Political Communication

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/upcp20

Coordinating a Multi-Platform Disinformation Campaign: Internet Research Agency Activity on Three U.S. Social Media Platforms, 2015 to 2017

Josephine Lukito

To cite this article: Josephine Lukito (2020) Coordinating a Multi-Platform Disinformation Campaign: Internet Research Agency Activity on Three U.S. Social Media Platforms, 2015 to 2017, Political Communication, 37:2, 238-255, DOI: 10.1080/10584609.2019.1661889

To link to this article: https://doi.org/10.1080/10584609.2019.1661889

Political Communication, 37:238–255, 2020

ISSN: 1058-4609 print / 1091-7675 online
DOI: https://doi.org/10.1080/10584609.2019.1661889

Coordinating a Multi-Platform Disinformation Campaign: Internet Research Agency Activity on Three U.S. Social Media Platforms, 2015 to 2017

JOSEPHINE LUKITO

Though nation-states have long utilized disinformation to influence foreign audiences, Russia's 2015 to 2017 campaign against the U.S.—executed by the Internet Research Agency (IRA) —is unique in its complexity and distribution through the digital communication ecology. The following study explores IRA activity on three social media platforms, Facebook, Twitter, and Reddit, to understand how activities on these sites were temporally coordinated. Using a VAR analysis with Granger Causality tests, results show that IRA Reddit activity granger caused IRA Twitter activity within a one-week lag. One explanation may be that the Internet Research Agency is trial ballooning on one platform (i.e., Reddit) to figure out which messages are optimal to distribute on other social media (i.e., Twitter).

Keywords disinformation, US-Russia relations, social media, time series, propaganda

Disinformation campaigns have long been used by states to target and influence domestic and foreign audiences (Martin, 1982; Romerstein, 2001). However, with the rise of the internet, disinformation actors must adapt to digital communication norms, including devising new strategies to reach audiences across many online communication platforms. One well-known group deploying these strategies is the Russian government-supported Internet Research Agency, or the IRA (Russia's "troll army"). This company specializes in the production and dissemination of false content on social media platforms during salient political events such as the 2016 U.S. Presidential election (Downes, 2018).

A *disinformation campaign* (the IRA's specialty) is an intentional and coordinated attempt by an actor to spread false information to an audience, typically to achieve a political communication goal.[1] False information can refer to incorrect facts, the use of a false identity, partial information, or a combination thereof (Fetzer, 2004). The word "campaign" clarifies the scope: typically, one group will target an audience with a specific intent or goal.[2] This is similar to the use of "campaign" in phrases like "advertising campaign" or "political campaign." A campaign can employ multiple strategies targeting different media platforms or audiences to achieve a common goal (or set

Josephine Lukito is a Mass Communication Ph.D candidate at the University of Wisconsin, Madison, with minors in Political Science and English Linguistics.

Address correspondence to Josephine Lukito, School of Journalism and Mass Communication, University of WIsconsin-Madison, 821 University Ave, Madison, WI 53706. E-mail: jlukito@wisc.edu

Color versions of one or more of the figures in the article can be found online at www.tandfonline.com/UPCP.

of goals). Disinformation campaigns, specifically, have political and communication goals. For example, false flag operations help states persuade their own citizens to support wars (Hoyle, 2008). The Internet Research Agency's U.S.-focused campaign is an example of a disinformation campaign executed by one country (Russia) to influence a foreign audience (citizens of the United States) through social media platforms.

State-sponsored disinformation campaigns targeting foreign audiences reflect an intentional desire by one state to influence the internal affairs of another country. This is a violation of Westphalian sovereignty principles. In fact, Russia and China have criticized the United States for intervening in domestic policy as a violation of their state sovereignty (Charbonneau, 2012). The rise of state-sponsored disinformation campaigns on the internet has made it increasingly difficult for states—even powerful ones—to manage intra-state politics without interference by foreign states.

This paper focuses on the activities of Russia's Internet Research Agency in U.S. social media between 2015 and 2017 (during and after the 2016 U.S. Presidential election). While previous studies have looked at the dynamics of this campaign on individual social media platforms (e.g., Broniatowski et al., 2018), none have empirically tested the possibility that multi-platform disinformation campaigns are internally coordinated. This study uses a time series analysis to understand the temporal dynamics between different social media. Results suggest that activity on Reddit and Twitter, where IRA operatives wrote as U.S. citizens, were coordinated. More specifically, Reddit activity Granger caused Twitter activity. One possible explanation for this may be that Reddit was a testing ground for subsequent Twitter content.

Literature Review

Many states use disinformation campaigns, including the United States (Bittman, 1990), Rwanda (Pottier, 2002), and Russia (Kuzio, 2005). Even more have been victim to them, including Australia, Mexico, Turkey, Syria, Brazil, China, and Venezuela (Michael, 2017). Often, these campaigns occur around national elections, when people are attuned to political communication (Merloe, 2015). Recent disinformation campaigns are no exception. Though some state-sponsored disinformation campaigns are internal, many target "foreign audiences" (Kellner, 1995). To Russia, U.S. citizens are a foreign audience (and vice versa).

Disinformation campaigns are most effective when a state's citizenry can influence their government and when mass media inform the citizenry. This is because disinformation disrupts the flow of accurate information by flooding a communication ecology with salacious and false messages (Bennett & Livingston, 2018). Democratic states are especially susceptible to state-sponsored disinformation because, in an open marketplace of ideas, false information and propaganda can spread as quickly as good ideas (Kaufmann, 2004; McGeehan, 2018).

Digital Disinformation Campaigns

While some disinformation campaigns still occur in traditional media like print and radio (Boghardt, 2009), many now take place on digital media platforms, targeting online audiences. On the internet, disinformation actors use novel techniques to artificially and actually amplify attention toward their content. For example, bot armies retweet and share messages to make the content appear more popular than it actually is (Woolley, 2016).

Audiences can also unwittingly share disinformation as misinformation more easily if they do not realize the message contains false information (Fetzer, 2004). Like word of mouth, audiences perceive this form of distribution to be credible, helping it spread quickly (Ding, 2009).

Several key features of digital media alter the production and dissemination of disinformation. Notably, attempts to persuade a "mass audience" must now take place in a multi-platform environment, requiring techniques that target individual audience members and help achieve a unified communication goal (Sattelberger, 2015). As audiences are fragmented—that is, individuals have increasingly diverse media consumption patterns (Livingstone, 1999)—strategies to reach them have become more nuanced. This is true of all campaigns with communication goals: they must now find ways to reach a more complex and less "singular" audience. Furthermore, if there are individuals who are especially susceptible to spreading misinformation, targeted disinformation can also find these individuals and produce specifically-tailored content for those individuals (Maibach, Myers, & Leiserowitz, 2014).

Because audiences are dispersed, it is likely that digital political communication, and disinformation campaigns specifically, are multi-platform phenomena. However, academic scholarship rarely considers different digital platform strategies as coordinated. Instead, research has studied disinformation in singular social media platforms (e.g., Farkas, Schou, & Neumayer, 2018; Kumar, West, & Leskovec, 2016).

The IRA's U.S.-targeted disinformation campaign serves as a useful case for unpacking how actors used different social media platforms to achieve a political communication goal. During the 2016 U.S. Presidential election, the Internet Research Agency was active on many social media (United States [U.S.] v. Internet Research Agency LLC [IRA], 2018). Because many U.S. citizens have multiple social media accounts (particularly if they are young adults; see Lenhart, Purcell, Smith, & Zickuhr, 2010), a coordinated campaign could also increase how often a citizen was exposed to disinformation.

Understanding Digital Disinformation Campaigns as Strategic Communication

One way to analyze a disinformation campaign with a multi-platform strategy is through the lens of strategic communication, which includes in marketing, advertising, and public relations; all of these industries use multi-platform strategies (Doyle, 2015). Mangold and Faulds (2009), for example, characterize social media use in an advertising promotional mix as having "multi-media formats […] and numerous delivery platforms" (p. 359). Scholarship in this area notes that different demographics use different social media platforms and respond to different kinds of messages (Freberg, 2012). To address this, strategic communication actors tailor messages to fit the advantages and style of individual social media platforms. Despite this variance, all messages within one marketing campaign are still produced with an integrated, strategic goal in mind (Ashley & Tuten, 2015).

Studies about effective marketing strategies make an important distinction between "paid" content and earned or "organic" content. The former refers to traditional advertisements: when a group pays a platform to display a message to an audience. The latter refers to messages that help promote a brand or product but are not paid for by the brand, such as word-of-mouth promotion and unsolicited recommendations (Buzzetto-More, 2013). Strategic communication research suggests that organic messages tend to be more persuasive compared to paid advertisements (Fulgoni, 2015).

Because disinformation content is inherently deceptive, it is important to stress that organic disinformation messages are not truly organic (e.g., IRA specialists were paid to write messages). However, one goal of this content is for the audience to perceive disinformation messages as having an organic source. This is similar to the practice of political astroturfing (Howard, Woolley, & Calo, 2018). In this study, IRA "organic" content refers to IRA messages that *look* like they come from U.S. citizens.

Though a campaign may use both paid and organic content strategies, the two are different strategies. Because a group must pay to place an advertisement in a medium, advertisements are more expensive to disseminate (Burcher, 2012). Marketers also use paid content in a narrower context, such as right before major events (see Stephen & Galak, 2012 for an example in marketing research). Therefore, the following hypothesis is proposed:

H1: Although paid and organic content can be used together in strategic communication, their strategic value is slightly different. Because of these differences, it is likely that there is **no** temporal relationship between the IRA's Facebook ads and the IRA's organic content produced on Twitter and Reddit.

Of the content produced on Reddit and Twitter, two possible relationship emerge. First, IRA activity on each platform can influence one another. For example, if certain messages become popular or "go viral" on one platform, they may be adapted for another platform and vice versa. However, the IRA can also use certain social media platforms to *trial balloon* messages (Hausman, 2014). In this scenario, new message strategies are tested on a smaller platform or to a smaller audience. The most popular or controversial messages are then selected for dissemination to a larger platform or audience. Research on the spread of political memes across different social media communities suggest that memes produced on Reddit often spread to other social media communities, including Twitter (Zannettou et al., 2018). Two hypotheses are therefore constructed:

H2A: Since strategic communication strategies on different platforms can inform one another, IRA activity on Twitter and Reddit may have a bi-directional temporal relationship.

H2B: Since Reddit activity has been shown to influence Twitter activity, IRA activity on Reddit may influence IRA activity on Twitter.

Understanding Stated-Sponsored Disinformation Campaigns through Propaganda Theory

Though states that engage in digital disinformation campaigns rely on modern strategic communication techniques, their goals are anything but new. We can understand the goals and intent of state-sponsored disinformation campaigns through the lens of propaganda theory. Propaganda strategies, defined as attempts by a state to persuade an audience, are typically categorized into two groups: black and white (Becker, 1949). In white propaganda, states identify themselves as the source of information. But states using black propaganda will obfuscate their role or spread false information (Gelders & Ihlen, 2010). While the two can be used in tandem (Boghardt, 2009), black propaganda is considered

more versatile and riskier (Doob, 1950). Disinformation campaigns are one type of black propaganda.

Historically, black propaganda has been associated with military operations (Martin, 1982). Allies and Nazis used black propaganda against one another and on their own citizens (Becker, 1949). Disinformation campaigns were also popular during the Cold War, as the United States and Soviet Union were eager to influence foreign audiences' perceptions of the two global powers (Romerstein, 2001). The ongoing use of disinformation as propaganda continues to be appealing because disinformation campaigns are cheaper to execute compared to on-the-ground military strategies (Abang & Okon, 2018).

In the era of cyberwar, black propaganda strategies have become part of a broader information warfare repertoire, which includes electronic warfare, economic information warfare, and cyber-warfare (Libicki, 1995). These strategies treat communication spaces as battlefields.[3] Collectively, states use these tactics to target an opponent's information communication technology and gain a competitive military advantage (Van Niekerk, Pillay & Maharaj, 2011). For example, news coverage about biological weapons can be rife with disinformation produced by states seeking to incite panic within another state (Guillemin, 2004).

Research shows that military actors have used black propaganda as a signaling strategy. Because talk is cheaper than military action, states may employ black propaganda to dampen a foreign audience's desire to go to war (Marlin, 2013). This strategy was utilized by both the United States and Russia at the height of the Cold War to discredit each other's alliances or discourage uses of force (Marquardt, 2007). However, some scholars question the effectiveness of black propaganda as a "passive-aggressive" signaling strategy (Stolarski, 2015).

Since the case analyzed in this study involves two countries for whom disinformation is intimately tied to other foreign policy actions (military or diplomatic), it is possible that IRA activity was influenced by Russia's overall foreign policy actions toward the United States or influenced by U.S. actions toward Russia. Activities indicating increasing conflict or animosity may be executed in tandem with information warfare strategies as part of a "hybrid warfare" campaign (Lanoszka, 2016). However, it is unclear whether this is reactionary or proactive. Two hypotheses are proposed:

H3A: Since disinformation campaigns can be part of a broader hybrid warfare strategy that encompasses other foreign policy actions, it is hypothesized that IRA activity is influenced by Russian foreign policy actions against the United States.

H3B: Since black propaganda can be used to as a signal to discourage action from the opposing state, it is hypothesized that IRA activity is influenced by U.S. foreign policy actions against Russia.

One of the most well-known purveyors of modern black propaganda, and the focus of this paper, is Russia. During the Cold War, the Soviet Union was a prolific producer of disinformation (Bittman, 1985; Ross, 1984). These strategies became mass-coordinated efforts under the KGB (Abrams, 2016; Romerstein, 2001). As a result, modern secret intelligence strategies employed in Putin's Russia, including disinformation, are tied to historical practices employed by former leaders (Abrams, 2016).

Russia has since invested significantly into developing new disinformation strategies. Its most recent foray into disinformation targets online platforms such as blogs and social media. The most well-known source of this is the government-sponsored Internet

Research Agency. Formed in 2004, the IRA is notable for its executions of many long-term digital disinformation campaigns. These disinformation campaigns utilize the global nature of the internet to create various campaigns targeting different countries (Ring, 2015).

What We Know about the Internet Research Agency's Disinformation Campaigns

On February 16, 2018, Special Counsel Robert Mueller indicted 13 members of Russian's Internet Research Agency (IRA), the Kremlin "troll farm," for attempting to influence the elections by posing as U.S. citizens and writing messages on U.S. social media platforms with the intent of sowing discord (United States v. Internet Research Agency LLC, 2018).

There is little public information about the inner workings of the Internet Research Agency. Mueller's IRA indictment notes that "specialists" (employees who produced disinformation) worked in one of three shifts to manage several social media accounts. Each specialist had a minimum number of disinformation pieces they had to produce (a tweet, news article, or blog post constituted one "piece"). They also received regular "feedback and directions to improve the quality of their posts" (United States v. Internet Research Agency LLC, 2018, p. 15), including the types of messages they should produce to elicit the greatest audience engagement (there is little public information about how often these specialists received feedback).

Some former specialists of the Internet Research Agency have talked to journalists about their experiences. It should be noted that, to my knowledge, none of the interviewed former employees worked specifically on a U.S.-targeted campaign. However, these interviews provide clues about the inner workings of the IRA. For example, former specialist Marat Mindiyarov recounted his work routine in an interview with WTOP-FM:

> "In the morning," Mindiyarov said, "you got an email with a lot of links (to internet sites) where you were supposed to post comments. They told you which topics you should comment on and how to write your comments. You just had to play with the words." (Green, 2018)

Given that social media metrics and audience listening was an important consideration for the IRA's strategy (United States v. Internet Research Agency LLC, 2018), it is plausible that the IRA would modify their disinformation strategies (what content to produce and how much) regularly.

It is also possible that other political factors influenced IRA social media activity. For example, Mueller's indictment states that IRA activity, "included supporting the presidential campaign of then-candidate Donald J. Trump" (p. 4). Therefore, IRA specialists may have been more active when then-candidate Trump's approval went up.

H4: Since disinformation actors often target foreign audiences during politically salient moments, IRA activity could be influenced by dynamics of the 2016 U.S. Presidential election. More specifically, as one of the IRA's explicit goals was to support then-candidate Trump, IRA social media activity may be positively related to public approval of Trump.

Methods

Collection of IRA Content

This analysis focused on messages produced by IRA specialists across three social media platforms popular in the United States: Facebook, Twitter, and Reddit. These three social media made their data available following the discovery of IRA content on their platforms and, for some, subsequent Congressional pressure. Therefore, the veracity of these datasets depends on each platform's ability to accurately identify accounts controlled by the IRA.

The first dataset included every Facebook advertisements purchased by the IRA. This dataset was published by Democrats on the House Intelligence Committee (Permanent Select Committee on Intelligence, n.d.) and made available as PDF files (each advertisement was one PDF). The PDF files included an image of the advertisement, the ad text, a landing page, the number of impressions, the number of click throughs, information about the demographic target (e.g., age, location, language), and a datetime stamp of the creation time. To use the data, a free optical character recognizer tool (FreeOCR) extracted the meta-data for each PDF file (i.e., for each advertisement). I then reviewed and corrected the results of the OCR tool. Each advertisement constituted one message.

The second dataset contained English tweets written by IRA accounts, including retweets, responses to tweets, and original tweets (Twitter, 2018). This social media platform found 3,616 accounts associated with the Internet Research Agency. On October 17, 2018, Twitter released a corpus of every tweets posted by one of these accounts. There was a total of nine million IRA tweets published between 2009 and 2017. Within the corpus, about three million tweets were written in English; a little under two million were posted within the timeframe of analysis. From this social media platform, each tweet was one message.

The third data set consisted of Reddit posts and comments written by IRA accounts (this includes both original content and comments posted on other user's comments). On April 11, 2018, Reddit released a list of 944 accounts they identified as having a relation with the Internet Research Agency. Unlike Twitter and Facebook, Reddit preserved all the content produced by accounts they have identified (Suspiciousaccounts, n.d.). Reddit posts and comments made by IRA accounts were collected using the R package RedditExtractoR, an R wrapper for the Reddit API (Rivera, 2018). Each individual post (whether original or as a comment) was one message.

Collection of External Data

To incorporate event data into the analysis, I relied on the event database GDELT, which uses computational strategies to extract and compile event information from news stories daily (Kwak & An, 2014). This dataset was selected because it includes detailed information about cross-national events. Aside from collecting information about the location and date of the event, GDELT also includes codes for the following information (this is not an exhaustive list): the country affiliated with Actor 1 of an event, the country affiliated with Actor 2, and the topic of the event (GDELT uses CAMEO codes to distinguish event types, such as providing aid [CAMEO 07] versus engaging in combat [CAMEO 19]).[4] These three pieces of data were necessary to identify events where Actor 1 and 2 were affiliated with the U.S. or Russia, and to focus on conflict-oriented events.

Four time series were constructed using the GDELT data. The first was a daily count of events when the United States either threatened (CAMEO 13) or engaged in military posturing (CAMEO 15) toward Russia, two events indicating a show of aggression. The second time series was a daily count of the same events (CAMEO 13 and 15), but when Russia was the instigator, and the United States was the receiver. The last two time series also focused on U.S.-to-Russia and Russia-to-U.S. interactions, but counted disagreements (CAMEO 11, indicating disapproval, and CAMEO 12, indicating rejection).

To examine the relationship between IRA activity and public approval of Donald Trump (first as a candidate, later as President), I used on *Real Clear Politics'* aggregated polling average of Trump's favorable rating (RealClearPolitics, n.d.), sometimes known as a poll-of-polls average (MacWilliams, 2016; Rothschild, 2009).

Time Series Construction

For the time series analysis, the unit of analysis was one week. Although social media activity could be analyzed at more granular temporal levels, such data is noisy, making it difficult to identify meaningful dynamics. Furthermore, journalistic investigations have highlighted the complexity of the IRA's disinformation campaign, including the interaction of departments that focus on audience metrics, content creation, and content dissemination (MacFarquhar, 2018; Maynes, 2018). Given the separation of departments and the assembly-line nature of content production within the IRA, strategic changes influenced by audience metric research were not likely to influence content production instantaneously.

Using the data collected, I constructed six time series, each spanning from July 2, 2015 (the first available measurement of Trump's approval) to May 31, 2017 (prior to their discovery). At a week-level of aggregation, this produced 101 time points in each series. The first three time series represented IRA activity on different social media: (1) a weekly count of tweets posted from IRA specialists, (2) a weekly count of Facebook ads paid for by the IRA, and (3) a weekly count of Reddit posts and comments made by the IRA. The second group represented external factors which may influence IRA activity: (1) a weekly count of Russian threats and military posturing actions toward the U.S., (2) a weekly count of U.S. threats and military posturing toward Russia, and (3) approval of Donald Trump, averaged by week.

Results

Within the study's time frame (July 2, 2015 to May 31, 2017), there were 3,126 Facebook advertisements, 1,886,919 tweets, and 12,603 Reddit posts produced by the Internet Research Agency. A descriptive examination revealed similarities across the three platform's IRA content: many messages focused on U.S. politics, including the 2016 U.S. Presidential Election and the travel ban proposed by President Trump, and audiences such as far-right and social justice activists, supporters or opponents of the police, and undetermined voters.

On Facebook, most advertisements linked to landing pages on Facebook and Instagram (nearly all of these links were dead). Some advertisements rerouted to IRA-created groups with names like "Black Matters US" and "Woke Blacks." On Twitter and Reddit, IRA accounts published evocative messages as if they came from individuals or political groups. For example, one tweet posted by @Jenn_Abrams on

January 16, 2016, said, "95% of child rape and molestation convictions in the UK were committed by Muslims. But let's respect Ramadan anyway." Some tweets also referenced ongoing U.S.-Russian relations, particularly after the email leaks during the 2016 Democratic National Convention and after former Chief of Staff John Podesta's emails were leaked to WikiLeaks. IRA Reddit posts spanned 826 subreddits, including /r/funny (1,172 posts), /r/uncen (854 posts), /r/Bad_Cop_No_Donut (535 posts), /r/PoliticalHumor (460 posts), and /r/The_Donald (277 posts). Many of the posts created by IRA Reddit accounts were polarizing, focusing again on far-right and social justice activity.

Univariate Analysis

Figure 1 displays the time series of tweets, Facebook ads, and Reddit messages posted by the Internet Research Agency. Facebook ads and Twitter posts increased over time. This was also true at the start of the Reddit time series; however, after the election, Reddit activity dropped significantly. Contrastingly, the IRA posted more tweets per week after the election than they did during the election cycle. Though there were fewer advertisements a week prior to and a week after the election, the Internet Research Agency continued purchasing ads until they were discovered in 2017.

To prepare the data for multivariate analysis, I first tested for non-stationarity in all six time series. Two tests for unit roots (the KPSS and ADF tests) indicated that all series had unit roots. Using the Bayesian Information Criterion (BIC) to determine an optimal univariate ARIMA model for each time series, results suggested that the count of Facebook ads was modeled best with a (0, 1, 1) ARIMA model (BIC = 1119.65), the count of Reddit posts with a (0, 1, 2) ARIMA model (BIC = 963.45), and the count of tweets with a (0, 1, 0) ARIMA model (BIC = 1982.06). ARFIMA models, which have fractionally integrated units, yielded lower BIC criteria relative to the ARIMA model, indicating that fully integrated models were more appropriate.

Multivariate Analysis

A vector autoregression (VAR) model was used to test H1 and H2. VAR models are popular in multivariate time series analysis because they allow researchers to impose few restrictions while testing for dynamics across many endogenous and exogenous variables (Freeman, Williams, & Lin, 1989; Wells et al., in press). In order to prepare the data for a VAR analysis, each series was first-differenced to remove the integrated component of the time series (DeJong, Nankervis, Savin, & Whiteman, 1992).

Testing lag structures between one and seven, the model with a lag of two (2) produced the lowest score on the Bayesian Information Criteria (Ahelegbey Billio, & Casarin, 2016; for results, see Appendix). Once a VAR(2) model was constructed, I tested for bivariate relationships using Granger causality tests and analyzed the orthogonalized shocks of pairs using impulse response functions, two common procedures for interpreting VAR models (Freeman et al., 1989; Soroka, 2002).

In addition to the three IRA time series, five external variables were included as exogenous variables in the VAR model (four about U.S.-Russian relations, and one representing public approval of Trump). These were used to test H3 and H4. Table 1 displays the estimates and significant levels of the VAR, with each column representing a different equation estimation.

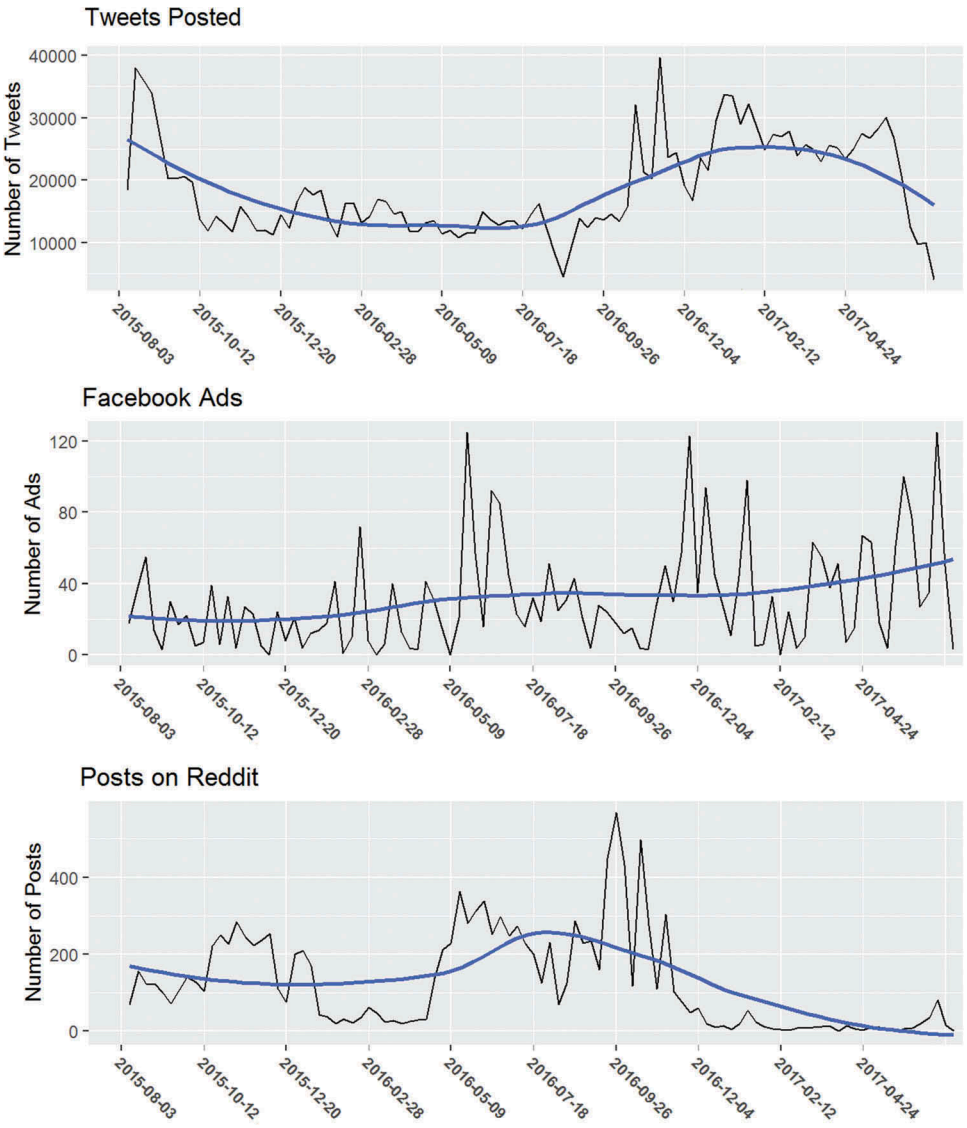

Figure 1. Weekly time series of IRA activity on Twitter, Facebook, and Reddit.

As vector autoregressive estimates can be difficult to interpret (Benati & Surico, 2009), I will focus on the Granger causality results and impulse response functions in this paper. Table 2 displays the results of the two-way Granger causality tests using the Toda-Yamamoto method (Toda & Yamamoto, 1995), which relies on a chi-square, rather than an F-test, which loses power as the number of variables and lags increases.

Results of the Granger causality tests suggested a unidirectional relationship from Reddit to Twitter, but not between any other platforms. This provided support for H1—the IRA's Facebook advertisement activity seemed to be temporally unrelated to Reddit or Twitter activity.

Table 1
Vector autoregression estimates per social media platform

	Facebook	Reddit	Twitter
Facebook (−1)	−0.48***	0.14	5.66
Reddit (−1)	0.01	−0.43***	17.73***
Twitter (−1)	0.00	−0.00	−0.08
Facebook (−2)	−0.55***	0.13	−10.30
Reddit (−2)	−0.04	−0.26*	−7.98
Twitter (−2)	0.00	−0.00	−0.06
Constant	0.87	−2.27	−475.55
Exogenous			
RU → US, disagreement	0.03	0.09	−7.64
RU → US, threaten	−0.04	−0.02	15.64
US → RU, disagreement	−0.00	−0.05	3.24
US → RU, threaten	−0.09	0.19	−13.45
Approval of Trump	−3.21	−4.61	1070.22**

Note: "US" stands for United States and "RU" stands for Russia.
***$p < 0.001$, **$p < 0.01$, *$p < 0.05$

Table 2
Granger causality tests of IRA activity per social media platform

	X^2	p-value
Facebook → Reddit	0.49	0.92
Facebook → Twitter	3.36	0.39
Reddit → Facebook	0.69	0.88
Reddit → Twitter	18.38	< 0.00
Twitter → Facebook	2.71	0.43
Twitter → Reddit	1.84	0.63

To examine the Reddit-Twitter relationship further, impulse response functions (IRFs) were used to analyze how a shock of one variable impacted another variable for *n*-lags (this study tested up to 6 lags). Figure 2 displays two IRFs (Reddit → Twitter and Twitter → Reddit). The IRFs show that Twitter responded to Reddit activity at $t = 2$, though this effect diminished right after. In other words, a shock of Reddit activity at $t = 1$ increases Twitter activity the week after, but not longer. A shock in Twitter activity did not impact Reddit activity. Therefore, H2B was supported and H2A was not: Reddit activity at time *t* Granger caused Twitter activity at $t + 1$, but not the other way around.

To test for H3A (that IRA activity was influenced by Russian threat or military posturing toward the United States), H3B (that IRA activity was influenced by U.S. threat or military posturing toward Russia), and H4 (that IRA activity was influenced by approval of Donald Trump), I returned to the VAR model, which accounted for these

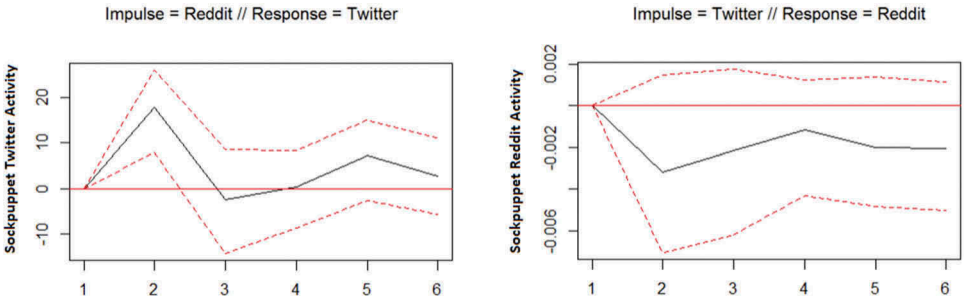

Figure 2. Impulse response functions between IRA activity on Reddit and Twitter.

time series as exogenous variables. The VAR results suggested that IRA activity on Twitter was influenced by approval of Trump (coeff = 899.89, $p < .01$), which supported H4. However, events did not seem to influence IRA activity in any social media platform. Therefore, H3A and H3B were rejected.

Post-hoc tests for co-integrations between the three social media series indicated there was no co-integration. The Durbin-Watson test was used to check for autocorrelation in the residuals; all results were over $p > .05$, implying that all the autoregressive components had been accounted for (Savin & White, 1977). This was confirmed by several Ljung-Box tests, which showed that the residuals of all the time series were white noise (Ljung & Box, 1978).

Discussion

Several key findings deserve to be highlighted. First, IRA activity on Twitter appeared to be Granger caused by IRA activity on Reddit, but not vice versa (H2). Neither had a relationship with the Facebook ads paid for by the IRA (H1). This indicates a delineation between paid disinformation strategies, such as the use of campaign advertisements, and organic or "owned" disinformation strategies, such as social media posts from false identities.[5]

One explanation for the unidirectional Reddit-Twitter relationship could be that Reddit was a "trial balloon" space (Hausman, 2014). In other words, the IRA may have used Reddit to test prototype messages prior to posting them on Twitter. Twitter's centrality to the IRA's campaign may also explain why more content was produced on Twitter relative to Reddit.

Why the focus on Twitter? Perhaps it is because of Twitter's unique position in the journalism profession (McGregor & Molyneux, 2018). Since many journalists pay attention to Twitter, IRA tweets may have been shared in news stories, granting the content a wider audience. Another reason the IRA used Twitter more could be the platform's reliance on short messages, which were easier and faster to produce. This line of inquiry can be studied further with the analysis of content (if messages on Reddit precede similar messages on Twitter, this study's results would be confirmed).

Two other findings emerged from the inclusion of the exogenous event variables (U.S.-Russia activity and approval of candidate Trump). First, Russian-to-U.S. and U.S.-to-Russia activity did not have a relationship with IRA activity. This is an important null

hypothesis that supports scholarship contesting the use of black propaganda as a "passive-aggressive" strategy (Stolarski, 2015).

However, Trump's public sentiment in the VAR analysis yielded a positive relationship with IRA activity. This suggests that IRA content was sensitive to polling information about the election. Given that the IRA tracked audience metrics, it is likely they also studied election metrics such as polling data about a candidate. Such a tactic would also align strategically with the IRA's intent to support President Trump's 2016 campaign (United States v. Internet Research Agency LLC, 2018).

Ultimately, these results speak to a future of increasingly complex disinformation campaigns, executed by countries who take advantage of the internet's anonymity and viral possibilities to spread inciteful messages. The selection of different subreddits, the variety of fake-American profiles, and the use of Facebook targeting to share ad content reveal different ways in which Russia, through the IRA, tailored disinformation for different U.S. publics (Maibach et al., 2014). The time series also revealed patterns for how disinformation activity on one platform (Reddit) preceded activity on another (Twitter). Such tactics suggests that Russia is taking advantage of the multi-platform digital ecology to test and deliver message across different social media.

Limitations

No study is without its limitations; this one is no exception. Importantly, this study only looked at count data of online activity across three outlets. Neither content nor audience metrics were empirically analyzed. Future studies can build upon these results by examine whether the dissemination of different types of content, for example conservative/right versus liberal/left content, were coordinated across platforms. Studies can also consider other social media platforms, such as Instagram and 4chan, or non-ad Facebook content, though this last group may be difficult to obtain as Facebook tightens its access to user content (Bastos & Walker, 2018). This study also did not consider platform moderation, but researchers should examine platforms' attempts to identify and moderate disinformation using both automated and human evaluations because these intervention strategies substantially influence how content is distributed within platforms (Gillespie, 2018).

Another limitation of this study is its reliance on the social media platforms' own reports of IRA activity. I don't know for sure how Twitter, Facebook and Reddit identified IRA activity or the associated accounts, and it is entirely plausible that their identifications contain some inaccuracies. However, this data should reflect each social media platform's best estimate of who is creating content as employees of the IRA, which may be the best that researchers can do.

Nevertheless, this study highlights the importance of studying state-sponsored, digital disinformation campaigns further. It is unlikely that these tactics will disappear, especially since the Internet Research Agency is still producing disinformation content, with goals of targeting the 2020 U.S. Presidential election (Sebenius, 2019). The ownness is on researchers, both in the industry and the academy, to identify disinformation campaigns, understand their dynamics and tactics, and develop strategies to combat this behavior.

These findings also make a compelling argument for the academic study of multi-platform digital communication strategies. While there is value to comparing and contrasting differences between digital platforms, the reality is that strategic communicators —including the Internet Research Agency—use many platforms in tandem to spread and

reinforce messages. It therefore behooves scholars to study political communication in a multi-platform context, rather than looking only at messages within one platform.

Acknowledgments

Thank you to following individuals for your advice and guidance regarding this study and/or manuscript: Larisa Doroshenko, Jon Pevehouse, Doug McLeod, Dhavan Shah, Jiyoun Suk, Chris Vargo, and Yini Zhang.

Notes

1. This definition is taken from Fetzer's (2004), who describes disinformation as, "the distribution, assertion, or dissemination of false, mistaken, or misleading information in an intentional, deliberate, or purposeful effort to mislead, deceive or confuse" (p. 231).

2. The audience can be delineated by platform use, country, demographic, or another attribute. The delineation determines the scope of a campaign and allows disinformation actors to tailor strategies for that audience.

3. Libicki's (1995) typology would identify the IRA's campaign as a form of psychological warfare, or a tactic to fatigue hearts and minds.

4. CAMEO (Conflict And Mediation Event Observation) is a detailed coding scheme to identify different event-types. Each event-type (e.g., diplomatic cooperation, military posturing, war) is given an identifying number. For more information, please view the codebook: http://data.gdeltproject.org/documentation/CAMEO.Manual.1.1b3.pdf .

5. The term "owned" and "paid" follow public relations strategy distinctions between paying for attention and using one's own media platforms to garner attention (see Burcher, 2012).

Data availability statement

The data described in this article are openly available in the Open Science Framework at https://github.com/jlukito/ira_3media and https://github.com/jlukito/ira_3media/blob/master/ts_data.csv

Open Scholarship

This article has earned the Center for Open Science badges for Open Data and Open Materials through Open Practices Disclosure. The data and materials are openly accessible at https://github.com/jlukito/ira_3media and https://github.com/jlukito/ira_3media/blob/master/ts_data.csv

Supplementary material

Supplemental data for this article can be accessed on the publisher's website at https://doi.org/10.1080/10584609.2019.1661889.

References

Abang, O., & Okon, E. E. (2018). Fake news, misinformation disinformation and deception as communicatio chanels of democratic governance in Nigeria. *International Journal of Integrative Humanism*, *9*, 135–143.

Abrams, S. (2016). Beyond propaganda: Soviet active measures in Putin's Russia. *Connections: The Quarterly Journal*, *15*, 5–31. doi:10.11610/Connections

Ahelegbey, D. F., Billio, M., & Casarin, R. (2016). Bayesian graphical models for structural vector autoregressive processes. *Journal of Applied Econometrics*, *31*(2), 357–386. doi:10.1002/jae.2443

Ashley, C., & Tuten, T. (2015). Creative strategies in social media marketing: An exploratory study of branded social content and consumer engagement. *Psychology & Marketing*, *32*, 15–27. doi:10.1002/mar.20761

Bastos, M., & Walker, S. T. (2018, April 11). Facebook's data lockdown is a disaster for academic researchers. *The Conversation*. Retrieved from http://theconversation.com/facebooks-data-lockdown-is-a-disaster-for-academic-researchers-94533

Becker, H. (1949). The nature and consequences of black propaganda. *American Sociological Review*, *14*(2), 221–235. doi:10.2307/2086855

Benati, L., & Surico, P. (2009). VAR analysis and the great moderation. *American Economic Review*, *99*(4), 1636–1652. doi:10.1257/aer.99.4.1636

Bennett, W., & Livingston, S. (2018). The disinformation order: Disruptive communication and the decline of democratic institutions. *European Journal of Communication*, *33*(2), 122–139. doi:10.1177/0267323118760317

Bittman, L. (1985). *The KGB and Soviet disinformation: An insider's view*. Washington, DC: Pergamon-Brassey's.

Bittman, L. (1990). The use of disinformation by democracies. *International Journal of Intelligence and Counter Intelligence*, *4*(2), 243-261. doi:10.1080/08850609008435142

Boghardt, T. (2009). Soviet Bloc intelligence and its AIDS disinformation campaign. *Studies in Intelligence*, *53*(4), 1–24.

Broniatowski, D. A., Jamison, A. M., Qi, S., AlKulaib, L., Chen, T., Benton, A., … Dredze, M. (2018). Weaponized health communication: Twitter bots and Russian trolls amplify the vaccine debate. *American Journal of Public Health*, *108*(10), 1378–1384. doi:10.2105/AJPH.2018.304567

Burcher, N. (2012). *Paid, owned, earned: Maximising marketing returns in a socially connected world*. London, UK: Kogan Page Publishers.

Buzzetto-More, N. (2013, July). Social media and prosumerism. Proceedings of the Informing Science and Information Technology Education Conference in Universidade Fernando Pessoa in Portugal. (pp. 67–80).

Charbonneau, L. (2012, February 8). Russian U.N. veto on Syria aimed at crushing West's crusade. *Reuters*. Retrieved from https://www.reuters.com/article/us-un-russia/russia-u-n-veto-on-syria-aimed-at-crushing-wests-crusade-idUSTRE8170BK20120208

DeJong, D., Nankervis, J., Savin, N., & Whiteman, C. (1992). Integration versus trend stationary in time series. *Econometrica*, 423–433. doi:10.2307/2951602

Ding, H. (2009). Rhetorics of alternative media in an emerging epidemic: SARS, censorship, and extra-institutional risk communication. *Technical Communication Quarterly*, *18*(4), 327–350. doi:10.1080/10572250903149548

Doob, L. (1950). Goebbels' principles of propaganda. *Public Opinion Quarterly*, *14*(3), 419–442. doi:10.1086/266211

Downes, C. (2018). Strategic blind-spots on cyber threats, vectors and campaigns. *The Cyber Defense Review*, *3*, 79–104.

Doyle, G. (2015). Multi-platform media and the miracle of the loaves and fishes. *Journal of Media Business Studies*, *12*(1), 49–65. doi:10.1080/16522354.2015.1027113

Farkas, J., Schou, J., & Neumayer, C. (2018). Cloaked Facebook pages: Exploring fake Islamist propaganda in social media. *New Media & Society*, *20*(5), 1850–1867. doi:10.1177/1461444817707759

Fetzer, J. (2004). Disinformation: The use of false information. *Minds and Machines*, *14*(2), 231–240. doi:10.1023/B:MIND.0000021683.28604.5b

Freberg, K. (2012). Intention to comply with crisis messages communicated via social media. *Public Relations Review*, *38*(3), 416–421. doi:10.1016/j.pubrev.2012.01.008

Freeman, J. R., Williams, J. T., & Lin, T. M. (1989). Vector autoregression and the study of politics. American Journal of Political Science, 842–877.

Fulgoni, G. M. (2015). How brands using social media ignite marketing and drive growth: Measurement of paid social media appears solid but are the metrics for organic social overstated? *Journal of Advertising Research*, *55*(3), 232–236. doi:10.2501/JAR-2015-004

Gelders, D, & Ihlen, Ø. (2010). *Government Communication about Potential Policies: Public Relations, Propaganda or Both? Public Relations Review*, *36*, 59–62. doi: 10.1016/j.pubrev.2009.08.012

Gillespie, T. (2018). *Custodians of the Internet: Platforms, content moderation, and the hidden decisions that shape social media*. New Haven, CT: Yale University Press.

Green, J. J. (2018, September 17). Tale of a troll: Inside the 'Internet Research Agency' of Russia. *Wtop*. Retrieved from https://wtop.com/j-j-green-national/2018/09/tale-of-a-troll-inside-the-internet-research-agency-in-russia/

Guillemin, J. (2004). *Biological weapons: From the invention of state-sponsored programs to contemporary bioterrorism*. Columbia: Columbia University Press.

Hausman, C. (2014). *Lies we live by: Defeating doubletalk and deception in advertising, politics, and the media*. Abingdon, UK: Routledge.

Howard, P. N., Woolley, S., & Calo, R. (2018). Algorithms, bots, and political communication in the US 2016 election: The challenge of automated political communication for election law and administration. *Journal of Information Technology & Politics*, *15*(2), 81–93. doi:10.1080/19331681.2018.1448735

Hoyle, R. (2008). *Going to war: How misinformation, disinformation, and arrogance led America into Iraq*. London, UK: Macmillan.

Kaufmann, C. (2004). Threat inflation and the failure of the marketplace of ideas: The selling of the Iraq war. *International Security*, *29*, 5–48. doi:10.1162/0162288041762940

Kellner, D. (1995). The US media and the 1993 war against Iraq. In Y. Kamalipour & Y. Kamalipour (Eds.), *The U.S. media and the Middle East: Image and perception* (pp. 46–105). Westport, CT: Praeger Publishers.

Kumar, S., West, R., & Leskovec, J. (2016, April). Disinformation on the web: Impact, characteristics, and detection of wikipedia hoaxes. Proceedings of the 25th international conference on World Wide Web in Montreal, Canada. (pp. 591–602).

Kuzio, T. (2005). Russian Policy toward Ukraine during Elections. *Demokratizatsiya*, *13*(4). doi:10.3200/DEMO.13.4.491-518

Kwak, H., & An, J. (2014, November). A first look at global news coverage of disasters by using the gdelt dataset. International Conference on Social Informatics in Barcelona, Spain. (pp. 300–308).

Lanoszka, A. (2016). Russian hybrid warfare and extended deterrence in eastern Europe. *International Affairs*, *92*(1), 175–195. doi:10.1111/inta.2016.92.issue-1

Lenhart, A., Purcell, K., Smith, A., & Zickuhr, K. (2010).Social media & mobile internet use among teens and young adults. *Pew Research Center*. Retrieved from https://files.eric.ed.gov/fulltext/ED525056.pdf

Libicki, M. C. (1995, August). *What is information warfare?* [Department of Defense S&T Report, ID: ADA367662]. *Defense technical Information Center*. Retrieved form http://www.dtic.mil/dtic/tr/fulltext/u2/a367662.pdf

Livingstone, S. (1999). New media, new audiences? *New Media & Society*, *1*, 59-66. doi:10.1177/1461444899001001010

Ljung, G. M., & Box, G. E. (1978). On a measure of lack of fit in time series models. *Biometrika*, *65*(2), 297–303. doi:10.1093/biomet/65.2.297

MacFarquhar, N. (2018, February 18). Inside the Russian troll factory: Zombies and a breakneck pace. *The New York Times*. Retrieved from https://www.nytimes.com/2018/02/18/world/europe/russia-troll-factory.html

MacWilliams, M. C. (2016). Who decides when the party doesn't? Authoritarian voters and the rise of Donald Trump. *PS: Political Science & Politics*, *49*(4), 716–721.

Maibach, E., Myers, T., & Leiserowitz, A. (2014). Climate scientists need to set the record straight: There is a scientific consensus that human-caused climate change is happening. *Earth's Future*, *2*(5), 295–298. doi:10.1002/2013EF000226

Mangold, W. G, & Faulds, D. J. (2009). Social media: The new hybrid element of the promotion mix. *Business Horizons*, *52*(4), 357-365. doi:10.1016/j.bushor.2009.03.002

Marlin, R. (2013). *Propaganda and the ethics of persuasion*. Peterborough, Canada: Broadview Press.

Marquardt, J. J. (2007). Transparency and security competition: Open Skies and America's Cold War statecraft, 1948–1960. *Journal of Cold War Studies*, *9*, 55–87. doi:10.1162/jcws.2007.9.1.55

Martin, L. J. (1982). Disinformation: An instrumentality in the propaganda arsenal. *Political Communication*, *2*(1), 47–64. doi:10.1080/10584609.1982.9962747

Maynes, C. (2018, April 17). Inside the Internet Research Agency: A mole among trolls. *VOA News*. Retrieved from https://www.voanews.com/a/inside-the-internet-research-agency-a-mole-among-trolls/4352107.html

McGeehan, T. P. (2018). Countering Russian disinformation. *Parameters*, *48*, 49–57.

McGregor, S. C, & Molyneux, L. (2018). Twitter's influence on news judgment: An experiment among journalists. *Journalism*. doi: 10.1177/1464884918802975

Merloe, P. (2015). Election monitoring vs. disinformation. *Journal of Democracy*, *26*(3), 79–93. doi:10.1353/jod.2015.0053

Michael, K. (2017). Bots trending now: Disinformation and calculated manipulation of the masses. *IEEE Technology and Society Magazine*, *36*(2), 6–11.

Permanent Select Committee on Intelligence. (n.d.). *Social media advertisements*. Retrieved from https://intelligence.house.gov/social-media-content/social-media-advertisements.htm

Pottier, J. (2002). *Re-imagining Rwanda: Conflict, survival and disinformation in the late twentieth century*. Cambridge: Cambridge University Press.

RealClearPolitics. (n.d.). Trump: Favorable/Unfavorable. *RealClearPolitics*. Retrieved from https://www.realclearpolitics.com/epolls/other/trump_favorableunfavorable-5493.html

Ring, T. A. (2015). *Russian information operations and the rise of the global internet* [Doctoral dissertation]. Retrieved from https://digital.lib.washington.edu/researchworks/bitstream/handle/1773/33528/Ring_washington_0250O_14502.pdf

Rivera, I. (2018). RedditExtractoR [R package]. Retrieved from https://github.com/ivan-rivera/RedditExtractoR

Romerstein, H. (2001). Disinformation as a KGB weapon in the Cold War. *Journal of Intelligence History*, *1*(1), 54–67. doi:10.1080/16161262.2001.10555046

Ross, D. (1984). The Soviet Union and the Persian Gulf. *Political Science Quarterly*, *99*(4), 615–636. doi:10.2307/2150704

Rothschild, D. (2009). Forecasting elections: Comparing prediction markets, polls, and their biases. *Public Opinion Quarterly*, *73*(5), 895–916. doi:10.1093/poq/nfp082

Sattelberger, F. (2015). Optimising media marketing strategies in a multi-platform world: An inter-relational approach to pre-release social media communication and online searching. *Journal of Media Business Studies*, *12*(1), 66–88. doi:10.1080/16522354.2015.1027117

Savin, N. E., & White, K. J. (1977). The Durbin-Watson test for serial correlation with extreme sample sizes or many regressors. *Econometrica*, 1989–1996. doi:10.2307/1914122

Sebenius, A. (2019, March 9). Russian internet trolls are apparently switching strategies for 2020 U.S. elections. *Time*. Retrieved from http://time.com/5548544/russian-internet-trolls-strategies-2020-elections/

Soroka, S. N. (2002). Issue attributes and agenda-setting by media, the public, and policymakers in Canada. *International Journal of Public Opinion Research*, *14*(3), 264–285. doi:10.1093/ijpor/14.3.264

Stephen, A. T., & Galak, J. (2012). The effects of traditional and social earned media on sales: A study of a microlending marketplace. *Journal of Marketing Research*, *49*(5), 624–639. doi:10.1509/jmr.09.0401

Stolarski, C. (2015). Book review: Motherland in danger: Soviet propaganda during World War II, written by Karel C. Berkhoff. *The Soviet and Post-Soviet Review*, *42*(1), 116–119. doi:10.1163/18763324-04201007

Suspiciousaccounts. (n.d.). Suspicious accounts investigated by Reddit. *Reddit*. Retrieved from https://www.reddit.com/wiki/suspiciousaccounts

Toda, H. Y., & Yamamoto, T. (1995). Statistical inference in vector autoregressions with possibly integrated processes. *Journal of Econometrics*, *66*(1–2), 225–250. doi:10.1016/0304-4076(94)01616-8

Twitter. (2018, October). Data archive. *Twitter Elections Integrity*. Retrieved from https://about.twitter.com/en_us/values/elections-integrity.html#data

United States v. Internet Research Agency LLC. (2018). 18 U.S.C. §§ 2, 371, 1349, 1028A. Retrieved from https://www.justice.gov/file/1035477/download

Van Niekerk, B, Pillay, K, & Maharaj, M. (2011). The Arab Spring: Analyzing the role of ICTs in the Tunisian and Egyptian unrest from an information warfare perspective. *International Journal of Communication*, *5*, 11.

Wells, C., Shah, D. V., Pevehouse, J. C., Foley, J., Lukito, J., Pelled, A., & Yang, J. (in press). The temporal turn in communication research: Time series analyses using computational approaches. *International Journal of Communication*, *13*, 1–22.

Woolley, S. C. (2016). Automating power: Social bot interference in global politics. *First Monday*, *21*(4). doi:10.5210/fm.v21i4.6161

Zannettou, S., Caulfield, T., Blackburn, J., De Cristofaro, E., Sirivianos, M., Stringhini, G., & Suarez- Tangil, G. (2018, October). On the origins of memes by means of fringe web communities. Proceedings of the Internet Measurement Conference in Boston, MA. (pp. 188–202). doi:10.25100/cm.v49i2.4056