

Research Article

The Information War in the Digital Society: A Conceptual Framework for a Comprehensive Solution to Fake News

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ABSTRACT

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INTRODUCTION

Fake news, alternative facts, disinformation, propaganda — the concept is not new, but the Digital Age has exponentially increased both the rate at which fake news is proliferated as well as the potential audience for consumption. The Internet provides a vast wealth of immediate information, but “for every challenge facing this nation, there are scores of websites pretending to be something they are not” (Stanford History Education Group, 2016, p. 4). The impact of fake news is as threatening as viruses, worms, phishing, and logic bombs. It is a war—an information war that has the potential to destroy trust, sabotage economies, ruin businesses, and devastate people’s lives.

This paper aims to begin an academic discussion about solutions to curtail fake news. To put the discussion in context, we first define fake news and its impact on society. In the review of literature, we identify the sociological effect on the construction of reality as well as the role of critical thinking to identify truth and verify “facts.” We then present a conceptual framework that identifies proactive, reactive, and technological solutions to eliminate, or at least reduce, fake news. Finally, we present four case studies to which the conceptual framework is applied.

Definition of Fake News

The rapid escalation of fake news poses a new threat to the fiber of the digital society. What can start as a harmless comment, tweet, or social media post has the possibility of “going viral” and reaching millions of people within minutes. Many people accept what they read and hear as “news” without verifying the source or fact checking the content, which leads to misconceptions about reality and can negatively affect decision making. Fake news can be defined the following ways:

- *News that has no factual evidence.* The person creating the content has no factual evidence to prove it, nor data to substantiate it. The content is fictional.

- *News that may be partly true but also partly false.* The person creating the content uses some truth that can be easily verifiable as leverage for gaining some form of credibility. Then false information is integrated into the story.
- *News that deliberately exaggerates to mislead.* The person creating the content begins with facts or verifiable situations, but then exaggerates details, such as claiming to see 2,000 ships when it reality there were only 200 ships.
- *News that is weaponized to destroy society, people, economies, or certain groups.* The person creating the content confuses the information or uses deception and manipulation to destroy people, society, groups of people, and economies or business organizations.

The Effects of Fake News and Its Impact on Society

How, where, and when fake news is disseminated determines its effect. For example, fake information can be aimed at destroying politicians or political parties and ideologies, sabotaging economic and financial interests, or creating mistrust that can negatively impact the social and moral fiber of a society. Additionally, misinformation can be used to create chaos and confusion. One interest group may stand to gain from distorting the truth, while other groups may suffer in the midst of all the chaos and confusion created. With the intent to create the most damage, fake news can be disseminated rapidly and globally, such as when Russian retweet bots were used to broadcast statements (Mensch, 2016).

Research Objective

Fake news can have far-reaching, negative repercussions if not eliminated or at least effectively recognized and minimized. Similar to viruses, worms, phishing emails, and logic bombs; fake news has the potential to destroy trust in society, sabotage economies, ruin business organizations, and devastate people’s lives. The objective of this paper is to purpose a

conceptual framework that visually defines the viral dissemination and consequences of fake news as well as explore possible solutions to eliminate, or at least reduce, the digital dissemination and perpetuation of fake news.

Literature Review

The impact of fake news on society is far reaching. Journal articles about fake news have been published recently in several academic disciplines including economics (Allcott & Gentzkow, 2017), education (Loertscher, 2017), journalism (Clark, 2017), legal affairs (Klein & Wueller, 2017), medicine (Tillotson, 2017), psychology (Mihailidis & Viotty, 2017), science (Musson, 2017), and, of course, technology (Berghel, 2017), just to name a few. These articles address fake news within the context of their disciplines—conversations that must continue at the micro level to contribute to academic knowledge. However, to put our proposed conceptual framework in perspective, the following review of literature focuses on the macro level—research that addresses the sociology of fake news and the perception of reality as well as the role of critical thinking in identifying fake news.

The Sociological Impact of News and Media on the Construction of Reality

Information is the primary asset that media holds. Breaking news first can mean more viewers and, thus more advertising money. According to Davenport, Eccles, and Prusak, information technology was supposed to stimulate information flow and eliminate hierarchy” (1992, p. 53). One could argue that with ubiquitous technology and real-time reporting, information technology has made the news less hierarchical. This has led to the somewhat frenzied nature of breaking-news reports and live-coverage broadcasting. However, Davenport et al. may be correct in stating that information politics is an attempt to preserve the hierarchy. Preserving hierarchy in media coverage now has become a difference in how the information is reported in addition to how quickly it is reported. In essence, the competitive advantage is presenting information in a new way.

Consider how news has changed. It is more urgent, with carefully word-smithed language, often including video, first-hand witness accounts, and banners of breaking information flowing across the bottom of the screen. In effect, news has become a buffet of information. Though it may sound outrageous, Nicholas Negroponte, the founder of MIT’s Media Lab, suggests that in the future information will be ingested with a pill (Negroponte, 2014). Other experts have compared consuming information on the news to physically consuming and ingesting information (Getti, 2012; Negroponte, 2014; Rangaswami, 2012). Just as food comes in many forms — such as protein-rich meats and nuts, nutritious fruits and vegetables, delicious though cholesterol-inducing junk food—information has many forms as well. You can’t live on one type of food alone. You need variety to be healthy. However, the choices can be overwhelming with the plethora of television news channels, online media, streaming services, newspapers, magazines, and radio. Depending on your tastes

in news coverage, you can choose from the buffet of outlets and media. (Edlund, 2012)

Media sources have autonomy about which content to report as news, how to analyze it, and how to disseminate it. Colman McCarthy, a Washington Post writer, affirms that “a major abuse in the media is not that we slant the news but that we can arbitrarily choose the news” (Schudson, 2003, p. 18). The media is able to choose what to present and, in essence, to “construct reality” (Schudson, 2003, p. 18). Berger and Luckmann emphasize that reality is constructed sociologically, and the study of the sociology of knowledge “must concern itself with everything that passes for ‘knowledge’ in society” (Berger & Luckmann, 1966, pp. 14-15). For many people, the media holds a significant amount of power because it can fulfill a need for knowledge, both on the subjective and objective levels. Objective knowledge is that which everyone tends to perceive the same way. For example, the name of the person who holds the office of president is an objective piece of knowledge. Subjective knowledge is based on personal experience, such as the perception one holds about whether the president is performing well, for example.

The power of the media is often overestimated because it is the “visible tip of the iceberg of social influences on human behavior” (Schudson, 2003, p. 19). The media is apparent, sometimes inescapable, but employs much action behind the scenes of which people may be unaware. Thus, its power is merely an illusion of power reflected by society. This is not to say that the ‘hypodermic model’ of media is at play, where “the media injects ideas into a passive and defenseless public,” but that the power placed upon the media suggests that people view it as a proxy for their own reality and legitimization of their beliefs (Schudson, 2003, p. 23). The problem occurs when the media reports information that conflicts with one’s subjective reality. This happens most often in the political arena.

In the political climate, especially in Washington, D.C., the media has power. People believe what is created by the media, “in the subjectivity of reality and the reality of perceptions. . . .” (Schudson, 2003, p. 17). Geoff Mulgan, a British critic, states that “we now live in a world in which fantasy and reality are impossible to distinguish” (Schudson, 2003, p. 17). This is especially true in light of fake news. After much publicity about what ended up being only two pages of President Trump’s tax returns, Rachel Maddow, broadcast journalist was mocked on social media (AOL.com Editors, 2017). Ms. Maddow appeared on Jimmy Fallon’s television show and asserted that “all of us in this business are worried that someone’s going to slip us a forged document or something’s fake and it’s like a trap. . . .we need to do our due diligence, too” (Locker, 2017). Conservative broadcast journalist Sean Hannity says about mainstream media, “I mean, they lie. They’re corrupt. They’re dishonest. They collude. They’re all in this hyperventilating mode about ‘fake news’ now, but they are fake news . . . look, people don’t need them anymore. Things have changed dramatically, with Breitbart, and Drudge, and cable news, and talk radio, and

social media – Twitter, Instagram, Facebook. People are getting information very differently than they did” (Hayward, 2016).

People are conscious of “the world consisting of multiple realities;” however, a problem occurs when a reality is presented that conflicts with someone’s personal reality (Berger & Luckmann, 1966, p. 21). Individuals can reconcile differing realities that conflict with their own by dismissing the information or combining with and adjusting their existing internalized subjective realities. The issue with fake news is not that it conflicts with one’s personal beliefs, but that it is skewed or false information being presented as objective reality.

Algorithms have been created to detect fake news, but computers can only do so much to categorize information as “pants-fire”, ‘false,’ ‘barely-true,’ ‘half-true,’ ‘mostly-true,’ and ‘true’” (Oberhaus, 2017). How do you teach a machine to recognize deception? Not all fake news looks alike, and neural networks, artificial intelligence, and natural language processing are currently limited to specific pattern recognition (Vorhies, 2017). Building an external fact-check database would be infeasible to maintain (Matz, 2016; Vorhies, 2017). Ultimately, the best “gold standard” for fact-checking is human interaction with the data (Vorhies, 2017). Websites such as FactCheck.org and Politifacts are already using human fact-checkers. The problem that occurs is determining at what level the allegedly deceptive data should be censored. Should it be totally censored, or should the user be forewarned that something looks like fake news, similarly to the way that spam and potential viruses are detected? In the future when computer-deception-recognition is better, the “virtuous cycle” will include the combination of people, computers, and data to determine fake news (Matz, 2016).

The Role of Critical Thinking in Identifying Fake News

Until technology is able to filter fake news for us, we need to think critically about the information we consume. Many people will agree that much of the content in gossip and entertainment publications, such as the *National Enquirer* and *Star* magazines, is often untrue. These “trashy tabloids” publish questionable cover content to lure readers, though the stories are either exaggerations of the truth or outright lies based on unfounded sources. They are created for entertainment purposes, much like sitcoms and comedy shows, such as Saturday Night Live. We expect them to be fictional. By contrast sources such as *The New York Times* and *The Wall Street Journal* are deemed reputable sources of factual information (Glader, 2017). We trust them to be factual. But aside from what we know to be purposefully fictional and what we trust to be factual, how does one ascertain truth from fiction in online content given the breadth and depth of information available in today’s Digital Age?

Critical thinking plays an increasingly important role in identifying fake news or at least questioning the reliability of sources and the evidence on which the content is based. The Foundation for Critical Thinking (2015) defines it as:

... the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action. In its exemplary form, it is based on universal intellectual values that transcend subject matter divisions: clarity, accuracy, precision, consistency, relevance, sound evidence, good reasons, depth, breadth, and fairness.

In an effort to create a simple and memorable framework to critically think about content, specifically web-based content, the Meriam Library at California State University, Chico (2010) created the CRAAP Test, which includes a list of questions to help readers evaluate the Currency, Relevance, Authority, Accuracy, and Purpose of the content (Wichowski & Kohl, 2012). Currency relates to the timeliness of the content—when it was published, has it been revised or updated. Relevance refers to the intended audience and whether the content is important to your needs. Authority is the source—who wrote it or published it, and what are their credentials? Accuracy requires the most amount of time to discern—is the content supported by evidence, has it been reviewed or refereed, does the tone seem unbiased? And finally, purpose questions why the information exists—what was the author’s goal in sharing the content?

Critical thinking takes time; it requires practice and persistence. It needs to become an integral part of education and incorporated into every discipline and at every level. An informed citizenry needs to think about “how do we know” and question sources of “data” to be able to identify fake data (Horsley, 2017).

Solutions for Minimizing Fake News: A Conceptual Framework

Our conceptual framework focuses on two variables—proactive solutions and reactive solutions that can be used to minimize the effect of fake news. Within this framework, technology is the presumed infrastructure of delivery as well as the main vehicle for filtering content. See Figure 1.

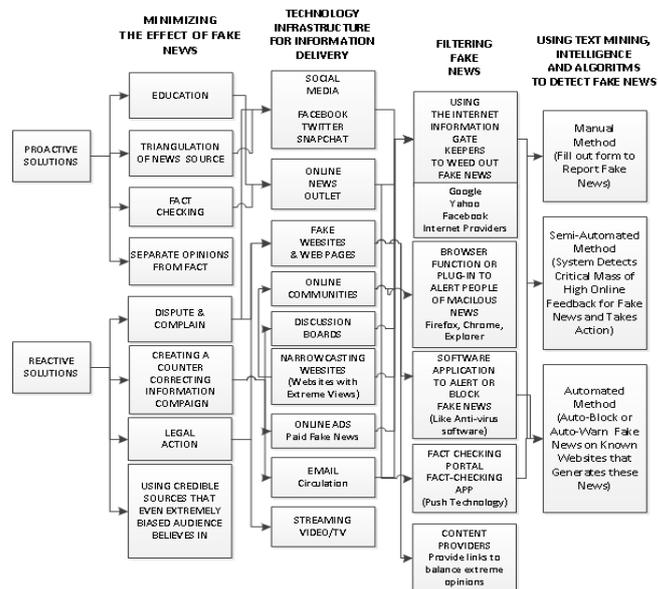


Figure 1. A Conceptual Framework for Fake News

Proactive Solutions

In order to avoid being victimized by fake news, Internet users need to be proactive in minimizing the effects of misinformation. First, internet users need to educate themselves about the existence of fake news. While this sounds like easy advice and common sense, the reality of the situation is much more complex than that. And this is why hundreds of thousands, if not millions, of people can believe in fake news. There are two main reasons why fake news works effectively even among highly educated people. First, fake news is targeted at winning over an emotionally biased audience. Second, people have blinders that prevent them from seeing the fact as it is. These blinders are created through environmental upbringing, past beliefs, family and community conditioning, or strong emotional leanings to view things in a certain way. Asking people to unlearn or give up their belief system is not easy.

However, to become critical thinkers who can discern fake news, people need to avoid the temptation to believe something quickly merely because it suits their views. They need to validate news sources through triangulation—finding at least two or more sources that validate the credibility of the information. However, in today’s environment, the sources of fake news also try to discredit mainstream media sources. To avoid confusion, we must separate opinions from facts by questioning the source and verifying the evidence.

If we look at the electronic media delivery platform, fake news is widely circulated in various social media venues. Both legitimate news outlets and fake news websites also pick up highly publicized fake news. There are also various online communities and discussion boards where fake news is circulated. ‘Extremist websites’ generate one-sided views that are broadcasted to a very specific biased audience. Additionally, paid advertisements create misinformation and fake news. Legitimate content providers such as Yahoo and Google post these ‘sponsored ads’ because they produce revenue. Emails and streaming video are also traditional ways of spreading fake news.

Reactive Solutions

Once the fake news is disseminated through an online platform, there are reactive solutions that can be used to minimize the effect of fake news. The content can be reported and/or disputed with the sources that provided it, such as Facebook, Twitter, Google, Yahoo, online communities, and discussion boards. For example, once they are identified, Google bans fake news websites from appearing in its search results (Townsend, 2017). There are also groups that provide a counter argument to correct wrong perceptions. Some people who are directly affected by the fake news have resulted to legal actions to stop the spread of fake news.

While many Internet users can be easily swayed by fake news posted to social media, the same users can also believe in more credible news outlets that traditionally cater to their views. So when credible news outlets denounce fake news, it helps to balance the viral spread of fake news on social media. For example, many politically conservative people may

believe a Republican politician who says “mainstream news media is the enemy of democracy and the source of fake news”. However, even mainstream conservative Fox News commentator, like Shepard Smith (2017), have defended the credibility of mainstream media. So, this has helped create some balance as Fox News are viewed by the same conservative audience that listened to a conservative politician claiming that mainstream media is the source of fake news.

Technological Solutions

In addition to proactive and reactive solutions, there are several technology solutions that can minimize the impact of fake news. These include information gatekeepers, browser applications, standalone software applications, fact-check portals, and content providers.

Information Gatekeepers. Google, Yahoo, Facebook, and other online news outlets can censor content and provide warnings about fake news. Using algorithms and artificial intelligence, they could flag certain news as potentially fake or even block it from appearing on their search engines.

Browser Applications. Firefox, Chrome, Explorer, and Safari are also in a position to block or at least warn users about fake news websites. They already block websites or provide warnings about websites that carry malware, adware, spyware, Trojan horses, worms, and viruses.

Standalone Software Applications. It is possible to develop software applications that help filter or fact-check fake news nearly in real-time, just like software that blocks adware, spyware, and viruses.

Fact-Check Portals. Although websites such as FactCheck.org and PolitiFact.com provide fact-check support, they cater mostly to political news statements. Their coverage could be expanded to more wide-ranging content. If more websites provide fact-checking support, a portal could be created to check for fake news across various news media outlets.

Content Providers. Content providers should support a more balanced view when one-sided news items are displayed in web searches. Many people who use search engines do not take the time to research what they read. Content providers should include fact-checking links as part of their news feeds to provide a balanced perspective.

Types of Reporting

The two forms of reporting described below—individual and semi-automated/automated methods—are used at different times in the fake news cycle.

Individual Reporting. While technology can be programmed to curtail the viral spread of fake news that has been circulating for several days, users will still need to individually report any recently released fake news. Just as a new computer virus is not yet in any virus database, ‘brand new’ fake news needs to be individually reported to solutions

providers so they become aware of the new threat and create a solution or filter for it.

Semi-Automated/Automated Methods. Once there are hundreds of users filing reports of a potential fake news event, it is possible that Internet gateway companies may temporarily block the source of the fake news based on the sheer volume of complaints reaching critical mass. An intelligent application or software tool could be programmed to trigger a blocking action once the number of complaints hit a critical mass. While the tool still needs human input, a critical-mass trigger can automate certain parts of the process to curtail the spread of fake news.

Fake news, just like spamming and phishing, is a money-making venture for some unscrupulous entrepreneurs, and it attracts advertising income because fake news can draw millions of Internet users to visit fake news websites. Web traffic brings in web advertising income from Google ads. However, once Google finds out websites are generating fake news to generate web traffic, they now block the IP address and various domain names of these fake news publishers on a more permanent basis. Google can automatically ban the IP addresses that constant generate fake news. These publishers frequently change their domain names, but they may be using the same IP addresses that point to the same owner.

Case Studies

While there are several instances of fake news generated in the political arena, we aim to analyze other areas where fake news is generated. In the following four case studies, we apply our conceptual framework to these situations.

Case 1 – Fake News in Finance

In 2016, a new product line of computer chips and graphics cards at Advanced Micro Devices (AMD) led to an exponential growth in AMD's stock price. It rose from \$3 to \$15 a share. In March 2017, ABD's biggest investor and shareholder, Mubadala Development Company, suddenly sold 45 million shares. The assumption was that they sold these shares based on the mixed reviews of the new AMD Ryzen microchip. At the time, AMD's stock was selling for \$15.20 a share. However, it plunged to \$13.04 after the news of Mubadala's sell off. Reputable rating companies such as Morningstar released news that AMD's biggest investor got 'spooked' by the mixed reviews and dumped their shares. (Chauhan, 2017)

While it is true that Mubadala did indeed sell 45 million shares, their reason for selling was not due to mixed reviews or the new chip line. The truth was that Mudabala sold their shares at the \$13.60-\$13.70 price range because it was the only way they could exercise their warrants (or long-term stock options) at a lower price of \$5.98.

According to the U.S. Securities and Exchange Commission (SEC), the only way Mubadala could exercise their warrants at \$5.98 per share was if they owned no more than 19.9% of AMD shares at any one time. (U.S. Securities and Exchange Commission, 2016)

The media coverage that Mudabala sold 45 million shares because they were 'spooked' about mixed reviews was very misleading fake news that was widely circulated in media. Mudabala, in fact, made a statement that it continued to support AMD and still owned more than 100 million shares. A few analysts, such as Austin Craig of Seeking Alpha, wrote about the situation to correct the fake news and reduce the impact of the negative perception. If AMD did not sell 45 million shares and they exercised the warrants, their ownership stake of AMD would be 21.80% and would violate the 19.99% ownership limit stipulated in the warrants agreement. And this would have meant that Mudabala could no longer buy shares at the \$5.98 price stipulated in the warrant contract. (Craig, 2017)

Why is this case interesting when looking at the issue of fake news? The answer is that the online investment community is made up of highly critical financial investors who evaluate financial information with greater scrutiny. Most investors do not quickly believe incredible news stories at face value. Financial analysts can spin financial news to their institution's advantage. The thousands of members of Stocktwits.com—the equivalent of Twitter for stock investors and traders—viewed the AMD discussion and shared information to correct the fake news that caused the massive stock sell off.

Many investors are 'highly proactive' in combating any fake news in the financial world. Given the level of risk and the value of their investments, they often triangulate and confirm financial news with independent sources. Investors usually 'fact check' news in broad media, such as Bloomberg, CNBC, The Wall Street Journal, and Barron's, and social media, such as Stocktwits.com, to ensure it is accurate and factual. Most investors also distinguish between 'facts' and 'opinions' or 'speculative forward-looking statements.' Therefore, if an internet user does not wish to be a victim of fake news, they should use the same level of evaluation and scrutiny. When investments and money is involved, most people are very careful about believing in any news, without verifying and researching the facts surrounding the news being circulated.

Case 2 – Fake News in Social Media

A Syrian refugee in Germany, Anas Modamani, took a "selfie" with German Chancellor Angela Merkel at a photo op when Merkel visited a refugee center. Modamani posted the photo to Facebook, but he was then slandered in fake news posts as a terrorist. Modamani sued Facebook to force the removal of all of his photos with Chancellor Merkel as well as the removal of the fake news stories that circulated with the photo. This resulted in Facebook having to put more safeguards in Germany's Facebook system to prevent further fake news from being circulated in the country. Facebook argued that they did not have the technological resources to detect all instances of fake news, but Modamni's lawyer argued that given the nature of the images that Facebook is able to detect, fake news stories should be equally identifiable. The argument boils down to whether Facebook's algorithm for facial recognition is effective in removing images of individuals used to propagate fake news. (Toor, 2017)

The New York Times article written by Melissa Eddy (2017) describes salient points of the case in the follow direct quotes:

Someone posted Mr. Modamani's photograph on Facebook and said that he had been involved in a December attack in which a homeless man in Berlin was set on fire. "I want peace in my life," the teenager told reporters after the hearing. "Not everyone believes that. Many people hate me, but all I did was take a selfie with Ms. Merkel." Mr. Modamani's lawyer argued that his client would continue to be a victim of libel until Facebook used its algorithms to prevent the image from being reproduced and circulated in Facebook.... Judge Volkmar Seipel said that the case raised questions about personal rights in the digital sphere that the law has not kept up with and that the court may not be in a position to answer. The social network also dismissed accusations that it had influenced the United States election by spreading misinformation. But Mark Zuckerberg, Facebook's chief executive, has since taken steps to bolster how the company handles such complaints. Last month, Facebook updated its Trending Topics feature, which offers links to popular subjects, to better promote links to reliable news outlets. It also teamed up with news organizations, including The Washington Post, El País of Spain and the German nonprofit news organization Correctiv, to offer curated news reports to some of its 1.8 billion users. In France, Facebook and Google are working with domestic news outlets to ensure that fake news reports are not published on its platform. Critics say those efforts do not go far enough.

This legal case involves a dispute/complain against the distribution of fake news. It questions the limitations of the laws and algorithmic capabilities of the social media infrastructure to prevent fake news from spreading. The case demonstrates the need for social media to create algorithms that can detect fake news as well a more systematic method to curtail fake news. The gravity of cases like this require technology companies to come up with better tools to filter, block, or warn users about fake news – if not manually, then by more intelligent algorithms. The plaintiff of this lawsuit has launched an information campaign to stop his name and image from being used by fake news outlets, which is one of the suggested solutions included in our conceptual framework. The framework also recommends the use of more credible sources to balance fake news. To this end, Facebook has begun to promote links to reliable news outlets, like the Washington Post (USA), El Pais (Spain), and Correctiv (Germany). These resources allow Facebook users to compare potential fake news stories on social media with related content on the mainstream news outlets side-by-side.

Case 3 - Fake News as a Lucrative Money-Making Enterprise

In November 2016, NPR news reporter Laura Sydell, covered a story about the creator of DenverGuardian.com, which is one of many websites that generate and publish fake news. The website was created by using the blogger website, WordPress. Through their research, NPR connected DenverGuardian.com

to a company called Disinfomedia, owned by Jestin Coler. A direct quote from the NPR article highlights the objective and money made from the fake news business:

Coler's company, Disinfomedia, owns many faux news sites — he won't say how many. But he says his is one of the biggest fake news businesses out there, which makes him kind of like a godfather of the industry.

At any given time, Coler says, he has between 20 and 25 writers. And it was one of them that wrote the story in the "Denver Guardian" that an FBI agent who leaked Clinton emails was killed. Coler says that over 10 days the site got 1.6 million views. He says stories like this work because they fit into existing right wing-conspiracy theories. ...

And as the stories spread, Coler makes money from the ads on his websites. He wouldn't give exact figures, but he says stories about other fake-news proprietors making between \$10,000 and \$30,000 a month apply to him. Coler fits into a pattern of other faux news sites that make good money, especially by targeting Trump supporters.

However, Coler insists this is not about money. It's about showing how easily fake news spreads. And fake news spread wide and far before the election. When I pointed out to Coler that the money gave him a lot of incentive to keep doing it regardless of the impact, he admitted that was "correct."

There are ethical and legal issues on whether websites that deliberately generate fake news for money or for other self-serving objectives should be allowed to publish fake news without any limitations, and whether Internet gateway companies like Google, Yahoo, and Facebook should block the fake news or merely warn readers about the type of websites that generate fake news. Coler said that when Google flagged one of his websites, NationalReport.net, as a fake website, he stopped running Google. While that reduced his income stream, Coler claimed that there are hundreds of other ad networks that want to partner with his website. His income from non-Google ads will continue.

Relating this case to our conceptual framework, will we see more effort from Internet gateway companies to flag fake news websites? Would their continued income stream from other sources continue to support their exponentially growth as they attract millions of readers? Will we see browsers such as Firefox, Google Chrome, Internet Explorer, and Apple's Safari flag these fake news websites to warn readers about the fake news, just like they flag websites that generate adware, malware, and spyware? Will we see more legal action from government or private parties as a reaction to deliberately misinforming people with fake news? Without any deterrents, the number of fake news websites will continue to grow. We believe this problem is just starting in the era of digital and social media, just like phishing, viruses, and identity theft have grown in the past.

Case 4 - Fake News and the Environment

There is a debate between the Environmental Protection Agency (EPA) and environmental scientists, including climate scientists, oceanographers, ecologists, claiming that fake news has caused the EPA to cut important federal scientific

programs that are critical for the future of the environment. The assertion that global warming is a Chinese hoax spread widely and enraged many scientists. In related developments, EPA Director Scott Pruitt (1) refuses to ban asbestos, which scientific studies say causes asbestos poisoning; (2) wants to bring back lead bullets for hunting that can cause lead poisoning among wildlife (i.e. causing American eagles to die when they eat the carcass of animals shot by lead bullets); and (3) wants to bring back pesticides like chlorpyrifos that caused neurotoxicity and cardiovascular risks among farm workers and children. (Formuzls, 2017)

According to writer Tom Philpott, an award-winning correspondent for *Mother Jones*:

Stephanie Engel, an epidemiologist at the University of North Carolina and a co-author of the Mount Sinai paper, says the evidence that chlorpyrifos exposure causes harm is ‘compelling’—and is ‘much stronger’ even than the case against BPA (bisphenol A), the controversial plastic additive. She says babies and fetuses are particularly susceptible to damage from chlorpyrifos because they metabolize toxic chemicals more slowly than adults do. And ‘many adults’ are susceptible, too, because they lack a gene that allows for metabolizing the chemical efficiently, Engel adds. Scientists are saying that ‘scientific facts are not opinions’ and the EPA needs to listen to scientists on the issue of climate change and the environmental effects of chemicals that are detrimental for the environment. (Philpott, 2017)

This case is unique to the other fake news scenarios in that the debate is far more complex than the ordinary fake news typically at issue in the political arena. Most people that are not in well versed in the environmental, chemical, and medical sciences and may have a difficult time understanding the arguments, appreciating the data, or being able to distinguish fact from fiction on either side of the debate. The issue of global warming has been debated by scientists for years. Using the conceptual framework in this paper, important elements in combating fake news include education, triangulation of news sources, fact checking of scientific data, and distinguishing opinion from facts. This is the kind of news that just cannot be easily filtered or blocked by technology. Both sides of the debate need to be heard more extensively for Internet readers to make a better judgement.

Analysis and Conclusion

We have chosen to look at four cases to see how fake news affects different areas (1) how it can impact the financial sector and cause investors billions of dollars in share value to disappear, (2) how those affected by fake news can push social media, like Facebook, to evolve and adopt better algorithms and systems to curtail fake news, or face more lawsuits and legal problems globally, (3) how fake news is a money generating business, just like phishing and spamming, and is therefore slated to grow as it can generate millions of audience and advertising money for the fake news publisher, and (4) that ‘fake news’ can be much more tricky when it comes to complex scientific debates like climate change and the effect of chemicals on the environment. We have used these four

cases to highlight how various parts of the conceptual framework in this paper can help curtail or neutralize the effect of fake news.

To tackle the problems and effects caused by fake news, our conceptual framework outlines both technology and non-technology solutions that need to be used and improved. We believe that fake news poses a new problem in the digital ecology and it can have far reaching effects economically, financially, environmentally, politically, socially, and legally. The underlying effect of fake news can be significantly more dangerous than a simple virus or phishing scam. Fake news affects people’s belief systems and can help form extremists ideology and digital mob mentality. We encourage more academic discussions and studies in the area of fake news.

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