might a future where we fail to intervene in the formation of echo chambers look like? Recent events have given us a preview: conspiracy theories reported by mainstream news outlets, the descent of general-interest newspapers and rise of completely personalized news experiences, undemocratic interference in elections through social media.

Without intervention, strong-held sociological and technological structures might begin to decay. Matters as fundamental as knowledge creation might be affected. If misinformation and propaganda become indistinguishable from fact-based news, democratic societies will face major epistemological challenges. In his 2015 paper, researcher Eric Feldman explained: "This propensity not to question one's own knowledge presents a challenge to democracy, where one's perceived knowledge of 'facts' influences political behavior and therefore shapes decisions." Instead of a race to win over the public through debates and proposed policy, an election could simply become a race to manipulate public opinion on social networking sites.

Machine learning is advancing steadily, meaning that in the future algorithms might hold an increasing amount of agency over online news experiences. Individuals could become so accustomed to governance by algorithm that it becomes an unchallenged, intangible force impacting billions of lives.[53] Owned by private corporations concerned with profit maximization,

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[53] *In 2017, Facebook reported that it had more than 2 billion monthly users.*

this formula might "weaken public-interest goals and social responsibility in the construction of reality and eventually consolidating and creating new social inequalities."[54] Inside the fortified echo chambers of a future with smarter personalization algorithms, individuals might be exposed to little or no diversity in voices. Hate groups might become increasingly emboldened — comforted by hearing their extreme ideas echoed back at them on social networking sites with few interruptions. Activists might have increased difficulty bursting through filter bubbles to reach a wider audience. Williams et al., for example, found evidence that climate change discussions on social media are highly characterized by homophily and segregation. Unchecked, this chasm in viewpoints might grow.

The echo chamber phenomenon in news consumption on social networking sites is a matter of concern. Can we — researchers, journalists, designers, politicians, citizens — rally around it? Can we identify, unpack and expose its actants and lived qualities? In the next section, I invite researchers to take an ANT-based approach to collectively address this phenomenon.

Future Research

During the time spent writing this document, Facebook announced changes to its news feed. Mark Zuckerberg explained in Facebook post on Jan. 11, 2018:

> *"The first changes you'll see will be in News Feed, where you can expect to see more from your friends, family and groups… As we roll this out, you'll see less public content like posts from businesses, brands, and media. And the public content you see more will be held to the same standard — it should encourage meaningful interactions between people."*

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[54] *Just and Latzer. "Governance by Algorithms" 2017*

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It's hard to tell what this means without exact details of how Facebook's algorithms work and what precise changes are being made, but one way to interpret the announcement is that Facebook is retreating on news content because dealing with the problems of fake ads, misinformation and conspiracy theories is hard. Twitter too, has addressed concerns about brevity of posts and in Sept. 2017 announced that they are testing doubling the Tweet length to 280 characters. Future scholarship should track the long-term impacts of these changes, and others on the horizon. There are many facets to the echo chamber phenomenon to investigate, and I propose the deck of cards created as part of this project (Appendix D) could be a starting point to mapping out the landscape of the issue. The deck represents only 24 actants — future research on the echo chamber phenomenon could help grow and expand this list of human and non-human factors. Participatory Design methodology can serve as a way to incorporate a diversity of views and knowledge into future initiatives that work to address the echo chamber phenomenon. Echology, the web tool created as part of this thesis project, exposes Twitter users to news posts they would not see otherwise; I propose future projects can improve and expand this idea of subverting selective algorithms. Projects like Echology can challenge users of social networking sites to think critically about the forces at play in an online news experience. As contributing factors to the echo chamber phenomenon are unpacked and highlighted, pressure might mount on industry giants to be more transparent, more careful and more civic-minded.

As this thesis work shows, the way news is consumed on social networking sites is quickly evolving. It will take a concerted effort to address new socio-technical concerns as they emerge. As a public matter, social networking can't be left to those in a boardroom at Facebook and Twitter — through initiatives like ANT research and Participatory Design methods, scholars can engage with the public and develop innovative ways to address one of the most critical issues of our time.

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Appendices

A. Card sorting categories

Amanda categorized the cards into:

1) Deep-rooted aspects of a person that would be difficult to change
2) Relationships (things that are difficult to change)
3) Social norms
4) Things a speculative app could potentially impact: a. Online landscape, b. Political landscape

Brice approached the cards from how they are part of the larger economy of information:

1) Relationship we have as individuals to the information that we're looking
2) The information itself (wrapped up by larger structures of power)
3) Personal: the choices we have as consumers
4) Systems that choose things for you

Paolo framed his categories through the lens of how and why people use social networking sites:

1) How an individual uses an app
2) People
3) Content
4) What AI does
5) How we feel about it all
6) I don't know (the 'capitalism' card fell into this category)

Jane categories the cards into broad categories:

1) Power/Societal actors
2) People
3) Relationships
4) Threats to democracy / roadblocks
5) Lack of attention span
6) Behind-the-scenes / machine stuff

Aileen did not create categories but instead talked about how the actants associate and fold into each other. For example, one of her card trails started with the homophily card. She described how homophily can grow into political partisanship, which can feed a selective algorithm.

B. Research Ethics Board Approval

The research methods used throughout a series of Participatory Design workshops were proposed before, and then approved by, The Research Ethics Board. The approved REB application (#101100) is dated Nov. 6, 2017 and is valid for one year, or until Nov. 5, 2018.

C. Workshop plan

The next three pages contain detailed instructions on how to facilitate Participatory Design workshops like the ones completed as part of this thesis project.

WORKSHOP PLAN

This series of Participatory Design workshops tackles the question: *How might designers address the echo chamber phenomenon?* Each workshop is suggested to be at least two hours long, but can be adapted to suit varying time constraints and numbers of participants.

WORKSHOP 1: EXPLORATION

Materials: *A laptop or desktop computer for each participant, markers, sticky notes, white board, actant cards*

1. MEET AND GREET
Participants meet, discuss professional backgrounds and interest in project

2. INTRODUCTORY PRESENTATION
Facilitator gives overview of project's research questions, theoretical frameworks (actor-network theory, matters-of-concern), findings from previous research, actant cards, and goals of the workshop series

3. USER TESTING AND DISCUSSION
Individually, participants conduct test-runs of five related creative works: PolitEcho, FlipFeed, AllSides, Vubble and Red Feed, Blue Feed. Next, participants analyze each work by jotting down answers to the following questions on sticky notes: What does this do well?', 'What are its weaknesses?', and 'What ideas does it give you? Notes are posted on a board or sheet. Each participant is presented with a deck of actant cards and asked to note which actants are addressed by related creative works, and which are not. Allow for open discussion about where there might be gaps, or unaddressed actants, in precedent design efforts.

WORKSHOP 2: DISCOVERY

Materials: *Deck of actant cards for each participant, markers, sticky notes, white board*

1. CARD SORTING EXERCISE

Participants assess actant cards and sort them into categories of their choosing. A couple of blank cards are included in the deck so that participants can insert their own ideas to the exercise.

2. EVALUATE CARD SORTING RESULTS

Participants take turns presenting findings to each other. Facilitator documents any patterns or differences in the way each participant approaches the sorting exercise.

3. BRAINSTORMING EXERCISE

Participants collectively brainstorm ideas for a digital design object that might address one or more actants. Facilitator should allow time for open discussion and track responses on the board. The goal of the brainstorming session is to generate a list of ideas for a web tool that addresses the echo chamber phenomenon. If an idea is going to be built by a web developer, have the group give input on which ideas they would like to see actualized. Between the second and third workshops, decide which idea is most feasible and loop in a full-stack developer. Another option is that the final output will be a paper prototype, created wholly by participants in the third workshop.

WORKSHOP 3: PROTOTYPING

Materials: *Bristol board, construction paper, markers, pens, scissors, glue sticks, tape, camera, computer*

1. PROTOTYPE DEVELOPMENT

If a digital prototype is being created, participants will make a paper prototype with the goal of figuring out how user might interact with a future digital iteration. Either all together or in groups of two or three, participants will use paper materials to mock-up the interface of the web tool.

2. USER TESTING AND GIF-MAKING

Participants will act out how a user might interact with the web tool. Facilitator can help students take images during the user-testing process, and use a number of free online GIF-making tools to create a GIF of how a user might interact with the prototype. If a digital prototype is not being created, the paper prototype and GIF are the final design outputs of the workshop series.

3. REFLECTIONS

Participants will discuss each stage of the Participatory Design process and reflect on the questions: How did the workshops help unpack the echo chamber issue and how can design serve as an intervention? Allow participants the opportunity to offer any closing remarks, suggestions, findings and/or responses.

FOLLOW-UPS

What happens after the completion of the workshops will vary depending on a project's unique goals. Depending on whether a digital prototype is created by a web developer, the facilitator might update participants about the digital prototyping process through email or in an online group chat. Participants should be invited to user-test, either remotely or as part of a fourth workshop, when a digital iteration is complete. As collaborators, participants should be kept in the loop about any future implications of the project.

D. Print-and-cut actant cards

Each card on the following page represents a potential contributing factor to the echo chamber phenomenon in news consumption on social networking sites. The terms were drawn from the many papers cited in this document's literature review. The description on each card is a short reminder to its holder of how the term might relate and/or contribute to the formation of echo chambers.

hyper reading

'Skimming, scanning, fragmenting, and juxtaposing texts'

— Katherine Hayles

algorithmic selection

The computational system that decides what users see — and don't see

homophily

The tendency to associate with people like ourselves

users' choices

What users choose to see and support on social networking sites; one's personal news filter

skepticism

An attitude/behaviour exhibited toward content that opposes one's views

misleading headlines

May incite polarization by presenting an event incorrectly or with bias

ideologies

'A system of ideas and ideals, especially one which forms the basis of economic or political theory and policy' — OED

capitalism

'A system in which a country's trade and industry are controlled by private owners for profit' such as social networking firms

— OED

brevity in posts

Limits ability to explain a news story in depth

personalization

Using filtering options to add or remove certain views from one's news feed

anonymity

The ability to hide one's identity online

conspiracy news

"Tends to reduce the complexity of reality by explaining significant social or political occurrences as plots conceived by powerful individuals or organizations"

— Anagnostopoulos et al.

previously-held beliefs

Personal beliefs that may impact an individual's view of news shared on a social networking site

propaganda

'Information, especially of a biased or misleading nature, used to promote a political cause or view' — OED

activism

Posting, mobilizing on behalf of a cause; an attitude/behaviour exhibited in support on one's views

strong ties

Close friends and family one follows on social networking sites

weak ties

An online acquaintance that one does not know well

trolling

'Posting deliberately offensive or provocative online messages'

— OED

misinformation

False stories deliberately circulated on social networking sites

social circle

Friends, family and acquaintances followed on social networking sites

cross-cutting content

Opposing viewpoints that made it into one's news feed

hashtags

A way to categorize posts on the same topic; Can be manipulated for political gain

political partisanship

'Prejudice in favour of a particular [political] cause; bias'

— OED

opinion leaders

Active users with many followers; potentially able to shape public opinion