# 4. Wikipedia as a Socio-technical Utility for Networked Content Analysis

In the previous chapter, I have assessed the climate change debate through scientometrics and networked content analysis. To understand the technicity of online networked content, I argued, it is necessary to address how content is networked and which kinds of digital methods and tools are therefore suitable for the demarcation of content and the operationalization of the research question. In this chapter, I will address the mapping of the climate debate in Wikipedia. But before coming to the discussion of this debate, as it plays out and is managed among and other controversial topics and the management thereof in Wikipedia, I will discuss how Wikipedia has revived the idea of the web as a place of human collaboration and mass participation by ‘everybody’.[[1]](#footnote-1) The Wikipedia platform is often considered as an example par excellence of the collaborative promise of social media, and of knowledge production and management that utilizes the wisdom of crowds. Since 2001, its group of editors and volunteers has engaged in developing an online encyclopedia whereby anyone with net access is welcome to contribute, and articles are open to continuous editing and refinement. Scholars who have evaluated or contested the value of Wikipedia content have almost unanimously focused on its crowd-based organization and have stressed the danger of producing low-quality information with many (anonymous) minds.[[2]](#footnote-2)

These concerns about Wikipedia are legitimate and relevant, of course, but the one-sided focus they give to human agents while neglecting the role of technology must be both resisted and complemented by attention to the socio-technological dimension of Wikipedia as a dynamic knowledge production and management project. In this chapter, therefore, I want to explore the technicity of Wikipedia content and assess how networked content analysis can be applied to this platform. What do researchers need to know of the platform's means of content creation, networking, and maintenance to be able to analyze its content in a way that is digitally and, more specifically, platform-informed? What does Wikipedia ‘do’ to content that is controversial, and what does this mean for the methods of networked content analysis put forward in this book? To answer these questions, I will first analyze how dependent the human social creation, use, and maintenance of Wikipedia knowledge is upon software robots (in short referred to as bots), the non-human content agents that assist in editing Wikipedia articles. Secondly, I will discuss examples of networked content analysis of controversial content that make use of the possibilities offered up by Wikipedia's technicity for controversy research.

The technicity of Wikipedia content makes it possible to refine further the techniques of networked content analysis, and to explore how resonance, related content, actor engagement, and controversy management may be studied within this encyclopedia project. It is crucial to understand Wikipedia as a dynamic, networked encyclopedia when approaching its content for analysis, which is why I will start (as I did in the previous chapter on Twitter) with a brief introduction of the platform’s technicities. Again, this is not meant to be an exhaustive overview of all the features of the platform, but rather can be seen as a kind of technical introduction to socio-technical fieldwork, exploring and describing the ways in which content is produced and networked.

Looking just at the level of its software, Wikipedia has changed drastically throughout the years. Overall, however, it remains a wiki-based encyclopedia platform, offering various levels of access to information of article history and editors, enabling researchers to follow the actors and close-read their positions, interactions, references, and commitment to a specific issue. The interface of Wikipedia presents an article and talk page for each Wikipedia subject. In the article tab, it is possible to read or edit the article, or to view the article's revision history. In the revision history, each edit is listed along with a timestamp, and a username (or IP-address for an anonymous edit). A click on the timestamp opens the particular version of the article from that edit date. It is possible to make a selection of differently dated versions of an article and compare the different revisions. For each Wikipedia article, the revision history lists external tools, including revision history statistics, revision history search, edits by user, number of watchers, and page view statistics. The Talk page shows some policies and general rules for discussion as well as a place to ask questions or discuss edits. It is also where the article's revision history is located and publicly accessible. A Wikipedia article may start with links to similarly named articles (disambiguation), or related articles. In the body text, highlighted words mark links to other Wikipedia articles. Each article ends with separate sections holding references and external links. In the left margin of the page, the language versions of the article are listed, as well as a list of ‘what links here’, which provides a list of all other Wikipedia articles that link to the article you have in front of you. All of this creates materials, which can be analyzed through networked content analysis.

In the next section, I will discuss how Wikipedia has been researched since its launch in 2001, and how dominant research practices have disregarded some of the crucial technical specificities of Wikipedia entailed in the production, organization, and maintenance of its content. Before discussing the climate debate in Wikipedia, I will first zoom in on two controversy analyses that are informed by the technicity of Wikipedia content, by looking at discussions on the talk pages (for the article on Gdańsk/Danzig), and by conducting a comparative analysis of articles across language versions (for the case of the Srebrenica massacre). While these analyses are unrelated to climate change research projects, they offer insights into the methodological workings of networked content analysis. The final project discussed in this chapter is a mapping of climate change articles, which ties back not only in terms of techniques but also in its subject matter to the previous chapters’ case studies of the climate debate on the web accessed through Google Web Search and Twitter. In my networked content analysis here, I build on existing research to trace climate change-related content and close read actor behavior in and through Wikipedia.

## Many Minds Collaborating

Wherever Wikipedia is discussed, the facts of its material composition very quickly drift into metaphor. It is variously described: by Sunstein as a platform of ‘many minds’ produced by what Kittur and Kraut call ‘the wisdom of crowds’; by Shirky as a system of ‘distributed collaboration’; by Tapscott and Williams as ‘mass collaboration’; and as a space enabling hybrid new forms of ‘produsage’ by Bruns, inspiring what Howe calls ‘crowdsourcing’ and Stalder and Hirsch describe as ‘Open Source Intelligence’, and Poe as ‘collaborative knowledge’.[[3]](#footnote-3)[[4]](#footnote-4)[[5]](#footnote-5)[[6]](#footnote-6)[[7]](#footnote-7)[[8]](#footnote-8)[[9]](#footnote-9)[[10]](#footnote-10) As a collectively written encyclopedia launched on a wiki platform, it is indeed one of the web’s most significant and longer duree (in internet history terms) examples of collaborative knowledge production. In early 2008, an article in the *New York Review of Books* explained the media cultural charm of Wikipedia:

So there was this exhilarating sense of mission — of proving the greatness of the Internet through an unheard-of collaboration. Very smart people dropped other pursuits and spent days and weeks and sometimes years of their lives doing ‘stub dumps,’ writing ancillary software, categorizing and linking topics, making and remaking and smoothing out articles — without getting any recognition except for the occasional congratulatory ‘barn star’ on their user page and the satisfaction of secret fame. Wikipedia flourished partly because it was a shrine to altruism — a place for shy, learned people to deposit their trawls.[[11]](#footnote-11)

Since the start of the Wikipedia project in 2001, the dedication of its contributors as well as the platform’s success in socializing knowledge production for the benefit of many, in contradistinction to academic and media industry reliance on experts, has been through numerous waves of praise and publicly mediated criticism. While Wikipedia has indeed become famous for its collaborative approach to networks — of many minds producing knowledge — it is interesting to recall that the project originally intended to be an expert-generated encyclopedia. Beginning under the name of Nupedia, a small team of selected academics was invited to write the entries, with the aim of creating a ‘free online encyclopedia of high quality’.[[12]](#footnote-12) The articles would be made available to World Wide Web users through an open content license. Founder Jimmy ‘Jimbo’ Wales and his employee Larry Sanger put into place a protocol based on academic peer-review.[[13]](#footnote-13) This expert approach failed, partly because of the slowness of the editing process by invited scholars. To speed up the process, Sanger suggested a wiki as a collective place where scholars and interested laypeople from all over the world could help with publishing and editing draft articles. The success of Wikipedia and the commitment of emerging Wikipedians took them by surprise. Sanger became the chief organizer, a wiki-friendly alternative for the job of editor-in-chief that he held for Nupedia. He made a great effort to keep Wikipedia organized while at the same time providing space for certain kinds of dynamic ‘messiness’ the platform was catalyzing (edit wars, inaccuracies, mistakes, fights, etc.) that ensues from collaborative production. In early 2002, however, Sanger was dissatisfied and turned away from the epistemic free-for-all of Wikipedia, towards an expert-written encyclopedic model called Citizendium; Wales stayed, choosing to pursue further the Wikipedia model.[[14]](#footnote-14)

Ever since the Sanger-Wales split, the question of whether online encyclopedias and similar enterprises should be produced by a few accountable individuals (experts) or from the fruits of many (amateur) minds has been a source of heated debate. Internet critic Andrew Keen applauded Sanger for coming to his senses about the (in his view) debased value of amateur contributions in favor of professional expertise.[[15]](#footnote-15) On the other end of the spectrum, many Wikipedia adepts have praised its democratizing potential as well as its ethos of community and collaborative knowledge production available to everyone to read and write.[[16]](#footnote-16)[[17]](#footnote-17) At the same time, the publicly consolidated narrative that Wikipedia is produced by *crowds* has been challenged, most notably by Wikipedia’s founders themselves. In actuality, during the first five years of its existence, Wikipedia was largely dependent on the work of a small group of dedicated volunteers. Although they soon formed a thriving community, the notion of a massive collective of contributors was repeatedly downplayed by Wales. As he pointed out in a talk at Stanford University in 2006:

The idea that a lot of people have of Wikipedia, is that it's some emergent phenomenon—the wisdom of mobs, swarm intelligence, that sort of thing—thousands and thousands of individual users each adding a little bit of content and out of this emerges a coherent body of work. (...) [But Wikipedia is in fact written by] a community, a dedicated group of a few hundred volunteers. (...) I expected to find something like an 80-20 rule: 80% of the work being done by 20% of the users (…) But it's actually much, much tighter than that: it turns out over 50% of all the edits are done by just [0].7% of the users.[[18]](#footnote-18)

As Wales asserts until 2006, Wikipedia was primarily written and maintained by a small core of dedicated editors (2% doing 73.4% of all the edits). Such a disproportionate contribution of (self-)designated co-producers versus ‘common users' can be found in research into production across the larger open source movement. Rishab Aiyer Ghosh and Vipul Ved Prakash were among the first to disaggregate the notion of ‘many minds’ collaborating in the open software movement. From their work, they conclude that ‘free software development is less a bazaar of several developers involved in several projects and more a collation of projects developed single-mindedly by a large number of authors’.[[19]](#footnote-19) In the open source movement then, very few total numbers of people were directly collaborating in developing software. This raises the question whether the same dynamics hold for Wikipedia.

It is important not to entirely dismiss the idea of Wikipedia's mass collectivity as a mere myth. The matter is more complicated than this. From 2004 onwards, the online encyclopedia shows a distinct decline of ‘elite' users while at the same time, the number of edits made by novice users and ‘masses’ steadily increases. Various researchers have pointed to a dramatic shift in workloads to the common user at this point.[[20]](#footnote-20) But instead of explaining the shift as a reversal of existing orders of participation, Kittur et al. speak of marked growth in the population of low edit users in terms of ‘the rise of the bourgeoisie’.[[21]](#footnote-21) Interestingly, these researchers explain this shift and coinage by describing Wikipedia's dynamic social system evolving as a result of the gradual development, implementation, and distribution of content management systems. After an initial period of being managed by a small group of high-powered, dedicated volunteers, the ‘pioneers were dwarfed by the influx of settlers’.[[22]](#footnote-22) The early adopters select and refine the technology and managerial systems, followed by a majority of novice users who begin to be the primary users of the system. Kittur and his colleagues observe a similar decline of elite users in Web 2.0 platforms and suggest that it may be a common phenomenon in the evolution of online collaborative knowledge systems.

This tentative conclusion is reinforced by the research of Burke and Kraut, which shows that to sustain the encyclopedia’s growing popularity, organizers need to identify the platform’s more productive workers and grant them ‘administrator’s status’.[[23]](#footnote-23) Important to note here is that since the publication by Kittur et al. in 2007, the English-language Wikipedia has lost one-third of its editors.[[24]](#footnote-24)[[25]](#footnote-25) Problematically, the composition of this remaining editor-base mainly consists of white male editors, a gender imbalance that plays out in the substance of the encyclopedia project. ‘Its entries on Pokemon and female porn stars are comprehensive, but its pages on female novelists or places in sub-Saharan Africa are sketchy’.[[26]](#footnote-26)[[27]](#footnote-27)

Although Wikipedia researchers who look at compositions of the so-called crowd do observe significant historical changes in the ‘wisdom of crowds’ narrative, their analyses tend to retain a binary divide between (few) experts and (many) common users, without considering other factors affecting collaborative production. Where they do notice the growing presence of non-human actors, such as software tools and managerial protocols, in the evolution of Wikipedia’s social dynamics, they tend to underestimate their importance. In fact, the increasing openness of Wikipedia to inexperienced human users is only made possible by a sophisticated techno-managerial system facilitating collaboration on various levels. Without the implementation of this strict hierarchical content management system and its reliance on MediaWiki software, Wikipedia would most likely have become a chaotic experiment.

According to Alexander Galloway, the Internet and many of its (open source) applications are not simply open or closed, but modulated. More specifically, Galloway’s work is key to comprehending the extent to which networked technology and the management of its developments are moderated by protocol — logics and authority generated ‘from technology itself and how people program it’.[[28]](#footnote-28) Wikipedia, built as an open system and carried out by large numbers of contributors, appears to be a *warm, friendly* technological space, but only becomes warm and friendly through what Galloway refers to as ‘technical standardization, agreement, organized implementation, broad adoption and directed participation’.[[29]](#footnote-29)

It is in these formative years of Wikipedia that the specific technicity of its content materialized and developed into a techno-managerial system, imposing a hierarchical order in deciding what entries to include or exclude and what edits to allow or block.[[30]](#footnote-30) Here, to look more closely at Wikipedia’s organizational hierarchy (Figure 10) is to distinguish various user groups, some of which are ‘global’ (in the sense that they edit across various language Wikipedias) while others are specific to a certain local Wikipedia.

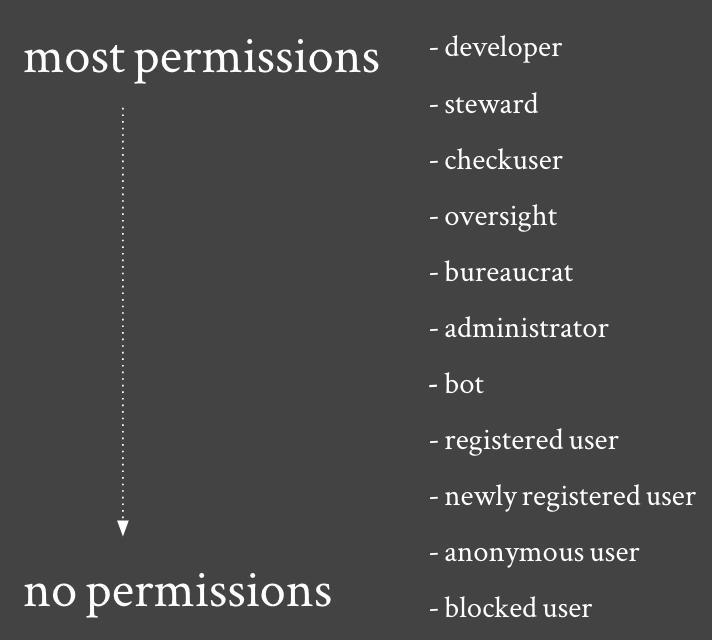


Figure 10: User groups and their permission levels. Schematic overview of global and local categories of Wikipedia users according to permission levels. Wikimedia contributors, 'Wikipedia User Groups', 13 August 2019, http://meta.wikimedia.org/wiki/User\_groups.

Each user group maintains the same pecking order, regulating the distribution of permission levels: blocked users have the least permissions, for they can only edit their own talk page. Unregistered (anonymous) users have fewer permissions than registered users, who, in turn, are at a lower level of permission than bots; bots are close to administrators (or ‘admins'), who occupy the highest level in the elaborate Wikipedia-bureaucracy. System administrators (or ‘developers') have the most permissions, including server access. This is a small user group of only ten people who ‘manage and maintain the Wikimedia Foundation Servers’.[[31]](#footnote-31) Remarkable in this ranking system is the position of bots (short for software robots), whose permission level is just below that of administrators but above the authority of registered users. I will return to the status of bots in the third section. For now, it is important just to note the significant role of automated mechanisms in the control of content.

Taking this notion of Wikipedia as a liberated vehicle of human collaboration, it could be argued that the very success of the Wikipedia project lies less as much in free collaboration as it does in the regulation of collaborative production at every level, from a small edit or a single upload to a more extensive contribution or even development of the platform or its content.[[32]](#footnote-32) Like any large public system, Wikipedia works through a system of disciplinary control by issuing rewards, such as granting a dedicated user the authority level of administrator, and by blocking the contributing rights of those users who deviate from the rules.[[33]](#footnote-33) A disciplinary system of power distribution in the digital age, however, can’t be regarded exclusively as a system of social control.[[34]](#footnote-34) As Gilles Deleuze has pointed out in his acute revision of Foucault’s disciplinary institutions, a ‘society of control’ deploys technology as an intricate part of its social mechanisms.[[35]](#footnote-35) Wikipedia’s content management system, with its distinct levels of permissions, allows moreover for protocological control: a mode of control that is at once social and technological—one cannot exist without the other.[[36]](#footnote-36) Along the same lines, Bruno Latour proposes to analyze technological objects and infrastructures as ‘socio-technical ensembles’, in which the strict division between ‘material infrastructure’ and ‘social superstructure’ is dissolved:[[37]](#footnote-37)

Rather than asking, “is this social” or “is this technical or scientific” [...] we ask: has a human replaced a non-human? Has a non-human replaced a human? […] Power is not a property of any of those elements [of humans or non-humans] but of a chain.[[38]](#footnote-38)

Attending to the chain, rather than reinforcing the ‘technology/society divide’ that these theorists have already deconstructed before me, I argue that Wikipedia’s dynamic interweaving of human and non-human content agents is an underrated yet crucial aspect of its performance. The online encyclopedia’s success is based on socio-technical protocological control, a complex combination of its technical infrastructure and the variegated collective ‘wisdom’ of its contributors. Rather than assessing Wikipedia’s epistemology exclusively in terms of the ‘power of elites’ versus the ‘wisdom of crowds’, I propose to define Wikipedia as a gradually evolving socio-technical system that carefully orchestrates all kinds of human and non-human contributions towards its development, by implementing managerial hierarchies, protocols, and automated editing systems that constitute the technicity of Wikipedia content. This technicity is also deployed to produce accurate and neutral content.

## Accurate and Neutral Encyclopedic Information

Disregard of technological elements occurs in another heated debate haunting the Wikipedia project since its inception: the question of the credibility, accuracy, and objectivity of its content as an encyclopedic knowledge source, given the phenomenal difference of its experiment in socially editable, collaborated and anonymous dissemination. In other words, Wikipedia organizes the authorship of content and manages its standards, and thus ‘authority’, quite differently to offline projects like the Encyclopedia Britannica, against which it has often been compared and tested.[[39]](#footnote-39) In response to this accuracy debate, reliant on the assumed polarity between (known) experts and (unknown) laypersons, few academics proposed to redirect their focus from encyclopedic content to the qualities and agency of Wikipedia’s technological tools.

One exception is a study by historian Roy Rosenzweig that conducted a thorough analysis of Wikipedia content by comparing it biographical entries to entries from the American National Biography Online (written by known scholars).[[40]](#footnote-40) Rosenzweig concludes that the value of Wikipedia should not be sought in the accuracy of its published content at one moment in time but in the dynamics of its continuous editing process — an intricate process where amateurs and experts collaborate in an extremely disciplined manner to improve entries each time they are being edited. Rosenzweig notices the benefits of multiple edits to the factuality of an entry. As he points out, it is not so many crowds of anonymous users that make Wikipedia a reliable resource, but a regulated system of consensus-based editing that shows up how history is written from multiple accounts. In his words: ‘Although Wikipedia as a product is problematic as a sole source of information, the process of creating Wikipedia fosters an appreciation of the very skills that historians try to teach.’[[41]](#footnote-41) One of the most important features, in this respect, is the website's built-in history page for each article, which lets you check the edit history of an entry. According to Rosenzweig, the history of an article, as well as personal watch lists and recent changes pages, are important instruments that give users additional clues to determine the quality of individual Wikipedia entries.

The politics and technicity of anonymity add a whole other layer to the accuracy debates, which is of importance to my development of networked content analysis. Disputes regarding the accuracy and neutrality of Wikipedia’s content concentrate on the inherent unreliability of anonymous sources. How can an entry be neutral and objective if the encyclopedia accepts copy edits from anonymous contributors who might have a vested interest in its outcome? Critics like Keen (2007) and Denning et al. (2005) have objected to the principle of distributing editing rights to all users. What remains unsaid in this debate is that the impact of anonymous contributors is materially restricted due to technological and protocological control mechanisms. At a base level, every erroneous anonymous edit is systematically overruled by anyone who has a (similar or) higher level of permission (which is anyone except for blocked users). Since anonymous users are very low in the Wikipedia pecking order, the longevity of their edits is likely to be short when they break the rules of objectivity and neutrality. Furthermore, for anonymous editors, Wikipedia lists the IP addresses. This has inspired and enabled the creation of counter-tools such as WikiScanner for checking the identity of anonymous contributors, which it does by matching IP addresses with contact information. Bias in contributions can in this way be identified by a layperson, tracked across multiple entries, and if necessary, reversed.[[42]](#footnote-42)[[43]](#footnote-43) My propositions for networked content analysis attendant to these socio-technics is informed by controversy mapping and follows the actors to understand the debate and the state thereof.

The debates concerning Wikipedia's accuracy and neutrality have been dominated by fallacious oppositions of human actors (experts versus amateurs, registered versus anonymous users) and have also favored a static approach to the evaluation of specific content (deemed correct or incorrect at only one particular moment in time). Both of these starting points have been ill-suited for the appreciation and analysis of dynamic and networked content in platforms such as Wikipedia, mostly because a debate grounded in such parameters fails to acknowledge the crucial impact of non-human actors—Wikipedia's dynamic content management system and the protocols by which it is run. Arguably, Wikipedia is not simply the often-advertised platform of ‘many minds,' nor is it merely a free-for-all space for anonymous knowledge production. But there is more to the technicity of Wikipedia content than savvy users armed with notification feeds and monitoring devices. The technicity of Wikipedia content, key to the further development and application of networked content analysis, lies in the totality of tools and software robots used for creating, editing, and linking entries, combating vandalism, banning users, scraping and feeding content and cleaning articles. It is this complex collaboration not of crowds but of human and non-human agents combined, which defines the quality standards of Wikipedia content and is crucial to networked content analysis. These aspects must be taken into account when studying Wikipedia content.

## Co-authored by Bots

The significant presence of bots in Wikipedia’s workings runs counter to the commonly held assumption that Wikipedia content is authored by human crowds. In fact, human editors would be greatly strained to keep up the online encyclopedia if they weren’t assisted by a large number of software robots. Bots are pieces of software or scripts that are designed to ‘make automated edits without the necessity of human decision-making.’ They can be recognized by a username that contains the word ‘bot,' such as SieBot or TxiKiBoT (Wikimedia, n.d.-i).[[44]](#footnote-44) Bots are created by Wikipedians, and once approved, they obtain their own user page and form their own user group with a certain level of access and administrative rights, made visible by flags on a user account page. One year after Wikipedia was founded, bots were introduced to help with repetitive administrative tasks. Since the first bot was created on Wikipedia, the number of bots has grown exponentially. In 2002, there was only one active bot on Wikipedia; in 2006, the number had grown to 151, and in 2008 there were 457 active bots.[[45]](#footnote-45)[[46]](#footnote-46)

In general, there are two types of bots: editing (or ‘co-authoring’) bots and non-editing (or ‘administrative’) bots. Each bot has a very specific approach to Wikipedia content, related to its often-narrow task. Administrative bots are most well known and well-liked among Wikipedia users, deployed to perform policing tasks, such as blocking spam and detecting vandalism. Bots that combat vandalism come into action when seemingly radical or destructive edits are made, for example, when large sections of content are deleted or written over in an article. Spellchecking bots check language usage and make corrections in Wikipedia articles. Ban enforcement bots can block a user from Wikipedia, and thus take away his or her editing rights, which is something a registered user is not able to do. Non-editing bots also include data miners, used to extract information from Wikipedia, and copyright violation identifiers. The latter compare text in new Wikipedia entries to what is already available on the web about that specific topic and report this to a page for human editors to review. Most bots are created to perform repetitive tasks and make many edits. In 2004, the first bots had accrued a record number of 100,000 edits.

The second category of editing or co-authoring bots seems to be much less known by Wikipedia users and researchers (for otherwise, they would certainly have played a role in the debates about reliability and accuracy). While not every bot is an author, all bots can be classified as what I am calling *content agents*, as they all actively engage with Wikipedia content. The most active Wikipedians are, in fact, bots; a closer look at various user groups reveals that bots create a large number of revisions with high quality. Adler et al. (2008) discovered that the two top contributors in their test of the longevity of edits were bots. As mentioned before, bots as a user group have more rights than registered human users and also a particular set of permissions. For instance, bot edits are by default invisible in recent changes logs and watch lists. Research cited above has already pointed out that Wikipedians rely on these notification systems and feeds for the upkeep of articles.

Describing Wikipedians in bipolar categories of humans and non-humans, however, does not do justice to what is the third category of many active users being robustly assisted by administrative and monitoring tools. The capacities of these kinds of users are captured in naming them ‘software-assisted human editors.’ Bots are Wikipedians’ co-authors of many entries. One of the first editing bots to be deployed by Wikipedians was rambot, a piece of software created by Derek Ramsey.[[47]](#footnote-47) Rambot pulls content from public databases and feeds it into Wikipedia, creating or editing articles on specific content, either one by one or as a batch. Since its inception in 2002, rambot has created approximately 30,000 articles on U.S. cities and counties on Wikipedia using data from the CIA World Factbook and the U.S. Census. Since the content produced by authoring bots relies heavily on their source, errors in the data set caused rambot to publish around 2,000 corrupted articles. With time, bot-generated articles on American cities and counties were corrected and complemented by human editors, following a strict format protocol: history, geography, demographics, etc. The articles appear strikingly tidy and informative and remarkably uniform. If we compare, for instance, an article on La Grange, Illinois, as created by rambot in 2002 with a more recent version of this article from 2009, it clearly shows the outcomes of a collaborative editing process; the entry has been enriched with facts, figures and images (Figure 11). The basic format, however, has remained the same. To date, it still is rambot’s main task to create and edit articles about US counties and cities, while human editors check and compliment the facts provided by this software robot.[[48]](#footnote-48)



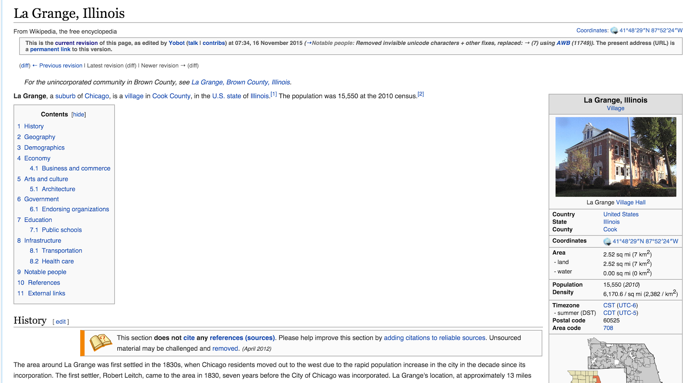


Figure 11: A bot-created article compared to a human-edited article. The upper screenshot is the La Grange, Illinois article as created by rambot on 11 December 2002. The lower screenshot shows the same article on 14 November 2015. Wikipedia contributors, 'La Grange, Illinois', 27 February 2016, https://en.wikipedia.org/w/index.php?title=La\_Grange,\_Illinois&oldid=707244890.

But how dependent is Wikipedia on the use of bots as content agents for the creation and editing of its articles? What is the relative balance of human versus non-human contributions in the online encyclopedia? Peculiarly, the answer to this simple question turns out to be layered and nuanced. From the statistics offered by Wikipedia, it is observable that the use of non-human contributions differs to a striking degree between various language Wikipedias.[[49]](#footnote-49) As a global project, Wikipedia features over ten million articles in over 250 languages. What is the relative balance of human versus non-human agents? The fact that Wikipedia distinguishes between local and global user groups already suggests that bot activity might differ across local Wikipedias. As it turns out, specific language Wikipedias not only greatly vary in size and number of articles, but also in bot activity. The percentage of bot edits in all Wikipedias combined was 21,5% in 2009. In 2014, Wikipedia had 22.4% bot activity. The percentage of bot edits in all Wikipedias combined was 25,8% in February of 2015. Excluding the English language Wikipedia, total bot activity counts up to over 35% (which was 39% in 2009). This shows that bot activity is unevenly distributed across language versions.[[50]](#footnote-50)[[51]](#footnote-51)[[52]](#footnote-52)

To account for the differences in bot activity versus human activity, in previous research I have compared bot activity in the most-used language Wikipedias (English, Japanese, German) to bot activity in endangered and revived language Wikipedias (e.g., Cornish, Oriya, Ladino).[[53]](#footnote-53) Most of the editing of the English, Japanese, and German Wikipedias in 2008 was shown to be done by human editors. The German Wikipedia, for instance, had only 9% bot activity, the English version even less. Wikipedias of small and endangered languages showed a high dependency on bots and a relatively small percentage of human edits. One small Wikipedia, in the language ‘Bishnupriya Manipuri' had seen 97% of its edits made by bots. Further analysis of bot activity versus human activity revealed that the degree of bot dependency could be an indicator of the general state of a language Wikipedia—if not the state of that language itself—in the global constellation.

It is noticeable when looking at the different types of bots that Wikipedias are maintained mainly by bots that network the content. These are called interwiki and interlanguage bots. These bots take care of linking ‘articles to articles’ in Wikipedias, and prevent links and pages from becoming orphans or dead ends. Wikipedia policy states that all articles should be networked and part of the Wikipedia web. Not only are ‘good' Wikipedia articles full of links to reliable sources, but they should also link to related Wikipedia articles and sub-articles, and be linked to. Articles that only refer to each other, but are not linked to or linking to other articles, are also considered a threat to the principle of building the web.[[54]](#footnote-54) Most of the work in interlinking these Wikipedia language versions is done by so-called interwiki bots.

It is possible to analyze a language version’s state of interconnectedness using the Wikipedia statistics pages, featuring lists of the most active bots per language Wikipedia. They reveal that most-used language Wikipedias, which obviously contain much more content than the smaller language Wikipedias, have bot activity distributed across administrative tasks. In German, for instance, the top 45 of most active bots featured 27 interwiki bots and 18 bots that are meant to edit content, add categories and fix broken links. In the smaller language Wikipedias, bots significantly outnumbered human editors and were mostly dedicated to linking articles to related articles in other Wikipedias; they made sure the content, however scarce, is networked. The Cornish Wikipedia’s top 45 of most active bots, for instance, showed at least 35 interwiki bots, and the remainder were bots with unspecified functions. These interwiki bots, such as Silvonenbot, a bot that adds interlanguage links, make connections between various language Wikipedias. Smaller language Wikipedias thus make sure that every article is properly linked sideways and prevent the language Wikipedia from becoming isolated.

Tracing the collaboration between human and non-human agents in Wikipedias thus allows for interesting and unexpected insights into the culturally and linguistically diverse makeup of this global project. Following the ‘wisdom of crowds’ paradigm, it is tempting to look for cultural-linguistic diversity in patterns of transnational collaboration in different languages, from so many proliferated cultural backgrounds. But in line with this paradigm, British information scientists have demonstrated that the Internet – and Wikipedia in particular – is anything but a culturally neutral space; major aspects of online collaborative work are influenced by pre-existing cultural differences between human contributors, as discussed in a comparative content analysis of the editing behavior found in four language versions of the Wikipedia article on Games.[[55]](#footnote-55) Adding a medium-specific networked content analysis of the varied distributions of bot dependency across the wide range of language Wikipedias, it is possible to elaborate further that cultural differences in collaborative authoring of Wikipedia content cannot just be accounted for in terms of human users; they reveal themselves, perhaps more strikingly, in the relative shares of human and non-humans contributions, which can be tracked through automated patterns of contributions. High levels of bot activity, mainly dedicated to networking content and to building the web, are an indicator of small or endangered languages; a wider variety of bot activity, largely subservient to human editing activity, could be considered an indicator of a large and lively language space. This is relevant to the understanding of Wikipedia content, for those researchers invested in its analysis.

Before moving to the climate debate, in the following section, I will present two studies that each offer a close reading of articles in order to study a controversy (in this case the Srebrenica Massacre and the city name of Gdansk) and how it is taking place behind the scenes of Wikipedia articles. I discuss these studies to make a case for an approach to networked content analysis that uses the (ever-evolving) technicity of the Wikipedia platform in the analysis of a controversial topic. Subsequently, I will proceed to discuss the issue central to the book, namely that of the climate change debate. The study explicitly deploys the *networked-ness* of Wikipedia content to demarcate an arrangement of related, interlinked articles and looks into the composition of its editors as well as editing activity over time.

## Wikipedia and Controversy Mapping

In its status as an encyclopedia project, it seems initially counterintuitive to think of Wikipedia as a space of controversy. If it were to operate fully in line with the offline genre of the encyclopedia, as a utility whose information is pre-officiated and fixed (but indeed, revisited authoritatively with each edition) the online reader would assume that all controversy would aim to be resolved as best as possible, prior to its publication. However, due to the way Wikipedia content is networked, designed, and managed, the platform has emerged to be recognized as a unique socio-technical site of, and for, controversy mapping, an encyclopedic project that is ever exposed ‘in the making’. To deal with controversy at the level of information, Jimbo Wales advocates the description of sometimes-conflicting perspectives within the same article, to achieve a neutral point of view (the NPoV rule). In his words:

Perhaps the easiest way to make your writing more encyclopedic is to write about what people believe, rather than what is so. In making this work, the NPoV rule in Wikipedia is crucial and has therefore been heralded as a success story of the potential of open editing. Consider the example of the controversial entry on abortion, where, after a dispute, editors chose to include an in-depth discussion of the different positions about the moral and legal viability of abortion at different times. […] This made it easier to organize and understand the arguments surrounding the topic of abortion, which were each then presented sympathetically, each with its strengths and weaknesses.[[56]](#footnote-56)

There are other examples in which a networked content analysis of controversial Wikipedia articles provides a much richer view of the debates taking place around a particular topic than the site itself can achieve. For instance, using the different language versions of an article is a useful means to compare Wikipedia articles on a single specific issue. Researchers including Rogers and Sendijarevic, and similarly Bilic and Bulian, have pointed out that it is more accurate to say that there are ‘national’ rather than ‘neutral’ points of view, where different language versions provide different views on a specific historic event.[[57]](#footnote-57) In this section, I will discuss two analyses of controversy around the history of a specific place, and how these case studies deploy the technicities of Wikipedia content for their analysis. First, I will discuss a famously debated article on Gdańsk/Danzig.[[58]](#footnote-58) Secondly, I will discuss the study of the Srebrenica massacre by Rogers and Sendijarevic.

The article on Gdańsk/Danzig is one of the better-known controversy objects within Wikipedia.[[59]](#footnote-59) An ethnographic study by Darius Jemelniak explores this case extensively, by looking at how the ‘traditional dispute resolution methods’ of Wikipedia proved ineffective in this case, such that consensus was never reached.[[60]](#footnote-60) The article on Gdańsk, which was written already in 2001 with the start of the Wikipedia project, in its first version consisted of just two sentences: ‘Gdansk is a city in Poland, on the Baltic sea. Its old German name is Danzig.’[[61]](#footnote-61) In December of the same year, after several changes to the body of the article, an editor decided to change its title and all other mentions of Gdańsk in the article to Danzig. Jemelniak describes how various editors have striven to reach a compromise in both the naming and the description of the city and its history through traditional means of conflict resolution, such as discussion on the talk page, mediation by administrators in contributing to the article, closing down the article from editing activity and eventually splitting the article into one about Gdańsk and one about Danzig.

Jemelniak emphasizes that in accordance with the larger Wikipedia model, a consensus is often reached over time; therefore, ‘winning an argument is simply about staying in the discussion long enough’.[[62]](#footnote-62) In the case of Gdansk, however, longevity did not lead to consensus, and the edit war persisted for years. Between 2003 and 2005, the editing was mainly done by four editors heatedly working on the article, which lead administrator Ed Poor (who we will see more of in the study of the climate change articles) to intervene. His efforts however, only exacerbated the edit war, which was by then even listed as one of the ‘lamest edit wars' ever on the Wikipedia page dedicated to tracking these.[[63]](#footnote-63)[[64]](#footnote-64)

Eventually, a sub-page was set up for voting about the naming convention. This subpage first ‘prolonged the debate’ but later did facilitate a vote, which attracted a strikingly small number of only 80 votes.[[65]](#footnote-65) Today, the Gdańsk page in English uses the city name Gdańsk throughout the article, and Danzig has its own dedicated article. Where Jemielniak looks mostly at the various actors and their discussions in the talk page for his content analysis, which allows for a close reading of the controversy, he also makes use of the technicity of the platform that includes the editing history per user, and checks the editing history of some of the 80 editors who did vote, for instance. The fact that some of these editors only had a very limited editing history before the date of the vote raises further questions about whether user accounts were created solely for this purpose.[[66]](#footnote-66)[[67]](#footnote-67) Jemielniak’s analysis concludes from this that Wikipedia as a ‘community relies as much on cooperation as it does on conflict’, which he then fleshes out by looking at the strict editing protocols at play (discussed earlier in this chapter).[[68]](#footnote-68)

In his analysis, Jemielniak makes use of various technicities of Wikipedia. For instance, he looks at the history of the article comparing versions of the article, follows the debate on the talk page, studies the actor composition by looking at the different users in the editing history, and looks at editing activity per user and the profiles of each of the Wikipedians involved in the discussions and editing wars. Furthermore, he gains insight into the internal Wikipedia culture by describing the role of administrators in mediating and locking down controversial articles, and by pointing at the (humorously intended) ‘lamest edit wars’ page.[[69]](#footnote-69) However, where Jemelniak starts his study by saying that ‘traditional dispute resolution methods’ did not work in the Gdańsk/Danzig example, we will see that the eventual forking of the article (into one about Gdańsk and one about Danzig) to displace controversy is a means to end (or at least isolate) controversy. This strategy is used frequently in Wikipedia, and may even be one of the most relied upon, and appreciated dispute resolution mechanisms.

Another strong example of a study that makes use of the technicity of Wikipedia content to appraise controversy in the workings of Wikipedia was conducted by Rogers and Sendijarevic around the topic of the Srebrenica massacre of July 1995. Where Jemielniak describes Wikipedia as a dissent-driven platform, Rogers and Sendijarevic discuss the platform as a ‘cultural reference’, and site for controversy mapping.[[70]](#footnote-70) Perhaps it is needless to emphasize again that this is a counter-intuitive point of departure from the notion of Wikipedia authorship as being principally invested in the cultivation of a neutral point of view (NPoV), to ‘[represent] fairly, proportionately, and as far as possible without bias, all significant views that have been published by reliable sources’.[[71]](#footnote-71) In this case study, conducted by Rogers and Sendijarevic, the research question is whether Wikipedia could show up ongoing differences in points of view on the events of July 1995 in Srebrenica, through a method of comparing various language versions of the article on the Srebrenica Massacre.[[72]](#footnote-72)

The content demarcated for this comparative analysis consists of six language versions of the article on the ‘Srebrenica Massacre’, namely the English, Dutch, Bosnian, Serbian, Croatian, and Serbo-Croatian versions. The content used for comparison contains the common parts of an article, such as title, table of content, authors (or editors), images, and references. Wikipedia-specific content elements that are added to the data set include the discussion pages and the location of anonymous editors (based on their IP-address).[[73]](#footnote-73) This leaves out other similarly specific elements that are also of interest in the study of Wikipedia articles, such as the activity of bots, which as discussed, are often the most active editors, whether across an entire language version of Wikipedia or in a single article.

A first step in the analysis was to align side-by-side the different elements of the various articles. Tables and charts were drawn up, which enabled the researchers to quickly discover that, indeed, significant discrepancies between the different language versions could be discerned. First of all, in the article titles: ‘Srebrenica Massacre’ (English), ‘Masakr u Srebrenici’ (Serbian), ‘Masakr u Srebrenici’ (Serbo-Croatian), ‘Genocida u Srebrenici’ (Bosnian), ‘Genocide u Srebrenici’(Croatian) and ‘De Val van Srebrenica’ (Dutch), they could identify references to this single event as massacre, genocide, or the military term ‘fall’ of Srebrenica, as the Dutch article title reads. Another striking difference could be found in the victim count across article versions (Table 1), where the Dutch and Serbian articles round down, and the others tend to be higher, and the English one most specific.[[74]](#footnote-74)

|  |  |
| --- | --- |
| Wikipedia Language version | Number of Bosniak victims  of the Srebrenica massacre |
| Dutch (Nederlands) | 7000-8000 |
| English | 8372 |
| Bosnian (Bosanski) | 8000 |
| Croatian (Hrvatski) | 8000 |
| Serbian (Srpski) | 6000-8000 |
| Serbo-Croatian (Srpsko-Hrvatski) | 8000 |

Table 1: Wikipedia articles compared across language versions. Comparison of victim counts from the Srebrenica massacre in the Bosnian, Croatian, Dutch, English, Serbian and Serbo-Croatian articles. Rogers and Sendijarevic. 'Neutral or National Point of View?’.

The first analysis confirmed a ‘national’ point of view rather than a ‘neutral’ point of view.[[75]](#footnote-75) With methodological nuance, Rogers and Sendijarevic explore Networked Content Analysis on different technical levels. Firstly, on a Wikipedia language version level, their detailed findings give an overview of the four Balkan language versions (Serbian, Croatian, Serbo-Croatian and Bosnian), and compare them in terms of article count, number of edits, number of users and number of active users. Secondly, on this same level, they compare the creation dates of the various Srebrenica massacre articles in the respective Wikipedia language versions, including Dutch and English, and set these against the creation dates of the Wikipedia language versions themselves.

Analyzing the editors of these articles for each language version, Rogers and Sendijarevic's results show editor activity across language versions, and for the anonymous users (for which an IP-address is listed as mentioned before when discussing the WikiScanner) an overview of their location. (Interestingly, as Networked Content Analysis researchers you can localize anonymous users, but not registered ones.) At the level of the article, their study includes a comparison of the use of images ‘looking at the sheer numbers (62 in total), the shares of them (English with 20, Bosnian 15, Croatian 14, Serbian and Serbo-Croatian 5 and Dutch 3), the common ones, and those that are unique’, and a similar analysis of shared and unique references, the victim count per article, and the table of content.[[76]](#footnote-76) Regarding the talk page, their study offers a very detailed description of the actors’ positions and discussions. Rogers and Sendijarevic make the point that these sub-analyses, especially of discussions, show the struggles to achieve neutrality, especially in the English and Serbo-Croatian version. ‘Editors of the various language versions participate in the English version, which results in a continually contested article often referred to (in the Serbian article) as western biased. The Serbo-Croatian strives to be anti-nationalist and apolitical, employing a variety of means to unify the Bosnian and Serbian points of view.’[[77]](#footnote-77) In all, the researchers found that ‘the analysis provides footing for studying Wikipedia’s language versions as cultural references’.

Both the Danzig and Srebrenica study offer examples of how the technicity of Wikipedia content provides opportunities for controversy mapping. A good example of what a Networked Content Analysis approach could look like when applied to the issue of climate change on Wikipedia can be found in a study by digital methods researchers Carolin Gerlitz and Michael Stevenson, which was conducted already in 2009, and is discussed in the following section. Their case study, titled *The Place of Issues*, combines the study of networked articles with a close reading of editing activity, and actor commitment, including active bots.[[78]](#footnote-78)

## Wikipedia and the Climate Change Debate

In their study, Gerlitz and Stevenson first collect all Wikipedia articles that are interlinked with the article on Global Warming, and only retain the reciprocal links.[[79]](#footnote-79) Subsequently, each of the resulting URLs is scraped for links to Wikipedia articles, which are collected in a relational database. This database is visualized with ReseauLu, software for network analysis and visualization, after which the articles selected for further analysis are highlighted (Figure 12).

The technicity of this Wikipedia article ecology represents a historical and geographical ‘mapping’ of a dispute that can be studied through a Networked Content Analysis. The network graph displays the network of articles surrounding ‘Global Warming’ on Wikipedia, based on links between the articles. The nodes are sized according to their numbers of links, and shaped according to their role in the network (hubs appear in purple), and distributed according to the links they receive (in-degree centrality) and give (out-degree centrality) to other articles. The article ‘Global Warming’ acts as a central node, connecting a dense cluster of articles related to climate change science (e.g. temperature records, key reports and concepts), to a looser, more heterogeneous network of articles, including some of the terms most popularly associated with the issue (‘Climate Change’, ‘Carbon Dioxide’, ‘Ozone Depletion’, ‘Kyoto Protocol' and ‘Renewable Energy'). Notably, this last group includes articles explicitly about the climate change debate: e.g., ‘Scientific Opinion on Climate Change’, ‘Global Warming Controversy', and ‘Solar Variation' (considered by the Wikipedian who created the article as ‘competition for “global warming” theory’).[[80]](#footnote-80) Within both clusters are articles explicitly about climate change debates, such as ‘Scientific opinion on climate change’ and ‘Global warming controversy’ in the looser cluster, and ‘Climate change denial’ in the dense cluster.

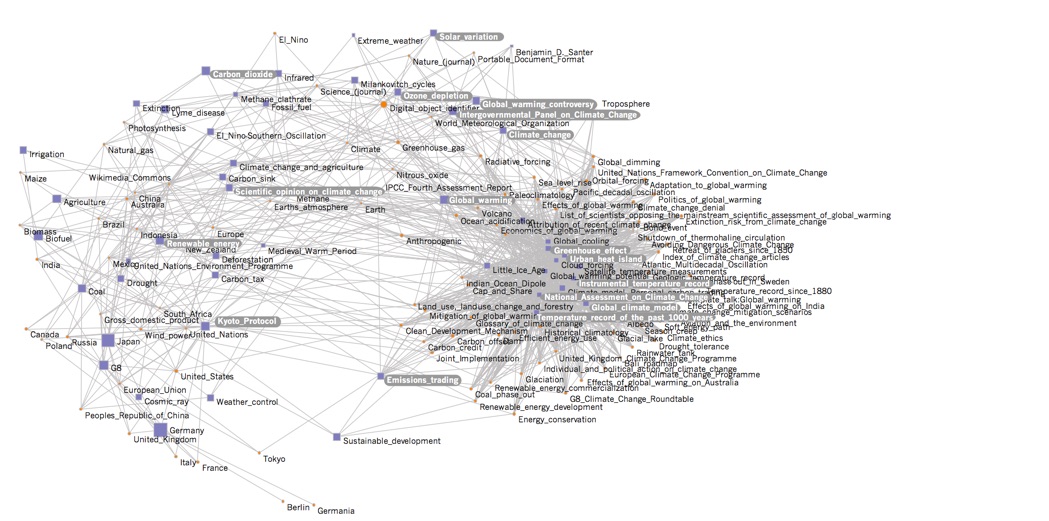


Figure 12: Article network graph. This graph depicts the network of Wikipedia articles interlinked with the ‘Global Warming’ Wikipedia article. Nodes are sized according to numbers of links, shaped according to their role in the network (hubs appear in purple), and distributed according to their in- and out-degree centrality. Digital Methods Initiative, 'The Place of Issues'.

One interpretation of the network of articles comes from the hypothesis that structurally, Wikipedia networks may represent the free encyclopedia's desire to resolve controversy (an aim embodied implicitly, for example, in the aforementioned NPoV core rule). From this perspective, one sees a very clear separation — at the level of discourse and article delineations and links — of factual articles from articles dealing with the popular debate surrounding the existence and causes of Global Warming.[[81]](#footnote-81)[[82]](#footnote-82)[[83]](#footnote-83) In further analyses (below), Stevenson and Gerlitz ask whether the creation of specific new articles dedicated to the controversy may be better viewed as a form of controversy management, one that is specific to Wikipedia.[[84]](#footnote-84)

Stevenson and Gerlitz commenced their study of ‘controversy management’ on Wikipedia by zooming in on editing activity within a select sample of articles address Global Warming. For each article in the sample, they tallied the number of edits per month from November 2001 to July 2009 and visualized this as a (over two meters wide) ‘bubble line’ heat map, where the intensity of the red color indicates editing activity (Figure 13).

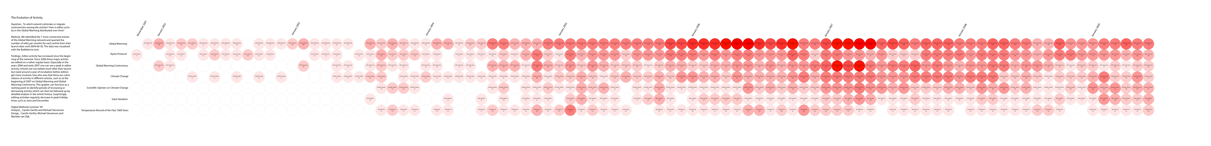


Figure 13: Editing heat map. This is an over two meters-wide bubble line heat map, visualizing the editing activity over time in a set of climate change-related articles. The intensity of the red color indicates the editing activity in the respective article Digital Methods Initiative, 'The Place of Issues'.

Networked Content Analysis allows for a historical reconstruction of a debate. Here, it appears to indicate generic Wikipedia editing trends, such as overall increases of editing interventions over time, and the relative decrease in activity in the months of June and December, as well as to mark out the existence of an 'incubation' period between an article's creation and its maturation, with initial editing and a period of inactivity followed by more regular editing. One may also recognize issue attention cycles as discussed in the Introduction, where ‘new’ news around the controversy or debate has the effect of spiking Wikipedia activity across specific pages. Accounting for tool-assisted human editors, who will receive alerts when ‘their’ articles have been edited, these upward spirals may have resulted in editing wars more than once. For example, consider the editing activity after the release of Climate Change 2007, the Fourth Assessment Report (AR4) of the United Nations Intergovernmental Panel on Climate Change (IPCC) in February of 2007. The sudden decline of activity for the ‘Global Warming’ and ‘Global Warming Controversy’ articles are the result of article protection of both articles after an editing war led administrators to close down the article from further editing. The heat map may thus also be used to signal significant moments in Wikipedia's management of the issue of global warming.[[85]](#footnote-85)

In addition to this editing activity heat map, Gerlitz and Stevenson made a similar bubble heat map of bot activity. Here, they shift focus to the technical actors active in this article ecology and recognize two things. Firstly, and perhaps unsurprisingly, the most actively edited articles in the network have most bot activity. The four most active bots in this space (ClueBot, SmackBot, TawkerBot2, and AntiVandalBot) are anti-vandalism bots that are indeed also most active in the most-edited articles.[[86]](#footnote-86)[[87]](#footnote-87) Secondly, the researchers found that bots do not account for the high editing activity, as most bots that are editing these articles make only up to ten edits each.

More telling in this particular case is a closer view on actor editing activity in the context of controversy management on and by Wikipedia. In February of 2003, the article ‘Scientific Opinion on Climate Change’ was created, which has led to a decline in editing activity both in the article on ‘Global Warming’ and that on ‘Climate Change’. By creating a separate article, the controversy was effectively displaced, taken out of the main articles, and as a ‘controversy object’ moved into its own dedicated space. Gerlitz and Stevenson looked close into this displacement by asking whether this displacement had let to editor migration from the main article on climate change to the controversy article on the scientific opinion on climate change. The visualization in Figure 14 shows the editing activity of those editors active in the ‘Climate Change’ article three months prior to the creation of ‘Scientific Opinion’ and three months after its creation. And indeed, we can see that most editors have migrated along with the newly created article, which again (just like the Gdańsk/Dantzig example) proves the effectiveness of this measure in the management of controversy on Wikipedia through forking. Only one of the editors active in the Climate Change article before the creation of the Scientific Opinion article remains active, however slightly, in the original article on Climate Change. The mass migration of editors who were active in the main article on climate change to the forked debate article on the issue yet again demonstrates a commitment to debate as such, rather than to the knowledge of climate change, as we have also seen in the web analysis of skeptics and their ‘related issues’ in the previous study in Chapter 3.

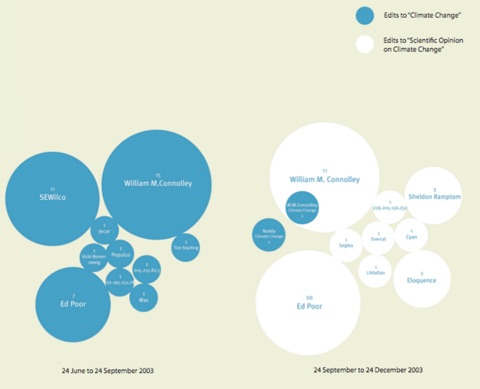


Figure 14: Editor migration map. This Dorling map visualizes the activity of editors active in the ‘Climate Change’ Wikipedia article in June of 2003 (left), as compared to those active in the articles on ‘Climate Change’ and ‘Scientific Opinion on Climate Change’ (right). Digital Methods Initiative, 'The Place of Issues'.

The above case studies are examples of how the methods of Networked Content Analysis can close-read the dynamics of controversy and controversy management in relationships between content and its technicity. As discussed in the first part of this chapter, much of the research has focused on the accuracy of Wikipedia content and its editor's collective (however small) effort to reach high quality and neutral content. However, these case studies reveal that for controversial topics, the articles presented may be the result of contestation, mediation, lock-down, or displacement.

Wikipedia, as an online encyclopedia project, presents hotly debated climate change entries side by side to more straightforward and uncontroversial entries. To further the study of Wikipedia content production and controversy, researchers, programmers, and designers of four universities working together in the context of the aforementioned project Electronic Maps to Assist Public Science (EMAPS) have created *Contropedia*, an analytical platform that offers novel visual analyses of the instances and objects of contestation within Wikipedia articles.[[88]](#footnote-88)[[89]](#footnote-89) Their key orientation towards these inquiries and their utility is that conflicts on Wikipedia ‘often reflect larger societal debates’.[[90]](#footnote-90) Contropedia, presently being developed for both the public and specific users such as scientists and decision-makers, aims to extract social controversies from Wikipedia and provide new insights into these through visualization tools. Contropedia builds its metrics on those of Wikipedia itself, and combines real-time data about editing and discussion activity, to ‘[allow] for a deeper understanding of the substance, composition, actor alignment, trajectory and liveliness of controversies on Wikipedia’.[[91]](#footnote-91) This commitment to the co-development of, essentially, a publicly available tool for networked content analysis, is perhaps a sign of this practice that I am outlining in this thesis starting to take form further, and is confirmed as necessary for public and civic sector needs. Contropedia is specific to Wikipedia, and could even help to refine the impact and relevance of the Wikipedia project, and will clearly provide a powerful tool for a networked content analysis of controversial issues, repurposing markers of technicity by reading them as markers of controversy (e.g. editing activity or talk page activity).

As discussed in the Introduction, in present media conditions, a clean separation of content from the platforms that serve and format it is no longer feasible. It is now impossible, or, at least, unadvisable, to regard a Wikipedia article as entirely separate from its publicly available production process. Questions regarding actor composition, bot activity, discussion, and forking are of great interest to those invested in content analysis in a networked era as such, and to anyone embarking on the mapping of a contemporary debate. Krippendorff has laid the groundwork for such analysis, well prior to content analysis having to deal with online content. Furthermore, Krippendorff has laid out the non-intrusiveness of the approach, the inclusion of content in all its shapes and forms, and the attention to the context of content, which are all applicable to the study of a debate in Wikipedia. By extending the approach to adapt to the specificities of networked content, I have proposed to take up digital methods and research *principles*, if you will, from controversy mapping. Herring, in her 2010 piece, has also suggested extending the paradigm of content analysis to suit web content. However, in contrast with her suggestion to pull in methods from non-digital realms, I propose to build on existing digital methods to suit the study of networked content. As controversy mapping urges researchers to *follow the actors* and *describe what you see* (rather than carrying pre-set categories and codebooks), this encourages the Networked Content Analysis researcher to make use of the networkedness of content and traverse content spaces.

## Conclusions

In line with David Beer’s call for a more thorough understanding of the ‘technological unconscious’ of participatory web cultures, I have in this chapter discussed several methods to study networked content while unraveling in detail the close interdependency of human and technological agents, in order to further the instruments needed for Networked Content Analysis.[[92]](#footnote-92) It is important to comprehend the powerful information technologies that shape our everyday life and the coded mechanisms behind our informational practices and cultural experiences. The analysis of the Wikipedia platform as a socio-technical system is a first step in the direction of developing such adaptive techniques for networked content analysis.

The first generation of scholarly Wikipedia research has focused mainly on the platform’s capacities for crowdsourcing knowledge production, as well as on the reliability of its co-produced content. I have argued for more attention to the machinery that facilitates and formats this knowledge production. While traditional content analysis may reach its limits to struggle with the omnipresence of technical agents in the wiki-platform of Wikipedia, networked content analysis provides means to properly assess Wikipedia’s content, across articles and language versions. Nicolas Carr has compared Web 2.0 to the mechanical Turk (of the late 18th century), which ‘turns people’s actions and judgments into functions in a software program’.[[93]](#footnote-93) Wikipedia, on the other hand, could be described as its opposite; people are so focused on watching the humans creating knowledge that they do not see the machinery and actual bots that are so entangled with what is created and collaborated.[[94]](#footnote-94) A thorough and critical understanding of the automated processes that structure human judgments and decisions in and beyond online space requires analytical skills and medium-specific methods. These are crucial to a full understanding of how Wikipedia and other online platforms work. The methods are also useful for users learning to critically analyze their interactions with technology beyond softwarized modes of control, and towards active engagement in technologized knowledge development.[[95]](#footnote-95) Furthermore, by assessing Wikipedia's content across articles and language versions, and its comparison to more static encyclopedia projects, frameworks, and tools for networked content analysis also make it clear how Wikipedia is socio-technically modulated towards reliability and consensus over time.

Wikipedia has never been an egalitarian space; its various user groups have very distinct levels of permissions, and it is not only human actors that form the hard core of editors. In this chapter, I have argued how Wikipedia’s collaborative qualities and workings are complexly technical and hierarchical, involving not only human users but specific combinations of human and non-human actors.[[96]](#footnote-96) Since 2002, Wikipedia content has been maintained by both tool-assisted human editors and bots, and collaboration has been modulated by protocols and strict managerial hierarchies. Bots are systematically deployed to detect and revert vandalism, monitor certain articles, and, if necessary, ban users, but they also play a substantial role in the creation and maintenance of content. As I have pointed out, bot activity may also be analyzed, perhaps counter-intuitively, as an indicator of the international or intercultural dimension of Wikipedia as a global project.

Studies that include technicity, non-human actors, and coded protocols can contribute greatly to our understanding of controversial topics such as climate change on platforms like Wikipedia. In this chapter, attention to climate change as a web-based controversy object, and to recent software projects such as Contropedia, enables a socio-technical view behind the scenes of collaborative knowledge production.[[97]](#footnote-97) With its history tabs and discussion pages, its intricate administrative systems of editing policy, software robots, and tool-assisted humans, Wikipedia proves to be a place and platform par excellence to conduct networked content analysis to map controversy dynamics.[[98]](#footnote-98)[[99]](#footnote-99)

Asking what kind of climate change debate Wikipedia puts forward, I want to conclude that Wikipedia offers critical insights into the socio-technics of online knowledge production and controversy management. However different its technicity is from other parts of the web, Wikipedia shares a capacity alongside the other platforms of this thesis to be extremely useful for the study of actor commitment. The mass migration of editors of the main article on climate change to the forked debate article, for instance, yet again underlines the skeptics’ commitment to debate *as such*, rather than to climate change as a specific topic and research field. This harkens back to the study of the skeptics on the web, where we found their ‘related issues' to be largely unrelated to climate change (see chapter 3). The different and recurring research findings, methodological insights, and analytics emphasized in this, and the previous chapter might prove to be scalable to other platforms and web infrastructures, too, as will be similarly explored in the following chapter on content networked by Twitter. In the next chapter, I will assess the composition of actors for even more specific climate-related discourses. Additionally, I will further ‘profile' these sub-discourses by looking at most amplified content (retweets) and most-shared content (by looking at the URLs included in tweets). So far, I would argue that the vastly different technicities we have encountered in the first two case studies confirm the necessity to refine the definitions and demarcations of (the materiality of) content, and recognize the technicity as an active agent and part of networked content.

1. Shirky, *Here Comes Everybody.* [↑](#footnote-ref-1)
2. A. Keen, *The Cult of the Amateur: How blogs, MySpace, YouTube, and the Rest of Today’s User-generated Media Are De-stroying Our Economy, Our Culture, and Our Values*, New York: Doubleday Currency, 2007. [↑](#footnote-ref-2)
3. C.R. Sunstein, *Infotopia: How Many Minds Produce Knowledge*, Oxford: Oxford University Press, 2006 [↑](#footnote-ref-3)
4. A. Kittur and R.E. Kraut, 'Harnessing the Wisdom of Crowds in Wikipedia: Quality Through Coordination', in *Proceedings of the ACM 2008 Conference on Computer Supported Cooperative Work*, New York: ACM, 2008, pp. 37-46. [↑](#footnote-ref-4)
5. Surowiecki, *The Wisdom of the Crowds.* [↑](#footnote-ref-5)
6. Shirky, *Here Comes Everybody.* [↑](#footnote-ref-6)
7. D. Tapscott and A.D. Williams, *Wikinomics. How Mass Collaboration Changes Everything* (New York: Penguin, 2006). [↑](#footnote-ref-7)
8. A. Bruns, *Blogs, Wikipedia, Second Life, and Beyond: From Production to Produsage*, New York: Peter Lang, 2008. [↑](#footnote-ref-8)
9. J. Howe, 'The Rise of Crowdsourcing', *Wired Magazine* 14.6 (2006): 1–4. F. [↑](#footnote-ref-9)
10. Stalder and J. Hirsh, 'Open source intelligence', *First Monday* 7.6 (2002): http://firstmonday.org/htbin/cgiwrap/bin/ojs/index.php/fm/article/viewArticle/961/88. M. Poe, 'The Hive', *The Atlantic Online*, September 2006, http://www.theatlantic.com/doc/200609/wikipedia. [↑](#footnote-ref-10)
11. N. Baker, 'The Charm of Wikipedia,' *New York Review of Books*, 55.4 (2008), http://www.nybooks.com/articles/2008/03/20/the-charms-of-wikipedia/. [↑](#footnote-ref-11)
12. Shirky, *Here Comes Everybody,* 109. [↑](#footnote-ref-12)
13. Shirky, *Here Comes Everybody.* Poe, ‘The Hive’. [↑](#footnote-ref-13)
14. See also Citizendium. 'Citizendium Beta', http://en.citizendium.org/wiki/Welcome\_to\_Citizendium. See also historiographies of Wikipedia in: A. Dalby, *The World and Wikipedia: How We Are Editing Reality* (Somerset: Siduri Books, 2009); J.M. Reagle, *Good Faith Collaboration: The Culture of Wikipedia,* Cambridge, MA: MIT Press, 2010; and A. Lih, *The Wikipedia Revolution: How a Bunch of Nobodies Created the World’s Greatest Encyclopedia*, London: Aurum Press, 2009. [↑](#footnote-ref-14)
15. Keen, *The Cult of the Amateur,* 186. [↑](#footnote-ref-15)
16. Y. Benkler, *The Wealth of Networks: How Social Production Transforms Markets and Freedom*, New Haven: Yale University Press, 2006. [↑](#footnote-ref-16)
17. H. Jenkins, *Convergence Culture: Where Old and New Media Collide*, Cambridge, MA: MIT Press, 2006. [↑](#footnote-ref-17)
18. A. Swartz, 'Who Writes Wikipedia', 2006, http://www.aaronsw.com/weblog/whowriteswikipedia/. [↑](#footnote-ref-18)
19. R.A. Ghosh and V.V. Prakash. 'Orbiten Free Software Survey', *First Monday* 5.7 (2000): 1. [↑](#footnote-ref-19)
20. A. Kittur, E. Chi, B.A. Pendleton, B. Suh, and T. Mytkowicz, 'Power of the Few vs. Wisdom of the Crowd: Wikipedia and the Rise of the Bourgeoisie', in *CHI*, 2007, San Jose. [↑](#footnote-ref-20)
21. Kittur et al. 'Power of the Few vs. Wisdom of the Crowd,’ 7. [↑](#footnote-ref-21)
22. Kittur et al. 'Power of the Few vs. Wisdom of the Crowd,’ 7. [↑](#footnote-ref-22)
23. M. Burke and R. Kraut, R. 'Taking Up the Mop: Identifying Future Wikipedia Administrators' in *Proceedings of the 2008 CHI Conference, Florence*, New York: ACM, 2008, pp. 3441-3446, http://portal.acm.org/citation.cfm?id=1358628.1358871. [↑](#footnote-ref-23)
24. Kittur et al. 'Power of the Few vs. Wisdom of the Crowd’. [↑](#footnote-ref-24)
25. Simonite, ‘The Decline of Wikipedia’. [↑](#footnote-ref-25)
26. Simonite, ‘The Decline of Wikipedia’. [↑](#footnote-ref-26)
27. See also A. Halfaker, R.S. Geiger, J. Morgan, and J. Riedl, 'The Rise and Decline of an Open Collaboration System: How Wikipedia’s Reaction to Sudden Popularity Is Causing Its Decline', *American Behavioral Scientist* 57.5 (2013): 664–688, http://doi.org/10.1177/0002764212469365, for a detailed study of this problem. [↑](#footnote-ref-27)
28. A. Galloway, *Protocol: How Control Exists after Decentralization*, Cambridge, MA: MIT Press, 2004, 121. [↑](#footnote-ref-28)
29. Galloway, *Protocol,* 142. [↑](#footnote-ref-29)
30. Joseph Reagle has described these dilemmas and protocols around openness versus control in his book *Good Faith Collaboration: The Culture of Wikipedia*, in the chapter titled ‘The Puzzle of Openness’ (pp. 73–96). [↑](#footnote-ref-30)
31. Wikimedia contributors, 'System Administators', 3 August 2019, http://meta.wikimedia.org/wiki/System\_administrators. [↑](#footnote-ref-31)
32. A lot of this is literally implemented in MediaWiki. [↑](#footnote-ref-32)
33. Burke and Kraut, ‘Taking Up the Mop’. [↑](#footnote-ref-33)
34. Social scientist Mathieu O’Neil has studied the hierarchies and power structures within Wikipedia, and underlines the ‘social authority’ of Wikipedia administrators as ‘interpreters of policy — judge, jury and executioner’. M. O’Neil, *Cyberchiefs: Autonomy and Authority in Online Tribes*, New York: Pluto Press, 2009, 159. [↑](#footnote-ref-34)
35. G. Deleuze, 'Society of Control', *L’autre Journal,* 1 (1990): http://www.nadir.org/nadir/archiv/netzkritik/societyofcontrol.html. [↑](#footnote-ref-35)
36. Galloway, *Protocol,* 17. [↑](#footnote-ref-36)
37. Latour, 'Technology Is Society Made Durable', 129. [↑](#footnote-ref-37)
38. Latour, 'Technology Is Society Made Durable', 110. [↑](#footnote-ref-38)
39. See Niederer and van Dijck, ‘Wisdom of the Crowd or Technicity of the Content?’ for the extended discussion of these tests and their outcomes. [↑](#footnote-ref-39)
40. Rosenzweig, ‘Can History Be Open Source?’. [↑](#footnote-ref-40)
41. Rosenzweig, ‘Can History Be Open Source?’, 138. [↑](#footnote-ref-41)
42. On the History page of each Wikipedia entry, it is possible to access the timestamp and IP-address for every anonymous edit made. The WikiScanner, a tool created by California Institute of Technology student Virgil Griffith in 2007, made it possible for anyone (not just logged in Wikipedia editors) to geo-locate anonymous edits by looking up the IP addresses in a IP-to-Geo database and listing the IP addresses and the companies and institutions they belong to, thus offering a tool for journalists trying to locate and expose biased content. In the WikiScanner FAQ on his website, Griffith states he created the WikiScanner to (among other reasons) ‘create a fireworks display of public relations disasters in which everyone brings their own fireworks, and enjoys’. The WikiScanner was designed to reveal bias, and Griffith has collected the most spectacular results on his website. The Wikiscanner is now offline. [↑](#footnote-ref-42)
43. On December 21, 2012, an open-source clone of WikiScanner called *WikiWatchdog* was launched. F. Scrinzi and P. Massa, 'WikiWatchDog', 2010, http://www.wikiwatchdog.com. [↑](#footnote-ref-43)
44. The name ‘bot,' and my description here of their movements may make bots appear as elaborate kinds of Artificial Intelligence robots but in fact they are mostly very simple scripts that are triggered by rules. [↑](#footnote-ref-44)
45. Wikimedia contributors, 'Bot Activity Matrix', http://stats.wikimedia.org/EN/BotActivityMatrix.htm. [↑](#footnote-ref-45)
46. Wikimedia contributors. 'Editing Frequency of All Bots', 3 March 2018, http://en.wikipedia.org/wiki/Wikipedia:Editing\_frequency/All\_bots. [↑](#footnote-ref-46)
47. Wikimedia contributors, 'User:Ram-Man', 1 March 2016, https://en.wikipedia.org/w/index.php?title=User:Ram-Man&oldid=707772255. [↑](#footnote-ref-47)
48. See SmackBot’s request for approval here: http://en.wikipedia.org/wiki/Wikipedia:Bots/Requests\_for\_approval/SmackBot\_0. [↑](#footnote-ref-48)
49. 'Wikimedia Statistics', http://stats.wikimedia.org/. [↑](#footnote-ref-49)
50. See also ‘Wikimedia Statistics’, http://stats.wikimedia.org/. [↑](#footnote-ref-50)
51. Researchers have also studied controversial ‘forkings’ (or splitting) of language versions, most famously the Spanish fork of 2002, a full copy of the Spanish Wikipedia content to a new wiki with the name ‘Enciclopedia Libre,’ which left the ‘Spanish Wikipedia rather inactive for all of 2002’. Lih, *The Wikipedia Revolution,* 138. [↑](#footnote-ref-51)
52. See also: N. Tkacz, *Wikipedia and the Politics of Openness*, Chicago: University of Chicago Press, 2015. [↑](#footnote-ref-52)
53. Digital Methods Initiative, 'Networked Content', 2008, https://digitalmethods.net/Digitalmethods/TheNetworkedContent. [↑](#footnote-ref-53)
54. See also Wikimedia contributors, 'Wikipedia:Manual of Style/Linking', 5 March 2016, https://en.wikipedia.org/w/index.php?title=Wikipedia:Manual\_of\_Style/Linking&oldid=708334675. [↑](#footnote-ref-54)
55. U. Pfeil, P. Zaphiris, C.S. Ang, 'Cultural Differences in Collaborative Authoring of Wikipedia', *Journal of Computer-Mediated Communication* 12.1 (2006): 88–113. [↑](#footnote-ref-55)
56. Wales in Bruns, *Gatewatching,* 112. [↑](#footnote-ref-56)
57. R. Rogers and E. Sendijarevic, 'Neutral or National Point of View? A Comparison of Screbrenica Articles across Wikipedia’s Language Versions', presented at the Wikipedia Academy 2012, Berlin, 2012. [↑](#footnote-ref-57)
58. D. Jemielniak, *Common Knowledge? An Ethnography of Wikipedia*, Stanford, CA: Stanford University Press, 2014. [↑](#footnote-ref-58)
59. Wikipedia contributors, 'Gdańsk', 10 March 2016, https://en.wikipedia.org/w/index.php?title=Gda%C5%84sk&oldid=709411660. [↑](#footnote-ref-59)
60. Jemielniak, *Common Knowledge?,* 59. [↑](#footnote-ref-60)
61. Jemielniak, *Common Knowledge?,* 65. [↑](#footnote-ref-61)
62. In his book chapter on the controversy, Jemielniak describes the various editor types that remained active throughout the years and distinguishes between ‘at least four groups’, including German and Prussian nationalists (pro-Danzig), Polish nationalists (pro-Gdańsk), editors trying to end the dispute by looking at sources (no preference), and editors trying to end the dispute through mitigation and inclusion of all viewpoints. Jemielniak, *Common Knowledge?,* 67. [↑](#footnote-ref-62)
63. Poor suggested the following solution: ‘Gdańsk (or Danzig) is a famous European city with a long and colourful history. It is known in English by two slightly different names: in alphabetical order, *Danzig* (German) and *Gdansk* (Polish)’. Jemielniak, *Common Knowledge?,* 69. [↑](#footnote-ref-63)
64. See also: Wikimedia contributors, 'Lamest Edit Wars', 17 July 2019, http://en.wikipedia.org/wiki/Wikipedia:Lamest\_edit\_wars. [↑](#footnote-ref-64)
65. Jemielniak, *Common Knowledge?,* 73. [↑](#footnote-ref-65)
66. The first sentence of the Gdańsk article reads: ‘Gdańsk (pronounced [gdaɲsk], English pronunciation [/](http://en.wikipedia.org/wiki/help:ipa_for_english)[ɡəˈdænsk](http://en.wikipedia.org/wiki/help:ipa_for_english#Key)/, German: Danzig, pronounced [ˈdantsɪç], also known by other alternative names) is a Polish city on the Baltic coast, the capital of the Pomeranian Voivodeship, Poland's principal seaport and the centre of the country's fourth-largest metropolitan area.’ Wikipedia contributors, 'Gdańsk', 10 March 2016, https://en.wikipedia.org/w/index.php?title=Gda%C5%84sk&oldid=709411660. [↑](#footnote-ref-66)
67. The first sentence of the ‘Free City of Danzig’ article reads ‘The Free City of Danzig ([German](http://en.wikipedia.org/wiki/german_language): Freie Stadt Danzig; Polish: Wolne Miasto Gdańsk) was a semi-[autonomous](http://en.wikipedia.org/wiki/autonomous) [city-state](http://en.wikipedia.org/wiki/city-state) that existed between 1920 and 1939, consisting of the [Baltic Sea](http://en.wikipedia.org/wiki/baltic_sea) port of Danzig (now Gdańsk, Poland) and nearly 200 towns in the surrounding areas.’ Wikipedia contributors, 'Free City of Danzig', 14 August 2019, http://en.wikipedia.org/wiki/Free\_City\_of\_Danzig. [↑](#footnote-ref-67)
68. Jemielniak, *Common Knowledge?,* 84. [↑](#footnote-ref-68)
69. The questions of which lock-down mechanisms are deployed by Wikipedia and what is the role of bots (and their automated user blocking) in these edit wars are worth asking here too. [↑](#footnote-ref-69)
70. Rogers and Sendijarevic. 'Neutral or National Point of View?’ [↑](#footnote-ref-70)
71. ‘Wikipedia: Neutral Point of View’, 2012, <https://en.wikipedia.org/wiki/Wikipedia:Neutral_point_of_view>. [↑](#footnote-ref-71)
72. Rogers and Sendijarevic. 'Neutral or National Point of View?’ [↑](#footnote-ref-72)
73. Rogers and Sendijarevic. 'Neutral or National Point of View?’ [↑](#footnote-ref-73)
74. Rogers and Sendijarevic. 'Neutral or National Point of View?’ [↑](#footnote-ref-74)
75. Rogers and Sendijarevic. 'Neutral or National Point of View?’ [↑](#footnote-ref-75)
76. Rogers and Sendijarevic. 'Neutral or National Point of View?’, 46. [↑](#footnote-ref-76)
77. Rogers and Sendijarevic. 'Neutral or National Point of View?’, 1. [↑](#footnote-ref-77)
78. Digital Methods Initiative, 'The Place of Issues', 2009, https://wiki.digitalmethods.net/Dmi/ThePlaceOfIssues. [↑](#footnote-ref-78)
79. Digital Methods Initiative, ‘The Place of Issues’. [↑](#footnote-ref-79)
80. Digital Methods Initiative, 'The Place of Issues'. [↑](#footnote-ref-80)
81. Digital Methods Initiative, 'The Place of Issues'. [↑](#footnote-ref-81)
82. In a brief study of the skeptics’ resonance in this set of Wikipedia articles, I took the list of interlinked global warming-related articles and queried them for a list of known skeptics — the keynote speakers of the first Heartland climate change conference in 2008 — and found most mentions of these skeptics in the articles on the ‘Climate Change Controversy’ and the ‘Inter-governmental Panel of Climate Change.’ S. Fred Singer was the most mentioned skeptic, listed in four different global warming related articles. [↑](#footnote-ref-82)
83. See also Digital Methods Initiative, ‘Climate Change Sceptiks in the Wikipedia Climate Change Space’. [↑](#footnote-ref-83)
84. This relates to what Jemielnak phrased as dispute resolution mechanisms, and also to the sociological studies of science and technology as discussed in the first chapter. [↑](#footnote-ref-84)
85. Digital Methods Initiative, 'The Place of Issues'. Another part of their study zooms in on bot activity, which is similarly visualized as a heat map ‘bubble line.’ [↑](#footnote-ref-85)
86. ClueBot (now called ClueBot NG) is an anti-vandalism bot; SmackBot (presently called Helpful Pixie Bot) is an editing bot, mostly formatting articles. TawkerBot2 and its follow-up AntiVandalBot were anti-vandalism bots (currently inactive). [↑](#footnote-ref-86)
87. See also: Wikipedia contributors, ‘User: AntiVandalBot’, https://en.wikipedia.org/wiki/User:AntiVandalBot. [↑](#footnote-ref-87)
88. Emaps, ‘Contropedia’. [↑](#footnote-ref-88)
89. My discussion of this project and other research and art projects related to big data was published in *Big Data & Society*: S. Niederer and R. Taudin Chabot, 'Deconstructing the Cloud: Responses to Big Data Phenomena From Social Sciences, Humanities and the Arts', *Big Data & Society* 2.2 (2015): http://doi.org/10.1177/2053951715594635. [↑](#footnote-ref-89)
90. Borra et al. ‘Societal Controversies in Wikipedia Articles’. [↑](#footnote-ref-90)
91. Emaps, ‘Contropedia’. [↑](#footnote-ref-91)
92. D. Beer, 'Power Through the Algorithm? Participatory Web Cultures and the Technological Unconscious', *New Media & Society*, 11.6 (2009): 985–1002. [↑](#footnote-ref-92)
93. Carr, *The Big Switch,* 218. [↑](#footnote-ref-93)
94. See also Niederer, 'Interview'. [↑](#footnote-ref-94)
95. Zittrain, *The Future of the Internet*, 245. [↑](#footnote-ref-95)
96. Critiquing the presentation of non-human actors as existing more or less autonomously from human users, Jaron Lanier has argued that: ‘Some people […] believe they are hearing algorithms and crowds and other internet-supported nonhuman entities speak for themselves. I don’t hear their voices, though – and I believe those who do are fooling themselves.’ Lanier, *You Are Not a Gadget,* 39. [↑](#footnote-ref-96)
97. Climaps, 'Contropedia'. [↑](#footnote-ref-97)
98. R.S. Geiger and D. Ribes, 'The Work of Sustaining Order in Wikipedia: The Banning of a Vandal', in *Proceedings of the ACM 2010 conference on Computer supported cooperative work (CSCW)*, Atlanta, GA: Association for Computing Machinery, 2010, http://www.stuartgeiger.com/wordpress/wp-content/uploads/2009/10/cscw-sustaining-order-wikipedia.pdf. [↑](#footnote-ref-98)
99. Niederer and van Dijck, ‘Wisdom of the Crowd or Technicity of the Content?’ [↑](#footnote-ref-99)