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Keeping Ottawa Honest—One Tweet at a Time? Politicians, Journalists, Wikipedians, and Their Twitter Bots

HEATHER FORD[1]
University of Leeds, UK

ELIZABETH DUBOIS
University of Ottawa, Canada

CORNELIUS PUSCHMANN
Hans-Bredow-Institute for Media Research, Germany

WikiEdits bots are a class of Twitter bot that announce edits made by Wikipedia users editing under government IP addresses, with the goal of making government editing activities more transparent. This article examines the characteristics and impact of transparency bots, bots that make visible the edits of institutionally affiliated individuals by reporting them on Twitter. We map WikiEdits bots and their relationships with other actors, analyzing the ways in which bot creators and journalists frame governments' participation in Wikipedia. We find that, rather than providing a neutral representation of government activity on Wikipedia, WikiEdits bots and the attendant discourses of the journalists that reflect the work of such bots construct a partial vision of government contributions to Wikipedia as negative by default. This has an impact on the public discourse about governments' role in the development of public information, a consequence that is distinct from the current discourses that characterize transparency bots.

Keywords: bots, Wikipedia, Twitter bots, algorithmic politics, journalism

Heather Ford: H.ford@leeds.ac.uk
Elizabeth Dubois: elizabeth.dubois@uottawa.ca
Cornelius Puschmann: cornelius.puschmann@hiig.de
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Recent research suggests that automated agents deployed on social media platforms, particularly Twitter, have become a feature of modern political communication (Forelle, Howard, Monroy-Hernandez, & Savage, 2015; Milan, 2015). Haustein et al. (2016, p. 233) cited a range of studies that put the percentage of bots among all Twitter accounts at 10–16%. Governments have been shown to employ social media experts to spread progovernmental messages (Baker, 2015; Chen, 2015), political parties pay marketing companies to create or manipulate trending topics, and politicians and their staff use bots to augment the number of account followers to provide an illusion of popularity to their accounts (Forelle et al., 2015). The assumption in these analyses is that bots have a direct influence on public opinion (Edwards, Edwards, Spence, & Shelton, 2014). There is still, however, little empirical evidence of the link between bots and political discourse, the material consequences of such changes, or how social groups react to bots.

We interrogate the influence of a particular class of bots called *transparency bots*. Transparency bots are automated agents that use social media to draw attention to the behavior of particular actors. Transparency bots are distinct from so-called "servant bots" that are developed to perform repetitive (and often laborious) work of human users (Clément & Guitton, 2015). Transparency bots report the behavior of targeted institutions to provide enhanced surveillance by the public.

In the case of WikiEdits bots, automated tools track government editors of Wikipedia and highlight those edits in Twitter posts. Figure 1 illustrates how WikiEdits bots work. When an edit is made to Wikipedia, it is logged internally. The bot checks the live reports of Wikipedia's editing activity and compares the IP addresses of the edits with a list of IP addresses believed to be associated with government institutions. If a match is identified, the bot tweets the page that has been edited and reports which government agency is identified by the IP address. The bot also points to Wikipedia's version comparison, making transparent what exactly has been edited in an article.

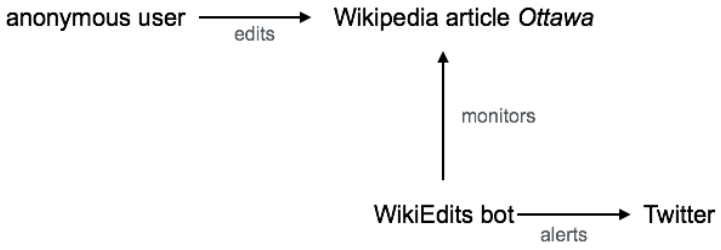

Figure 1. Schematic of WikiEdits bot activity.

The WikiEdits bots are the latest in a series of projects by Wikipedia editors to counter efforts by vested interests to manipulate Wikipedia articles. Bots in this category on Wikipedia include antivandalism bots that detect and revert harmful edits automatically (Geiger, 2014) and transparency bots that alert editors to potentially harmful content for further human scrutiny. Earlier projects with similar goals include Wikiwatchdog and its predecessor, Wikiscanner. By cross-referencing edits identified by IP addresses with institutional blocks of IP addresses, Wikiscanner volunteers created publicly searchable databases that linked millions of anonymous edits on Wikipedia to the organizations where those edits apparently

originated. WikiEdits combines the design of earlier instantiations with the ability of Twitter to reach larger audiences and potentially enable checking of edits by a greater number of people.

Transparency bots are different from transparency tools such as the Wayback Machine, which archives significant proportions of the Web. They are also distinct from tools such as Hidden From Google, which enables users to upload search results deleted from Google as a result of the European Union's Right to Be Forgotten rules, and Chilling Effects, which documents material taken down because of copyright complaints. Whereas Hidden From Google and Chilling Effects rely on users to manually upload relevant material, transparency bots are ex ante mechanisms that rely on an automated set of rules that target particular institutions based on assumptions about predicted behavior of a particular group of individuals.

There is a growing body of research investigating the role of bots within Wikipedia and Twitter. Initial research suggests that Wikipedia bots are essential to the functioning of the encyclopedia and constitute a kind of "distributed cognition" that enables a relatively small group of volunteers to maintain the quality of a vast resource (Geiger & Ribes, 2010). Bots have become well accepted by Wikipedia users (Clément & Guitton, 2015), and their design has a significant impact on the retention of newcomers (Halfaker, Geiger, Morgan, & Riedl, 2013).

Few studies have analyzed the role of bots within the larger Web ecosystem, however. To understand the role and implications of transparency bots, such cross-platform analysis is essential. We need to assess not only the changing behavior of relevant stakeholders in relation to bots, but also intersecting discourses as communities of Wikipedia and Twitter users—and journalists—come into contact with one another through the work of transparency bots. Bots play an important political role in terms of online transparency, and looking only at traditional political actors' behavior on separate platforms limits our ability to understand the everyday interaction of material technology, social relationships, and professional practice.

To understand the impact of bots, we map the relationships between WikiEdits bots, bot creators, journalists, and Wikipedia editors. We begin by describing the material affordances of WikiEdits bots and the network of actors whose relationships are being reconfigured by the bots' activities within the realm of political discourse. We then analyze the ways in which these bots are being used and described by bot creators and journalists, and conclude with an analysis of the role of transparency bots in reconfiguring relationships between political actors.

We find that despite the rhetoric that positions these transparency bots as apolitical, they are positioned to frame the activities of particular actors in particular ways. Such rhetoric actually reinforces the influence of bots on the public's perception of governments and their involvement in public information projects. Because bots are seen as merely displaying rather than influencing government activity, their activities may be seen as more authoritative than any human account.

In this way, bots are highly influential in framing activity by the actors whose practices they partially expose. Ironically, the negative portrayal of government Wikipedia editing will most likely

minimize the influence of such bots, as those government employees who do want to edit Wikipedia anonymously will mostly likely do so using more opaque mechanisms. There are indications that such activities are already taking place, as we show below.

Situating WikiEdits Bots

Bots are neither purely socially constructed products nor can they be explained purely according to the workings of technology. The theory of coproduction (Jasanoff, 2004) describes the ways in which the social and technological coproduce one another. According to coproduction, science and technology are produced by individuals, groups, and institutions that are inevitably biased and are driven by political motives. But science and technology are also shaped by the objects and material processes from which they are constructed. Instead of looking only at the social practices embedded in science and technology or addressing only the material functionality or affordances of technology, Jasanoff (2004) suggested analyzing the ways in which technologies reconfigure social relationships.

In the context of transparency bots, coproduction offers a useful framework for understanding the ways in which the bot–actor network works to reconfigure existing social relationships, reinforcing some centers of authority and disabling others. Of particular interest in the case of transparency bots is the relationship that has been initiated by the work of bots between journalists (who use bots as a source for stories), politicians and government employees (whose practices are being focused on as a result of the work of bots), and bot creators (who design bots with particular affordances and goals in mind).

Discourses, affordances, and local contexts are all critical considerations in the reconfiguration of relationships predicted by theories of coproduction. The design and affordances of technology make certain outcomes more possible than others (Bijker, Hughes, & Pinch, 1987; MacKenzie & Wajcman, 1999). As Lessig (1999) wrote, code is law: The architecture of code has effects on the world. The materiality of technology is certainly important to understanding the effects of science and technology on the world, but artifacts have different effects in different places and at different historical moments. According to Kitchin and Dodge (2011), the effects of code are neither universal nor deterministic, but rather contingent and relational. Context is critical to the ways in which code shapes the world. Space is not simply a container in which things happen, but rather is "subtly evolving layers of context and practices that fold together people and things and actively shape social relations" (Kitchin & Dodge, 2011, p. 13).

Equally important to affordances and spatial context are the discourses surrounding such technologies. Discourses are concerned with the narratives that result in certain technologies being associated in the imagination of their users as connected with particular outcomes. Such discourses constitute what Nagy and Neff (2015) called *imagined affordances*: affordances that "emerge between users perceptions, attitudes, and expectations; between the materiality and functionality of technologies; and between the intentions and perceptions of designers" (p. 1).

Particularly relevant in the study of WikiEdits bots are the discourses around the value of transparency that are attendant in discussions about the role of these bots and their intended impact.

Tkacz (2015) discussed how discourses related to openness relate to discussions about open source software, open content, how open data serve particular politics, and particular futures. With reference to the discourses surrounding Wikipedia as an open space, a platform that anyone can edit, Tkacz wrote that Wikipedia is positioned as a postpolitical space, a space outside the political. Actually, argued Tkacz, this is a fictitious space because collaborative production is never outside the political: No production in which everyday histories, politics, and entanglements are involved can be separated from it. Tkacz demonstrated that collaborative production is actually constituted by the political. These everyday politics and entanglements are actually what stimulate production and ensure its continuation.

The relationships between people, material technology, time, and space are contingent, relational, productive, and dynamic. The role of the analyst, then, is to understand the interrelationships and interactions between code and the world. It is these relationships that give rise to particular outcomes at particular times and in particular places. Similarly, transparency bots have a range of affordances that affect their functioning or their work in the world, but equally critical to those affordances are the ways in which bots' materiality affects relations where they are deployed.

In popular discourse, bots have been positioned as either bad or good (see, e.g., LaFrance, 2014, 2015). WikiEdits bots are generally located within the latter category (see, e.g., Woolley & Howard, 2016) because of their association with open government and transparency discourses. Along with Geiger and Ribes (2010), we argue that the designation of some bots as good and others as bad should be interrogated. This, then, is the goal of our article: to interrogate the relationships and the everyday politics that constitute the WikiEdits bot network and to understand the ways in which WikiEdits bots are reconfiguring such relations.

Method

Our approach was to understand the links and connections between mainstream news articles about politicians, political staff, and bureaucrats who edit Wikipedia and the bots that automatically represent such editing. We constructed our field site by tracing the actor networks around WikiEdits bots, botmakers, politicians, and journalists (Burrell, 2009). We followed the work of bots into the network of Wikipedia edits, tweets by bots, and journalistic articles that reference the bots. As is the case with other studies investigating the roles and impacts of political players in the context of digital media, we made use of a range of methods to gain a holistic view (Chadwick, 2011; Postill & Pink, 2012). Our methods included interviews, content analysis, and discourse analysis.

First, we examined bot history to understand how and why the bot was created. We used in-depth qualitative analysis of a range of sources including Twitter profiles of the bots themselves, Github repositories containing code and information about the creation of the bots, Wikipedia articles about the bots, newspaper articles, blog posts, and interviews with bot creators. The content was collected purposively by following links from the Twitter profiles of each of the three first WikiEdits bots that were created: @GCCAedits, @CongressEdits, and @ParliamentEdits.

Next, we focused on the specific example of @GCCAedits to analyze the ways in which bots might influence relationships between citizens and their governments via journalist intermediaries. We analyzed the content of tweets published by the @GCCAedits bot, as well as the articles about those edits published by journalists. As of April 26, 2016, in total, 24,530 tweets were downloaded, 24,106 of which reported editing activity.[2] Some tweets did not report activity, but instead responded to people or announced updates. A random sample of 350 edits tweeted by the bot were categorized based on the type of edit, such as correcting spelling, grammar, or formatting, or minor or major edits. The 30 Wikipedia articles with the most edits were categorized according to the subject of the article, as identified by the bot.

We downloaded all journalistic articles referencing @GCCAedits beginning with a list provided by bot creator Nick Ruest (2016b). No single source provided a comprehensive list of articles given that they all used different algorithms (and licensing agreements) to collate news. This approach, using both regional (Canada Newsstand) and international (ProQuest, Factiva, Google News) news services in addition to the human-curated list maintained by Ruest, enabled us to capture a wider range of articles. The language, style, and content of the 19 articles were analyzed, paying particular attention to the ways in which bots were framed by journalists, the types of edits that were highlighted by journalists, and the ways in which journalists talked about the government officials who were editing Wikipedia. Such discourse demonstrates how journalists construct a particular vision of the world grounded in assumptions about an ideal relationship between governments and citizens.

A Brief History of WikiEdits Bots and Their Affordances

British Internet celebrity @TomScott (Tom Scott) created the first WikiEdits bot, @ParliamentEdits, on July 8, 2014. The bot tweets every time an edit to Wikipedia is made from a British Parliamentary IP address. Figure 2 depicts the bot's first tweet.

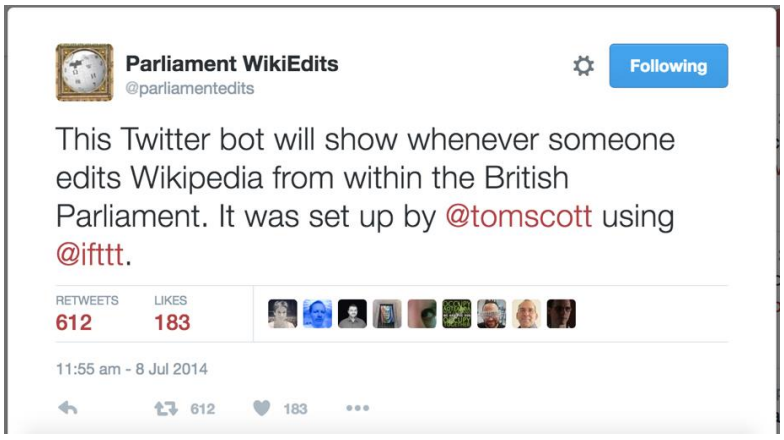

Figure 2. @ParliamentEdits first tweet. Source: Twitter.

[2] See Ruest (2016a) for access to data set.

Originally, Scott made use of the tool If This Then That to produce the @ParliamentEdits bot. Twitter user @EdSu (Ed Summers), a U.S.-based software developer, then created a Github repository with custom code that could be used to create new WikiEdits bots given a set of any IP range. Summers set up @CongressEdits, which tweets when anonymous edits are made from within the U.S. Congress. The Github repository was set up July 8, 2014, and by July 10, Summers had collaborators also contributing to the code. As of May 2016, the repository had been forked 129 times. In a blog post, Summers (2014) reflected on the positive response he received from the bot's creation and what he attributed its impact to:

> Watching the followers rise, and the flood of tweets from them brought home something that I believed intellectually, but hadn't felt quite so viscerally before. There is an incredible yearning in this country and around the world for using technology to provide more transparency about our democracies.

Volunteers quickly created WikiEdits bots targeting other countries and organizations. One of those bots is @GCCAedits, created by @Ruebot (Nick Ruest), a York University digital assets librarian in Canada. This bot is among the most active WikiEdits bots tweeting about edits from IP addresses associated with the Parliament of Canada, Senate of Canada, and various government agencies. Like @CongressEdits, @GCCAedits tweets the name of the governmental body associated with a given specific IP range in each tweet.

Responding to a journalist's questions about the bot, Ruest strongly associated the bot with the principles of empowerment, transparency, and citizen action, and with the open government and open data initiatives:

> It's a way to empower the citizenry to see what's going on. . . . There's a lot of things that are good that can happen [with the edits], but there are a lot of things that are bad. It's just transparency and that's the key thing for me. . . . All this data is out there and available, and it's [about] grabbing it and doing something with it. (Boutilier, 2014, para. 8)

Today, there are at least 81 WikiEdits bots according to a list compiled by Summers and collaborators on Github.[3] This number fluctuates as new bots are created and older bots are shut down. Some bots remain quite active and others rarely tweet.

According to Ford and Geiger (2012), a host of background knowledges are required to be an effective Wikipedia editor because Wikipedians leave traces "that are invaluable for each other but difficult for new users to comprehend" (p. 1). By providing some of this context regarding the identity of the editor, WikiEdits bot creators make Wikipedia edits more accessible to the general public and journalists in particular. WikiEdits bots distill what bot creators believe to be the most relevant information relating to the Wikipedia edit and post it to Twitter, capitalizing on the affordances of both platforms to connect with

[3] For the full list, see https://Github.com/edsu/anon#community

a wider audience. In doing so, however, WikiEdits bot creators make important framing decisions that impact the actions that are taken in response to their bots.

WikiEdits Bots and Their Networks

WikiEdits bots have at their core two functions: to monitor Wikipedia for edits from within a given IP range, and to alert the public and other actors via Twitter when edits are made. WikiEdits instances, such as @GCCAedits, share common code, but the bot creator for each instance makes important decisions that affect the role of each bot within particular networks.

The monitoring aspect of WikiEdits bots depends first on common WikiEdits code and second on the region-specific list of IP addresses. We have already explained that Scott originally conceived of the idea of a WikiEdits bot and implemented it using If This Then That. Summers, recognizing the need for a bot that could be replicated and that could include more IP addresses in its monitoring of edits, created custom code for WikiEdits bots. Scott's decision to change the code behind the @ParliamentEdits bot once Summers' code was available illustrates one of many ways a bot creator's decision impacts the functionality and role of the bot. With Summers' code, @ParliamentEdits became part of a network of other WikiEdits bots.

The list of IP addresses that each WikiEdits bot monitors is region specific and must be determined by the bot creator when configuring the bot. @ParliamentEdits tweets about anonymous edits made from within the Houses of Parliament, and @GCCAedits tweets about edits made from within a wide range of government offices. There is a second British WikiEdits bot called @WhitehallEdits, which was inspired by @ParliamentEdits and also uses Summers' code, but instead of focusing on the Houses of Parliament, it tracks anonymous edits from U.K. government computers. The account was set up one month after @ParliamentEdits and is maintained by Channel 4 News.

Figure 3 shows that the @WhitehallEdits account has many characteristics similar to the other WikiEdits bots we have described. Notably, whereas @ParliamentEdits has made only 239 tweets as of May 2016, @WhitehallEdits has made about 10 times that number at 2,224 tweets. Clearly, the choices bot creators make have an impact on who or, more accurately, what locations are tracked and, in turn, who can be held accountable for their edits.

Figure 3. @WhitehallEdits profile picture, description, location, and pinned tweet. Source: Twitter.

The ways in which the bot creator determines the list of IP addresses are key mechanisms by which the bot creator impacts the role of the bot and the bot's relationship to others. Ruest, the creator of the Canadian bot @GCCAedits, explained on his Github that he made use of Wikipedia, Hurricane Electric, and ARIN to establish his address lists. He also asked others to contribute additional IP addresses should they find that one was missing. Ruest continues to modify the list in response to changing conditions.

In contrast, Tom Scott, the creator of the @ParliamentEdits bot, discovered through a Freedom of Information request to the U.K. government that the IP addresses his bot had been monitoring had been changed. A subsequent request for the new list of IP addresses was rejected because of "national security concerns." Scott ultimately decided to make use of a list that another Twitter user, @jonty, had previously created.[4] Bot creators do not simply press a button that exposes governmental action on Wikipedia. The vision they enable of governmental action through the configuration of IP addresses is partial and demonstrates a range of dependencies: dependencies on government policy, dependencies on others curating their own lists, and dependencies on the transparency of the institutions themselves.

Importantly, WikiEdits bots depend on, and are shaped by, the Twitter platform itself. Each WikiEdits bot is publically accessible through its Twitter profile, which is created at the discretion of each bot creator. Tweets from accounts using Summers' code normally follow the format: *Wikipedia article title* edited anonymously from *Name of specific IP range* followed by the automated date and time stamp that accompanies all tweets on Twitter. See Figures 4 and 5 for examples.

[4] This Github lists IP addresses and describes how they were collected: https://gist.Github.com/Jonty/aabb42ab31d970dfb447

Figure 4. Example of typical @ParliamentEdits tweet. Source: Twitter.

Figure 5. Example of @GCCAedits tweets from two different IP ranges within the Canadian government. Source: Twitter.

As is standard on Twitter, profiles include a photo and a description, which may contain a variety of text forms including links, mentions, and hashtags. They also include a link and a location. Most depict some form of the Wikipedia logo in their profile photo and their bio description normally makes explicit the fact that the account is a bot and commonly linking to the human actor who initiated it and the Github repository where source code can be found. Figures 6–9 provide examples from @ParliamentEdits, @CongressEdits, and @GCCAedits.

Figure 6. @ParliamentEdits profile picture, description, and location. Source: Twitter.

Figure 7. @CongressEdits profile picture, description, and location. Source: Twitter.

Figure 8. @GCCAedits profile picture, description, and location. Source: Twitter.

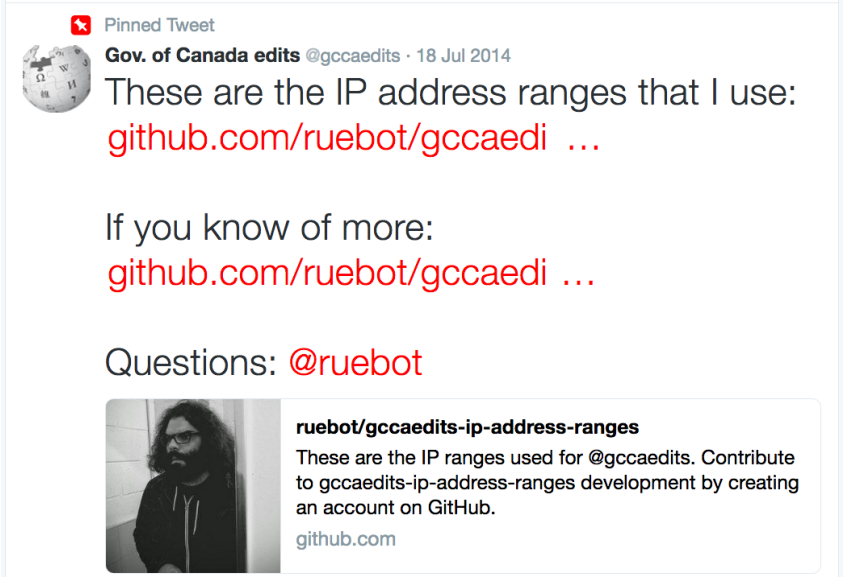

Figure 9. @GCCAedits pinned tweet. Source: Twitter.

When asked how he chose the @GCCAedits profile photo, Ruest explained that he liked that the @CongressEdits bot profile picture included an image of Congress and a Wikipedia logo and decided to replicate it. He further explained that he provided links to the Github repository for the sake of transparency. These links also make it easier for others to learn how to create other WikiEdits bots. Choices made in constructing bot profiles demonstrate the importance of a particular technical vision of transparency to bot creators. Transparency according to this vision is about users being able to look beyond the bot to see the code by which it was created. It is also about enabling users to take the code and create their own bot, and/or to work with named individuals (named in the profile or in links to their Github accounts) in improving the functioning of the bot.

Bot creators sometimes collaborate on the core WikiEdits code and always contribute at least a set of IP ranges to make their bot locally responsive. WikiEdits Twitter profiles specify the users who created the bot in addition, sometimes, to others who have played an important role in the life of the bot. In reality, however, the creation and maintenance of these bots are collaborative and in some cases dynamic, involving a wide range of actors and networks that become enrolled in the life of the bot over time. For example, we asked Scott if he would be interviewed for this project but he declined, saying that he was no longer involved. Although the initial WikiEdits bot was his creation, he felt it was now the responsibility of others.

This collaborative and dynamic set of actors combined with the multiple platforms of Wikipedia, Twitter, and Github, and data sources for IP ranges together define a WikiEdits bot. The collaborative nature of the WikiEdits bot network also has implications for ethical conduct. Who is responsible should the bot cause harm? Who should someone with a complaint or concern contact? What if they are inaccessible? Although the response to these and other questions is beyond the scope of this article, we pose them rhetorically to highlight just how crucial it is to understand and respond to the complex set of relationships involved in bots such as WikiEdits bots.

The @GCCAedits Assemblage

We examined the network of a single WikiEdits bot, @GCCAedits, to gain a contextual understanding of the discourses, relations, and objects that become enrolled in the bot. @GCCAedits was created by Nick Ruest to publicize Wikipedia edits made by Canadian government IP addresses, according to IP ranges for government departments such as Shared Services Canada, the central IT service used by government.[5] To understand the impact of the bot, we examined @GCCAedits tweets from when it was first created on July 9, 2014, to April 27, 2016, when we conducted our data extraction. We then compared the rate and categories of tweets with the journalistic articles mentioning @GCCAedits published during the same time period.

[5] The IP addresses used for @GCCAedits are aggregated from multiple sources and are available at https://Github.com/ruebot/gccaedits-ip-address-ranges#contributing

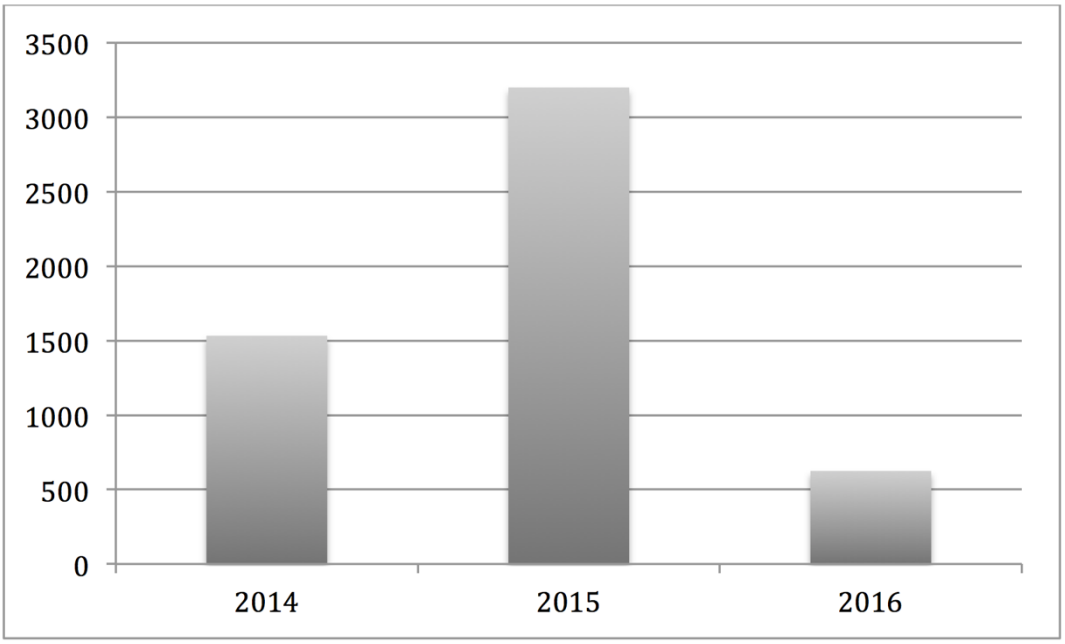

Figure 10. @GCCAedits activity by week (2014–2016).
Source: Authors' calculations based on data collected.

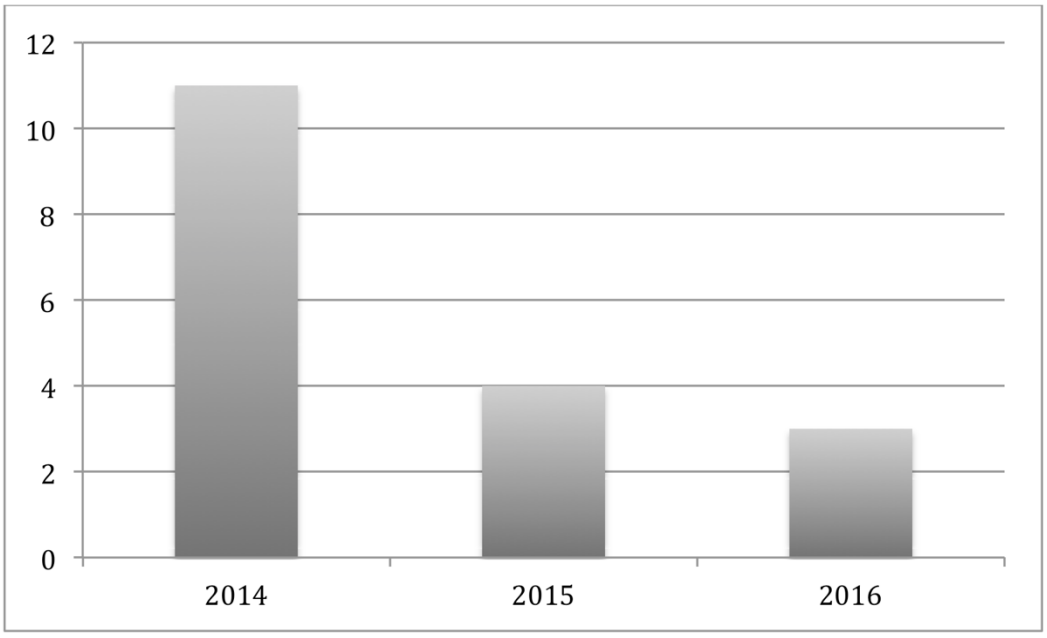

Figure 11. Number of journalistic articles mentioning @GCCAedits from 2014 to May 2016.
Source: Authors' calculations based on data collected.

Analyzing the rate of tweets (see Figure 10) and comparing them with the rate of newspaper articles (see Figure 11), one can see a decline in both sources over time. Newspaper articles declined from 11 unique stories in 2014 when the bot was first created to four in 2015 and three so far in 2016. There are three potential reasons for this decline. The story about government's meddling in Wikipedia could have run its course. Even though government users continue to edit Wikipedia, the story may be too old for the demands of journalistic outputs. Alternatively, journalists could be writing stories about governments editing Wikipedia without mentioning the @GCCAedits bot or by doing their own investigations or creating their own bots to track edits by particular groups. As a further alternative still, we might see the decline in both tweets and newspaper articles as a sign that, as journalistic sources dry up, so too do stories about those sources.

The decline in tweets illustrated in Figure 10 probably reflects a change of behavior in government users who may be editing under usernames instead of IP addresses after the media storm about government editing of Wikipedia articles.[6] For example, a former senior staffer for a Canadian minister described in our interview with him his experience following @GCCAedits. He explained that one day he saw a tweet about anonymous edits to a specific member of Parliament's Wikipedia page. He knew exactly who was responsible for making edits to that page having been in meetings with that person around that time. He went to the editor, confirmed that person had made the changes, and then warned the individual about the existence of @GCCAedits and explained that anonymous edits are traceable by IP address.

When asked why they thought @GCCAedits tweets were declining, both Ruest and Summers suggested that negative publicity catalyzed by the bot may have been the reason, either leading would-be editors to avoid editing or to avoid being flagged by the bot. Ruest also suggested the internal policies about whether Wikipedia editing is allowed on government computers could be contributing to the decline. Although there are no publically available data to confirm this, the portrayal of government action on Wikipedia by the media is instrumental in shaping behavior.

The ways in which journalists frame Wikipedia editing by governments are critical to understanding the impact of bots on behavior. If governments' edits are framed negatively by journalists, then it is likely that government editors will change their behavior to mask their institutional affiliations. If governments' edits are framed positively or neutrally, they will likely continue their behavior. To understand how journalists frame bot creators and government editors, we first compare the types of articles (and edits to those articles) announced by @GCCAedits with the types of edits featured in journalistic articles.

Table 1 provides a list of the top-15 most edited articles by users with IP addresses captured by @GCCAedits. The subjects of an animated television series, Navy ships, and regional Canadian history received particular attention. No politicians, political parties, or events/scandals made it to the top 15 of most frequently edited pages.

[6] If Wikipedia editors edit using usernames, then their institutional affiliation will not be visible in the same way as if they edit anonymously.

Table 1. Top-15 Most Edited Wikipedia Pages Referenced by @GCCAedits.

#	Page title	Edits	Category
1	*HMCS Algonquin* (DDG 283)	378	Navy ship
2	SIRIUS Travel Link	181	Digital radio service
3	*Hanna–Barbera Classics Collection*	176	Animated television series
4	Star Citizen	159	Video game
5	Ancaster, Ontario	124	Town
6	Colt Canada C7 rifle	114	Assault rifle
7	Ottawa	107	City
8	List of Web-archiving initiatives	105	List of organizations
9	Need for Speed	104	Video game
10	Norman Paterson School of International Affairs	100	Higher education
11	Halifax, Nova Scotia	92	City
12	*The Girls in the Office*	84	1970s television series
13	Charny (Lévis)	72	District
14	Alberta Football League	65	Amateur football league
15	Brioude	65	Commune in south-central France

In a random sample of 350 edits tweeted by @GCCAedits, an examination of the types of edits made suggests that more than 40% were simple changes to spelling, grammar, or basic formatting. These kinds of edits are not likely to be politically motivated. Indeed, 44% of edits were considered minor edits or changes of only a word or phrase. Examples of minor changes included adding a single new sentence or making stylistic changes through the use of adjectives or modifiers. Some edits were either unavailable for technical reasons (4%) or were not in English or French (2%). Finally, less than 10% of edits were classified as major substantive changes (more than a sentence). Figure 12 provides an example of a major edit wherein a paragraph about an ethics complaint was deleted from the Wikipedia page of Canadian politician Pierre-Hugues Boisvenu.

Notably, a change could be classified as major even when not explicitly political because categorization was focused on the type of edits independent of content. For example, one editor modified the weather section of the article about the Canadian city Halifax, Nova Scotia. Furthermore, contributions to Wikipedia talk pages and other behind-the-scenes discussions that the @GCCAedits bot flagged were treated by the same standard and so were normally categorized as major even though the discussion may or may not have led to a change on the outward facing Wikipedia page. This is because the content of the discussion was made available to those following @GCCAedits in the same way any normal page editing was.

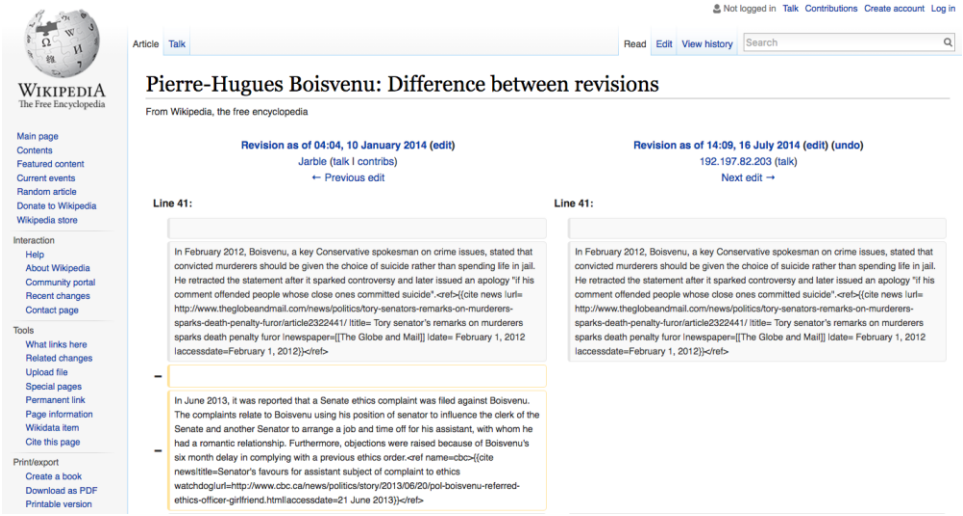

Figure 12. Pierre-Hugues Boisvenu Wikipedia edit. Source: https://en.wikipedia.org/w/index.php?diff=617183315&oldid=590026008

Some edits were conjectured to come from editors in their capacity as politicians or, more likely, staffers who support the work of politician. But much of the activity appeared quite similar to the daily work of dedicated Wikipedians, as the hundreds of edits to pages on ships and the Hanna-Barbera franchise attest. These edits were predominantly constructive, if apparently trivial, and important work for maintaining the quality standards of Wikipedia.

In contrast, the edits that journalists chose to showcase were labeled as "inane," as "censorship," or as "vandalism" (see Table 2). Journalists interpreted edits as a demonstration of "how people in power waste their time," as "completely inane," "mundane," or "hilariously off-topic" in their articles. Alternatively, some edits were determined to be examples of government "censorship," an attempt to "sanitize" the entries of government MPs, or MPs "manicuring their Wikipedia pages by removing their personal misdeeds."

Table 2. The Core Subjects of Journalistic Articles.

Edit categories inferred by journalists	Example
Censorship	Removal of controversial information from MPs' Wikipedia biographies. For example, an editor removed references to the story about Conservative candidate Rick Dykstra being photographed drinking with underage girls at a bar.
Vandalism	Changing the motto of the Canadian Forces Military Police from "Securitas" to "Harassates."
Inane	Editing the Cadbury Caramilk page to change the classification from "chocolate bar" to "candy bar."

Only one article noted that editing of Wikipedia may not necessarily be "nefarious." O'Malley (2014) noted that the edit in question may have been acceptable but that it may have been a "technical violation of Wikipedia's conflict of interest policies, which strongly discourage people from directly editing entries on friends, family members and employers" (p. 1).

Articles about the Canadian government's edits strongly carried through the transparency discourse originally asserted by the bot creators. Language used in the headlines of articles when the bot was first created demonstrate the wholesale adoption of the same transparency language by journalists in addition to a particularly negative framing of government activity. A *Toronto Star* article from July 16, 2014, for example, was titled "How to Keep Ottawa Honest—One Tweet at a Time" and contained quotes from Ruest about the transparency goals of the bot (Boutilier, 2014). Ruest's suggestion that "There's a lot of things that are good that can happen [with the edits], but there are a lot of things that are bad" (Boutilier, 2014, para. 8) was not followed by an explanation or following up of the "bad" that might occur.

Other articles around the same time reinforced the negative framing of government activity. McGuire (2014a, 2014b, 2014c) wrote three stories for *Vice* in July 2014 about Wikipedia edits. His first article on July 14 was a standard post about the bot's creation, asserting that the role of @GCCAedits was to make "sure governments aren't drastically revising history on everyone's favorite free encyclopedia," listing a few of the "inane" edits that the Canadian government computer users had made. At the time, McGuire (2014a) wrote that

> While it would certainly be a big story if the bot ended up catching a government employee trying to drastically rewrite history within a Wiki article, it's more likely it will continue to catch bureaucrats doing what they do best: wasting time. (para. 8)

McGuire's (2014c) final story on July 22, however, discussed the "landslide of data" surfaced by WikiEdits bots, writing cases of government "censorship . . . where a government or corporate actor tries to blur, or simply redact, certain truths from the internet." McGuire's stories moved from governments edits as "inane" to examples of "serious censorship," a theme that carried through the other articles.

The work of @GCCAedits was associated very strongly in these articles with ideas of democracy envisioned by technologies in the open data and citizen journalist traditions. McGuire (2014c) interviewed Jari Bakken, a developer from Oslo who put together a data set of approximately 156 million edits across 13 languages from governments, the United Nations, NATO, and large oil companies. Bakken was cited as declaring that harvesting edits made by governments and corporations was a powerful democratic act:

> Anyone with a basic understanding of democracy will understand why it's interesting to know how people in power behave when they can edit an encyclopedia anonymously. I also think it's a nice example of how technology can be used creatively to make the exercise of power more transparent, which hopefully will inspire further ideas. (McGuire, 2014c, para. 9)

One of the stories that gained the most attention was a story by journalist Jason Fekete on August 16, 2014, that was republished by at least seven newspapers including the *Calgary Herald*, the *Edmonton Journal*, *The Montreal Gazette*, the *National Post*, the *Ottawa Citizen*, the *Vancouver Sun*, and the *Phoenix Sun.*

Evidence of government's time wasting was used to support a larger argument about the policy decisions of the then-Conservative government:

> People using federal government computers to make changes to the online encyclopedia is a questionable use of resources at a time when the Conservatives have been cutting spending and looking to reduce government waste. (Fekete, 2014, para. 8)

Edits uncovered by WikiEdits bots are framed as "anonymous," suggesting that government editors are trying to evade scrutiny by being deliberately opaque and secretive. *Anonymity* is actually a misnomer here. Authentication of identity is not required by Wikipedia's software. Editors may edit without logging into the site, but they may be unaware of the fact that such edits are logged according to a user's IP address and that the IP addresses can be looked up and users located to within a few kilometers. Editing without logging into the site is confusingly called "anonymous" editing, but actually enables any other user to identify where geographically the edit is coming from.

Analyzing the language used by journalists and the role that they play in the spreading of information that bots are publicizing demonstrates how journalists are acting as important intermediaries in the work of transparency bots. Journalists and news media select, investigate, and spread information about anonymous edits, which WikiEdits bots flag. But journalists only selectively spread information from the bots, and they frame the work of bots in particular ways that reinforce larger narratives about governments as wasteful or manipulative in relation to public information sources.

In response to Crawford's (2016) article about government edits to Wikipedia, public policy professor Amanda Clarke (2016) wrote that journalistic outrage over government Wikipedia edits sends the wrong message about government openness:

> [W]hen the media and the Canadian public indulges in outrage over a few Wikipedia edits, we risk creating a chilling effect that inhibits public servants from engaging with Canadians online even when it is entirely legitimate to do so. (para. 8)

Clarke's article highlighted that it is certainly important that journalists alert the public when institutional actors with a conflict of interest are editing important political topics. Her suggestion of the negative impact of such reports alludes to the idea that it is equally important to recognize that this framing is not apolitical. The way that both bot creators and journalists frame government activity on Wikipedia is a partial frame based on particular ideologies, is dependent on particular relationships, and sets the relationship between governments and citizens as oppositional by default. This framing of government editing activity on Wikipedia is more likely to result in nefarious activity by particular government operatives going underground. In known cases, operatives have made use of anonymous usernames and have therefore been outside the remit of the bot. This framing also discourages governments from being involved even in constructive edits of Wikipedia based on their expertise.

As noted, behavioral change among government editors in response to negative media stories was born out in interviews with both Ruest and Summers, who noted that negative publicity catalyzed by the bot could be the reason why @GCCAedits tweets are in decline. John Emmerson, creator of @NYPDedits, explained in an interview that he was inspired to create the bot by a journalist, Kelly Weill (2015), who reported that edits about police brutality had been made from within an IP range associated with the New York City Police Department. When asked about the impact of @NYPDedits, Emmerson explained that he thought it stopped police department members from editing Wikipedia anonymously. However, he followed this statement with one suggesting that they could be using anonymous accounts, which are not caught by the bot.

Conclusion

The key influence of bots in the case of WikiEdits is in producing a particular vision of the activities of other actors, sometimes zooming into particular activities, but always providing a partial vision. The perspective of each actor is a partial perspective that is framed by the experiences, motivations, expertise, and technical access accorded to each group. Experienced Wikipedia editors and bot creators see individual editors as identified by their institutional affiliation as revealed by IP address ranges. The variety of editors within that IP range, from bureaucrats to political staffers to politicians, may not know that their activities are being monitored and identified, albeit according to general institutional rather than individual identification. Journalists see edits coming from particular institutional addresses about particular topics but cannot identify particular individuals and therefore do not recognize the context in which those edits were made.

Relationships are distinguished by an unequal "trace literacy" between different sets of actors, as we have demonstrated in this article. Whereas experienced Wikipedians and bot creators are able to identify traces and monitor contributions, those using IP addresses to edit articles have limited understanding of Wikipedia practice and can therefore not translate Wikipedia traces into behavioral clues. Institutions that manage computers within a particular IP address range, on the other hand, have a greater ability to identify individuals who have edited particular articles than the Wikipedia editors and journalists who see only broad IP ranges as the source of edits, with those IP addresses belonging to sometimes hundreds of computers.

Bots are not necessarily new actors, but they reconfigure relationships between different actors. Shedding light on the human work required for bots to have an impact on public discourse in politics is useful to develop a clearer picture of the impact of automated agents on social and political life. This is significant because it demonstrates how the impact of bots on political discourse is always relational and never essential. The impact of bots is determined by the literacy of different actors relative to one another, as well as by the potential of particular bots to either obscure or make transparent particular types of activities. Bots may set out to improve transparency, but transparency does not necessarily lead to positive outcomes for democracy. No vision is transparent in the same way: Every actor sees behavior and action differently, and this is determined not by the technology alone, but by institutional structures, incentives of different groups, and their relationships within a particular political context.

Future work will need to extend the analysis of @GCCAedits to the relationship networks of other WikiEdits bots to understand different local conditions and to analyze the effects of news stories and bots on edits to Wikipedia articles to understand the response by other editors and the public to conflict of interest concerns raised by bots. Another potential avenue for future work is to understand new approaches and behaviors of would-be anonymous Wikipedia editors following popular knowledge of these bots. The impact of transparency bots such as these cannot be traced through the content collected and shared. Instead, their impact reverberates through the system and drives different actors to adopt different practices. Understanding the ways in which automated agents such as WikiEdits bots reconfigure relations of power between different social groups is a complex but critical task for research in the future.

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