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The Handbook of Peer Production

Chapter 13: Wikipedia and Wikis

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1. Introduction

WikiWikiWebs or wikis constitute the core platform of peer production. Wikis are software programs allowing for flexible collaboration without necessarily having a defined content owner or leader. A wiki is a user-editable website or content management system. Wikis might use different programming languages and licenses, but they apply the same model for cooperation, which means that collaborators can modify content, insert hyperlinks, and change the structure of a document directly in any web browser. Edits are usually archived and open to revision for all collaborators. The most popular and successful wiki-based project by far is Wikipedia. Established in 2001, today this encyclopedia is one of the most popular sites on the Web; what is more, with its data supporting other applications and commercial platforms like Google, Wikipedia has taken on an infrastructural role in the contemporary internet. This chapter lays the groundwork for a basic technical understanding of wikis and Wikipedia, sometimes with reference to Wikipedia itself, but also to reviews of research from a number of different disciplines, including (but not limited to) computer science, media and communication studies, and information studies. It delineates their most central design principles, history and affordances.

Wikis are described as content management systems that allow for flexible collaboration without a defined content owner or leader. Users can modify the content and structure of documents directly in their web browser. Edits are usually archived and open to revision. This chapter pays particular attention to the most successful wiki-based system, the non-profit, online encyclopedia Wikipedia. As the chapter explains, Wikipedia actually contains a broad range of more or less individual wiki projects and has inspired a plethora of other endeavors, both open source and proprietary. The particular peer production model employed in Wikipedia is elucidated, and in the course

also complicated and critically assessed. The chapter concludes by highlighting a number of tensions emerging from a wiki-based peer production model, between amateurs and experts, human editors and bots, lay knowledge and academic knowledge and the shaping of trust through external actors.

There is a substantial amount of literature on Wikipedia (for research overviews, see Jullien, 2012; Mesgari et al., 2014; Okoli et al., 2012, 2014) and therefore this chapter will only review selected highlights. Furthermore, the focus is on wikis and Wikipedia in the context of peer production; accordingly, it leaves out many other aspects of Wikipedia research (such as studies on the quality of content *per se* or on Wikipedia usage in different settings) except for when those aspects can be related to peer production. It should also be noted that the academic interest in wikis and Wikipedia peaked around 2015, after about a decade of intense research activity, and has since then has decreased, as Figure 1 illustrates.

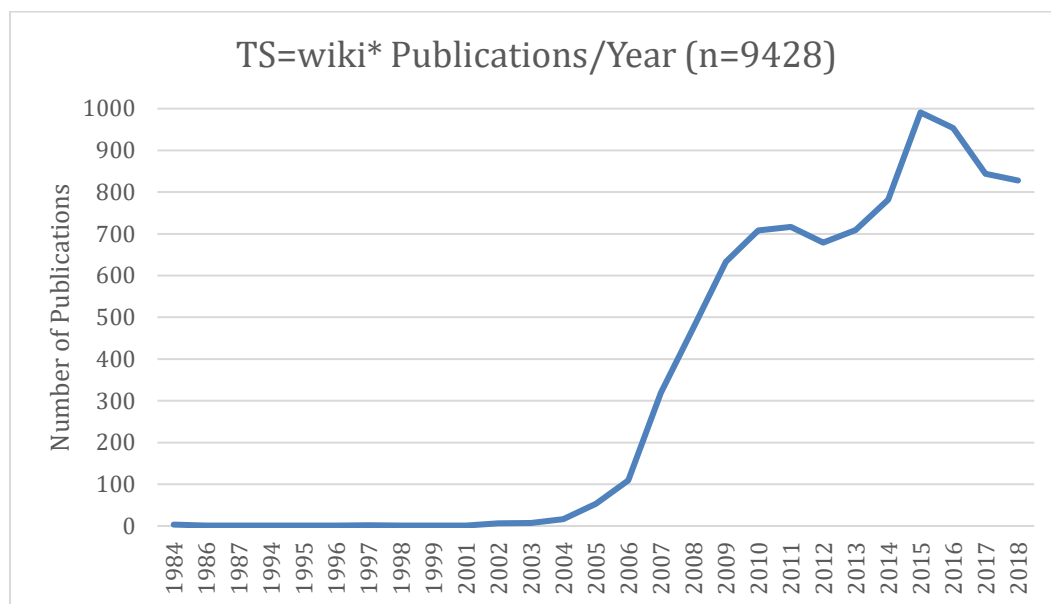


Figure 1: Articles in World of Science database 1994-2018 with wiki* in the article title.

This diminishment of scholarly interest might result from the fact that wikis, and especially Wikipedia, are nowadays taken for granted and their mode of peer production is no longer considered noteworthy. Wikipedia itself has an article for research on Wikipedia with links to ethical guidelines (Research, 2019, March 24), and some of its administrators also engage in research on and development of Wikipedia or other wikis. The foundation behind Wikipedia, Wikimedia, has developed a specific wiki system, the MediaWiki, that operates a number of other wikis based on this software and also employs a research team that works to improve their various wikis (Wikimedia Research, n. d.).

2. The Wiki Platform

The initial development of wikis can be traced back to 1994 when American programmer Ward Cunningham started developing a software intended to simplify collaboration during programming. This software came to be the first wiki (WikiWikiWeb). The name *wiki*, coined by Cunningham in the 1990s, comes from Hawaiian and means “quick.” Since its inception, countless wikis have been set up for many different purposes. Many of these are open for anybody to contribute to, although the subjects addressed in many cases are very specialized, which limits public interest. Other wikis, such as those that have been set up to support cooperation within an organization, require registration and logging in. Different wikis have different designs and different rules for engagement, but the overall principles, guided by the wiki software, are similar in all of them.

But what exactly is a wiki? A wiki is a software (sometimes referred to as an application), a website, or a platform that allows users in different locations to collaborate on certain specific content (that is, to discuss, write, edit, link, delete, search,

create new pages, and reorganize) from within an ordinary web browser. A wiki can also be described as a content management system in which users of each wiki can define their own structures and organization, and invent and enforce their own rules for user participation. Users find information they want to access through browsing and following hyperlinks or, in some wikis, through a dedicated search engine (Wiki, 2019, January 19) and, increasingly (as in the case of Wikipedia), through Google.

Typically, a wiki page has four access points: 1) the *page* itself, which contains the published information on the topic in question, 2) a *talk page* where editors can discuss the content of the page, 3) an *edit page* on which editors can make their contributions, and 4) a *history page* on which it is possible to see all changes or edits applied to a specific page. Any change to a page is made with an easy-to-use tool (such as mark-up language or a WYSIWYG interface), and the change automatically creates a new version in the history of the page. As a result, it is always possible to re-create any earlier version – to roll back time, metaphorically speaking. A page that has 100 edits can be thought of as existing simultaneously in 100 layers, where each layer is always accessible.

In addition to the particular content that a wiki is dedicated to, there are community pages that usually include other information and instructions about the wiki, such as rules and guidelines for user contributions, and other meta-information. These pages can usually also be changed in exactly the same way as the content pages. Registered, signed-in editors can create user-pages where they can present themselves for other editors or readers. History pages show which users have contributed to a page, what their contributions were, and when those contributions were made. Taken together, history pages and talk pages can thus provide glimpses into disagreements and discussions between editors, and can show how a topic solidified into a certain factual

representation. Usually these pages are rather dry and bureaucratic, but occasionally they record a history of veritable editing wars. Either way, as Pentzold (2009) suggests, when discussing Wikipedia as a “global memory place,” these pages constitute residues of cultural memory in their own right, specific to the particular peer production model employed (see also Gustafsson, 2019).

In addition to Wikipedia, there are numerous other projects built on the wiki software. Most public ones are also encyclopedic in nature and they are usually about very particular subjects, ranging from gardening, travelling, and programming to news, internet memes, sharia law, lyrics, and pornography. Unsurprisingly, Wikipedia has a comprehensive list of popular public wikis, including projects such as Heroes Wiki, LyricWiki, Citizendium, WikiTribune, and numerous others (List of Wikis, 2019, March 31).

Wikis are grounded in the open source community and this origin is reflected in a wiki’s information architecture and in its technological affordances for collaboration. Its technical features convey certain ways of how users can (and cannot) work together and these are derived from hidden assumptions and values stemming from the open source community. Accordingly, most public wikis use creative commons (CC) licenses for their content. Some, however, are more restrictive and even have their content protected by copyright, such as for instance the Chinese encyclopedia Baidu Baike, which is owned by the Chinese search engine giant Baidu. Assumptions of openness are built into wiki software, which can limit the usefulness of wikis for knowledge work in other contexts. For instance, in a study on adoption of wikis in the corporate setting, Yeo and Arazi (2012) demonstrated the lack of directly visible attribution in the edited text (which is otherwise a clear advantage in an encyclopedia or a software manual) conflicted with certain corporate norms, for instance with the norm

of personal career advancement. Lack of attribution could also hinder the adoption of wikis in certain educational situations where grading, guidance, and formative feedback from authority figures are valued and need to be considered.

3. Wikipedia: Background and History

The best-known wiki by far is Wikipedia. According to the web traffic analysis company Alexa Internet (The top 500 sites on the web, n. d.), the English-language version of Wikipedia is, at the time of writing, the 5th most popular site on the web. It is safe to say that the printed encyclopedias of the past, although well-known and much used, never came close to this level of general usage. Wikipedia's front page greets the user with the following words – “Welcome to Wikipedia, the free encyclopedia that anyone can edit” – in the upper left corner. Immediately after the greeting, the number of articles that Wikipedia currently contains is mentioned. At the time of writing this, in February 2019, that number for the English-language Wikipedia is 5.802,563. The front page thus highlights some of Wikipedia's key characteristics: it is based on a wiki, it is free to use, it is an encyclopedia that anyone can edit, and its size is enormous.

Wikipedia stands in a tradition of thought grounded in the Enlightenment ideal, emphasizing rationality and the benefits of universal access to knowledge (Haider & Sundin, 2010). In line with these ideals, Jimmy Wales, (co-)founder of Wikipedia, once summarized the utopian goal of Wikipedia: “Imagine a world in which every single human being can freely share in the sum of all knowledge” (Roblimo, 2004, July 28). As such, Wikipedia is only one project out of many attempts to summarize, organize, and make accessible all possible knowledge, akin to historical projects such as Denis Diderot and Jean le Rond d'Alembert's *Encyclopédie*, Paul Otlet's *Encyclopedia Universal Mundial*, Gottfried Wilhelm von Leibniz's *Characteristica Universalis*, and

Otto Neurath's *International Encyclopedia of the Unified Sciences* (Haider & Sundin, 2010). Historically, it was assumed that this overarching aim had to rely on experts. Wikipedia's peer-production model with its digital platform has certainly revolutionized both the production and distribution of encyclopedic content. At the same time, Wikipedia also continues the long tradition of encyclopedism and as Loveland and Reagle emphasize, "it is important not to exaggerate the discontinuities between Wikipedia and its predecessors" (2013, p. 1305).

Wikipedia started in 2001 as a side project to another encyclopedic project, Nupedia (1999–2003), which was funded by the company Bomis. The two encyclopedic projects Wikipedia and Nupedia were founded by Jimmy Wales and Larry Sanger, and both were built on voluntary contributors. Nupedia leaned on traditional peer review, while Wikipedia used a wiki-based open editor system from the start (History of Wikipedia, 2019, March 19). Wales and Sanger ended their collaboration because they had differing views on the requirements for contribution; Wales, who had argued for an open platform, continued with Wikipedia. In 2007, Sanger started a wiki called Citizendium, which, like Nupedia, also uses a more traditional peer-review model to vet information. Wikipedia grew quickly and in its first year got substantial media coverage by high-profile mainstream outlets like *The New York Times* as well as more specialized online communities like Slashdot (ibid.). A number of additional language versions of Wikipedia were set up at almost immediately, including German, French, Catalan, Japanese, Chinese, Dutch, Hebrew, Italian, Portuguese, Russian, Spanish, Swedish, Polish, Afrikaans, Norwegian, and Esperanto in the same year that Wikipedia was founded (ibid.).

The presence of volunteer editors makes Wikipedia possible, but Wikipedia also requires physical infrastructure, which in turn requires direct financial backing.

Since 2003, these needs have been met by donations to the non-profit organization Wikimedia Foundation. According to Wikimedia, “[t]he mission of the Wikimedia Foundation is to empower and engage people around the world to collect and develop educational content under a free license or in the public domain, and to disseminate it effectively and globally” (Mission Statement, 2007, September 1). In other words, Wikimedia provides the infrastructure (including servers and software development) for a number of wiki projects, such as Wikiquote, Wikinews, Wiktionary and Wikipedia (Wikimedia Foundation, 2019, March 28). The different projects are developed using the MediaWiki software, which is available under the GNU General Public License.

4. Wikipedia and its Contributors

Wikipedia is “peer production *par excellence*” (Pentzold, 2018, p. 455). It is difficult to conceive of another decentralized peer production effort of this magnitude in terms of number of collaborators and amount of output. In early 2019, the English-language Wikipedia alone had 35,488,240 registered users (Statistics, 2019, March 27). Obviously, not all registered users are equally active in Wikipedia’s production; rather, Wikipedia is dependent on a considerably smaller number of very prolific editors. For instance, in February 2019, just 3,445 editors had performed more than 100 edits per month. Of these very active editors, 312 were actually bots (*ibid.*) (for more about bots and Wikipedia, see the section *Wikipedia and its content*). There appears to be a friction between, on the one hand, the ideal of “the free encyclopedia that anyone can edit” and, on the other hand, a reality where the project depends on a rather limited number of so-called elite editors. However, as Kittur and colleagues (2007a) showed in their study on the development of the early dominance of elite editors, there has been an increase in “low-edit users” (p. 7). Two years later, Suh and colleagues (2009) also identified a

decline in the numbers of editors. Halfaker and colleagues (2013, p. 683) discussed the reasons for this decline, concluding:

Wikipedia has changed from the encyclopedia that anyone can edit to the encyclopedia that anyone who understands the norms, socializes himself or herself, dodges the impersonal wall of semi-automated rejection, and still wants to voluntarily contribute his or her time and energy can edit.

This somewhat polemic statement chimes well with the work of Shaw and Hill (2014) in which they show that often when wikis (not just Wikipedia) grow in size and become more complex, an “organizational oligarchy” forms whereby original participants tend to control a wiki’s further development at the expense of a strict democratic model.

Some have found a correlation between the number of edits and distinct editors and the quality of articles. Wilkinson and Huberman (2007) assert that Wikipedia entries with more contributing editors and more edits are of higher quality than those with fewer editors. Yet other research suggests that the different ways that editors coordinate (or do not coordinate) collaborations among themselves need to be considered to fully understand this connection. Kittur and Kraut (2008) distinguished two different ways that editors coordinate writing, namely implicit and explicit coordination. *Implicit coordination* occurs when a limited number of editors carry out the majority of the work, and most other editors only participate in a limited way. *Explicit coordination* describes situations with visible divisions of labor, where negotiations over content and planning of work occur on the talk page of the respective article. Kittur and Kraut (2008, no page numbers) conclude that “implicit coordination was especially valuable for articles and time periods with many contributions, while

explicit coordination was especially valuable for articles and time periods with few contributors.” The way that talk pages function as an arena for planning and coordinating the writing of an article has been elucidated by Viégas and colleagues (2007), who visualize the talk pages’ functions for socializing users by acclimating them to the policies and guidelines of Wikipedia. They argue that meta-activities, such as writing on talk pages, increase in significance as Wikipedia becomes larger and more structurally complex. In other words, while the number of distinct editors and edits might be indicative of quality to a degree, it is important to also allow for the role of coordination.

The incentives for editors to contribute to Wikipedia have been likened to those thought to be at work in science, that is, an interest in contributing to the creation of knowledge — of “true facts” as for instance Forte and Bruckman (2005, no page number) argue. Clearly, the reward for most voluntary, human Wikipedia editors is recognition rather than financial rewards (van Dijck 2013, p. 148), in contrast to commercial platforms built on user contributions. Different editors have different levels of authorization regarding their interaction with Wikipedia. In the English-language Wikipedia, users are divided into numerous categories, authorization types and user access levels, such as administrator or bureaucrats, unregistered, registered, confirmed or extended confirmed users, founders or researchers, rollbackers, various types of patrollers or mass message senders, to name just a few (User access levels, 2019, July 30). Clearly, the types are not strictly hierarchical and a single user often fits into several categories. Of course, a large number of non-registered users (who nevertheless can easily be identified by their IP numbers) contribute to Wikipedia. Their editorial permissions differ slightly in different language versions. Additionally, there is yet one more user category that often remains unmentioned: the blocked user. This user, as for

instance Niederer and van Dijck (2010) discuss, has the least authorization to contribute to Wikipedia. Moreover, different pages have different rules for editing: usually anyone (except blocked users) can contribute, but on what terms, in what way exactly, and with what authority differs considerably.

The number of contributor categories and the rather hierarchical permissions system that comes with those categories make clear that Wikipedia is a socially complex, tightly controlled system thoroughly infused with bureaucracy, quite different than the straightforward “anyone can edit” rhetoric often associated with it (van Dijck, 2013, pp.145–147; see also Tkacz, 2014). As Ford and Wajcman (2017, p.522) show, “being a Wikipedian ... involves acquiring particular forms of sociotechnical expertise and authority that constitute the knowledge or epistemological infrastructure of Wikipedia. Beneath the rhetoric of amateurism,” they write “a new form of expertise, and hence power, is being constituted, but that it is once again gender-coded as male.” This male gender-coding also has to be seen in relation to the community of human Wikipedia editors being largely male, something which is also reflected in the choice and representation of topics in Wikipedia (ibid.). This resonates with Hargittai and Shaw’s (2015) work on the Wikipedia gender gap and biased access. They moreover show that, besides gender, a variety of other aspects, including age, educational background, internet skills, employment status, income, or race/ethnic identity, effect who participates in the Wikipedia project as content producers, but also as readers (Shaw & Hargittai, 2018). The various inequalities in Wikipedia have also been described as a “politics of exclusion” (Graham, 2012). It contributes to entrenching the further marginalization of indigenous epistemologies and knowledge systems (e.g., van der Elden, 2012) as well as of content and authors from non-Western countries (e.g., Ford, 2012; John, 2012; Luyt, 2018).

As mentioned previously, working with the content of articles is not the only work that editors engage in (Bryant, Forte & Bruckman, 2005; Littlejohn & Hood, 2018). A core feature of Wikipedia is that all articles (even internal Wikipedia policies) and user pages have talk pages. That is, each article about a topic has a talk page on which the contributing editors discuss the content of that specific article, and how to collaborate and improve it. It has been suggested that this talk page function is one of the keys for getting such a large encyclopedic project to work despite the seemingly leaderless structure and the high number of number of editors (Viégas et al., 2007). There is also a community portal that includes something called a *Village Pump*, where editors can discuss all kinds of questions, projects of various kinds, dispute resolutions regarding article content, and so on (Community portal, 2019, March 27). For the purpose of assessing the credibility of specific articles, the back-end activities and discussions are in many ways just as interesting as the front-end encyclopedic articles, answering questions such as who has contributed, has there been there a discussion about the content in the talk page, has the article received “featured article” status, and so forth (Sundin & Francke, 2009). Kittur and colleagues (2007b) noted that almost 40% of all edits concern contributions other than to front end encyclopedia entries, and they distinguish between direct work and indirect work, where the former relates to working with the content of articles and the later relates to all the other kinds of meta-activities in Wikipedia. Kittur and colleagues argued that the direct work on articles decreased due to what they called “increasing coordination costs” (no page number), which results from the sheer size of the Wikipedia project.

In a similar line of thought, O’Neil (2010) identifies a range of further costs involved in crowdsourcing knowledge production by ridding it of editorial oversight and specifically in crowdsourcing Wikipedia. He distinguishes between costs, “directly

affecting the quality of the product” on the one hand, more precisely uncertainty, lack of perspective, as well as irresponsibility, and indirect costs on the other hand. Most notably the latter derive from editorial conflicts and edit wars, “which divert resources from the task of building an encyclopaedia” (ibid. p. 3).

5. Wikipedia and Its Content

When Wikipedia content is discussed, the focus is most often on issues of quality and the various facets of quality, including comprehensiveness, timeliness, readability and style, and reliability (Mesgari et al., 2015). Of these, reliability, understood in terms of the accuracy of the content presented as factual, has probably attracted most attention, both in terms of scholarly consideration and attention in the public debate. When Wikipedia first became popular, it did not just pose a challenge to traditional encyclopedias by threatening their financial models based on subscriptions or sales — it also challenged their very production model. Wikipedia is often said to have profoundly challenged and changed the role of experts, specifically of the role of named authors who adorned with certain credentials are entitled to express themselves as experts (e.g., Weinberger, 2007). We will nuance this picture in the upcoming sections, but it is safe to say that Wikipedia has contributed considerably to the success of a novel way of producing and reviewing the content of codified knowledge.

The success of this new model quickly led to discussions of Wikipedia’s reliability and accuracy, and content comparisons between Wikipedia and traditional encyclopedias started to proliferate. In a much-discussed article (Giles, 2005), the quality of Wikipedia was assessed by letting experts compare 42 articles with the corresponding articles in the Encyclopaedia Britannica. The author found the accuracy of the two encyclopedias to be more or less equivalent (see also Chesney, 2006). In

addition, within a short time Wikipedia became considerably more comprehensive than traditional encyclopedias (at least the English-language version), continuously expanding and adding new articles. Moreover, Wikipedia had a clear advantage regarding how quickly errors could be corrected. The question of quality is transparent in the sense that it is possible to follow discussions about quality while those discussions are happening among the editors (Stvilia et al., 2008).

Another way of assessing quality in Wikipedia has been by investigating references. The need to verify knowledge claims by backing them up with references to external sources, *verifiability*, is one of the key policies (Huvila, 2010; Nielsen, 2007; Sundin, 2011). By referring to sources outside Wikipedia, the credibility of a certain article comes to depend on other, often scholarly, publications rather than peer production as such. As in academic knowledge production, the higher the status of the cited sources, the stronger the knowledge claim becomes. Besides, roughly one article per thousand in the English-language Wikipedia is labelled as a *featured article*, that is, it is an article of particularly high quality (Featured articles, 2019, April 1). The decision concerning which articles should be included amongst featured articles is achieved by a community vote. However, there are a number of criteria that must be met before an article is considered for feature article status, one of which is whether the article is properly researched and refers to external sources. Voting is also the practice for deciding whether an article should be deleted and other important decisions, like policy decisions. Citing practices and verifiability of content is discussed further in the section *Wikipedia and the role of experts*.

Wikipedia content is not only produced by humans, but also by bots and other non-human actors, such as policies, templates, menus or other navigational items and information architecture (Geiger & Ribes, 2010; Niederer & van Dijck, 2010). A bot is a

computer program that functions as “an automated tool that carries out repetitive and mundane tasks to maintain the 46,939,344 pages of the English Wikipedia” (Bots, 2018, December 29). Niederer and van Dijck (2010, p. 1369) consider Wikipedia a sociotechnical system in which humans and technology work together: “It is the intricate collaboration between large numbers of human users and sophisticated automated systems that defines Wikipedia’s ultimate success as a knowledge instrument”. Some of the automated tasks are blocking spam, detecting vandalism, spell-checking, data-mining for detecting copyright violation (ibid., p. 1378; see also Geiger & Ribes, 2010). An example of a bot is the MediaWiki extension WikiOpener which automatically queries external databases (Brohée et al., 2010). In fact, several thousand bots are active on Wikipedia, and these bots have user pages just like human editors do. In total, in early 2019, bots had created more than 16 million articles (across all language versions). So far, the most productive bot has been one called Lsjbot. Lsjbot was particularly active on the Swedish, the Cebuano Wikipedia, and the Waray Wikipedia where it created millions of articles and made tens of millions of edits (Bot article only, 2019, January 31). Lsjbot’s impressive productivity is also the reason that the Cebuano Wikipedia ranks number two and the Swedish Wikipedia ranks as number three in total number of articles among all languages, ranked higher than for instance Spanish-language, Japanese, Chinese, or Arabic Wikipedias, all of which are much more widely spoken languages. Lsjbot has started out by writing short articles about animals and plants that provide references in accordance with Wikipedia’s citation rules (Guldbrandsen, 2013), but has since also contributed articles in other areas.

At the core of Wikipedia is the question of how the quality of content can be vetted and guaranteed. Above we discussed the various policies and guidelines providing the frame for producing articles of good quality. Another important aspect is

how the peer-review process, or more accurately post-publication-review process, is carried out. Notably, these processes differ somewhat in Wikipedia's different language versions. The original principle for contribution to wikis and thus also to Wikipedia was that anyone could edit without being a registered user, and that all edits are visible to all users as soon as they are saved. When an already existing article is edited, those changes are immediately visible for other users. Furthermore, bots as non-human contributors constantly examine changes to find and root out instances of vandalism.

Originally, the Wikipedia's reviewing principle builds entirely on a review process carried out after publication. However, over the years exceptions to this have emerged, most notably in the German-language Wikipedia. In order to come to grips with vandalism, that is purposeful destruction of Wikipedia content, and other types of misuse, such as for political or commercial purposes (Osman, 2014), and to raise the level of quality, an additional layer of peer-review or editorial control has been tested, first in the German-language Wikipedia and thereafter also in the English-language one. In the German instance, edits are marked for editors to review through the MediaWiki extension "FlaggedRevs." After a test period accompanied by intense debate in the English-language Wikipedia community, flagged protection for certain articles (for instance, articles about living persons) has been introduced when they are written by very new and very inactive users. The issue has been discussed frequently within the community (Pending changes, 2019, January 8). In the German-language Wikipedia, a similar peer-review system (Gesichtete Versionen, 2019, March 19) has been in use since 2008, but for all edits. The system's primary purpose is to guard the encyclopedia against vandalism. Editors with the right to review a change must have passive or active reviewer status. This status is assigned automatically when a user fulfils certain sets of criteria, mostly expressed in numbers of edits during certain periods. There is also the

possibility of manually assigning and reversing reviewer status. In addition to different types of reviewing rights the German-language Wikipedia has also introduced a voting system. And while even bots can have the status of reviewers, at least passive ones, they are not entitled to vote. In the German-language Wikipedia, having the right to vote requires that you have been a registered user for two months, that you have made 200 edits in one namespace, and that you are a human editor. Even here a hierarchy is in place. There are two different types of voting power, a general right to vote, and the more restricted right to vote on arbitration committees. For the latter, stricter criteria are applied.

6. The Wikipedia Community

Wikipedia has been studied not only as an encyclopedia with advantages and shortcomings, but also as a culture in its own right (e.g. Konieczny, 2009; Reagle, 2011; Sundin, 2011). Notably, Reagle (2011, p. 3) includes “both the textual artifact and the community producing it” into his conception of what constitutes Wikipedia, and he talks about its particular collaborative approach as an expression of “good faith culture.” Similarly, Pentzold (2011, p. 458), in an attempt to capture the core idea of collaboration in Wikipedia, describes its working methods as “a form of collectivism.” The Wikipedia community, or more broadly the Wikimedia community, builds on notions of transparency and egalitarianism as advanced by the open source philosophy, and the Wikimedia community’s existence is dependent on the work of collaborating volunteers acting as editors.

Wikipedia is intimately connected to a notion of *open* specifically as developed within the open source movement and ideas connected to free software development. Knowledge, in this context, is considered “open if anyone is free to access, use, modify,

and share it—subject, at most, to measures that preserve provenance and openness” (Open Knowledge Foundation, n. d.). The project needs to be understood within the context of a proliferation of different notions of “open” and thus as advancing a “politics of openness” as Tkacz (2014) elucidates in much detail, which is conditioned and curtailed by the circumstances the current economic system creates. That is, despite its conceptual alliances with “transparency, collaboration, competition and participation, and its close ties with various enactments of liberalism” (Tkacz, 2012, p. 399), the notion of openness gives way to closures that remain largely invisible. This way openness itself transmutes into a near-irrefutable, catch-all concept obstructing the view towards the diverseness of issues it is applied to and the various power relations shaping those issues.

Connected to this, Wikipedia has been described as promoting an “uneven openness” (Graham & Hogan, 2014), which applies to the topics represented in Wikipedia, to the ways in which certain topics are framed and represented (Luyt, 2019), and also to who has access to the encyclopedia. Between 2012 and 2018, the Wikimedia Foundation ran a project called Wikipedia Zero, which through subsidized mobile plans enabled users in developing economies to get free access to Wikipedia (Gebhart, 2016). Being in breach of the tenet of net neutrality, this practice was described as colonial (Toupin, 2019). However, it was only discontinued after users in the Global South creatively re-appropriated the infrastructure provided by Wikipedia Zero to share copyright protected files (Toupin, 2019).

Wikipedia is more than an encyclopedia, i.e., a textual artefact or database. It is also a site for people to meet, collaborate, discuss, and debate. These meetings are not constrained to meetings on the platform — active editors sometimes also meet in person in local or global events, such as most notably the yearly Wikimedia Conference, and

also at smaller national conventions. The writing of Wikipedia articles is occasionally made public and performed collectively in the same space and at the same time.

Editathons (edit-a-thons) have been organized the world over to increase contributions to Wikipedia in certain topics and by certain people who are underrepresented in the regular community of editors. Most notably, the community as it currently stands has been shown to be largely male (Hill & Shaw, 2013), which has led to Wikipedia being called out as representing “the sum of all male knowledge” rather than *all* knowledge as it otherwise claims (Ford & Wajcman, 2017, p. 522). Editathons are often organized by cultural heritage institutions, such as museums or libraries, and occasionally also in tandem with an organization hosting a Wikipedian-in-residence. A Wikipedian-in-residence is a further instantiation of Wikipedia intersecting with traditional institutions and physical space; the British Library in 2010 was the first institution to host a person with the dedicated aim of strengthening cooperation between that institution and the Wikipedia community (Wikipedian in residence, 2019, March 27).

Wikipedia is a place for disputes, but also a place that values the idea that disputes can be solved through discussions and democratic processes. Assume Good Faith (AGF) is one of the leading guidelines for Wikipedia, the essence of which is captured in the following quote:

When disagreement occurs, try to the best of your ability to explain and resolve the problem, not cause more conflict, and so give others the opportunity to reply in kind. Consider whether a dispute stems from different perspectives, and look for ways to reach consensus. (Assume good faith, 2019, March 24)

Despite this ideal, not all disagreements can be easily solved. Sometimes disagreements occur at very high levels between and within communities, which points to profound discrepancies about how openness and transparency are framed and how hierarchies are organized. For instance, a controversy between the community of editors and the community of managers at the Wikimedia Foundation became evident when plans for creating a Wikimedia search engine were revealed in 2016, and the Executive Director of Wikimedia left her position as a result of the conflict (Sentence, 2016, March 3). The conflict concerned the perceived secretive nature of the project, which was regarded as being incompatible with the guiding principle of transparency. That is, there was no open process involving the community. It was furthermore considered “a move away from human-curated and authored knowledge towards automatically generated content,” which was seen as undesirable (ibid.)

Wikipedia is constantly in motion and none of its rules are written in stone. However, there are policies and guidelines steering peer production, and these are specifically listed on the page Wikipedia’s About page (*italics added by the authors*):

Wikipedia is not, which summarizes what belongs in Wikipedia and what does not;

Neutral point of view, which describes Wikipedia’s mandatory core approach to neutral, unbiased article-writing;

No original research, which prohibits the use of Wikipedia to publish personal views and original research of editors and defines Wikipedia’s role as an encyclopedia of existing recognized knowledge;

Verifiability, which explains that it must be possible for readers to verify all content against credible external sources ...;

Reliable sources, which explains what factors determine whether a source is acceptable;

Citing sources, which describes the manner of citing sources so that readers can verify content for themselves;

Manual of Style, which offers a style guide—in general editors tend to acquire knowledge of appropriate writing styles and detailed formatting over time.

About, 2019, March 6 [italics added by the authors]

Together, these rules constitute the cornerstones of Wikipedia. Different scholars have emphasized different policies and guidelines when they have discussed the uniqueness and success of the collaborative Wikipedia project. Reagle (2011) stressed the collaborative culture of Wikipedia as leaning on the policy of Neutral Point of View (NPOV) and the above discussed guideline Assume Good Faith (AGF).

When transferring the notion of collaboration as it is used in software development, to collaboration when writing about subjects with many perspectives and even divergent knowledge claims, another take on how to reach consensus is necessary. In computing and engineering, consensus can often be reached by testing *what works*, which is basically a pragmatic epistemology in the common-sense understanding of pragmatic, rather than *what is true*. In an encyclopedia, the potential for reaching consensus is often not even the goal; rather, the issue is which aspects of a topic should be represented, to which extent, and in what form. Wikipedia tries to approach this by combining the AGF and NPOV policies. A neutral point of view is defined as “representing fairly, proportionately, and, as far as possible, without editorial bias, all of the significant views that have been published by reliable sources on a topic” (Neutral

point of view, 2019, March 18). The definition does not mean that all views should be given equal space, but that differing views should be given proportionate space according to the general understanding of the proportion of “reliable sources” for a particular view. The engineering notion of *what works* has here been translated to *what can survive the editing process*. At the same time, conflicts about content (often referred to as “edit wars”) do happen, and although the talk page is not supposed to be used for solving conflicts, they are often full of debates that are at times longer than the article in itself. Occasionally conflicts or repeated vandalisms lead to different levels of protection of an article, which in fact are restrictions to the “anyone can edit” ideal (Protection policy, 2019, March 31). Also, editors can, through the “Maintained” template, claim territoriality of a certain section of an article in attempts to strengthen that section’s quality (Thom-Santelli et al., 2009).

7. Wikipedia and the Role of Experts

Wikipedia is based on the principle of “the wisdom of crowds” rather than the expertise of a few. That is, the guiding principle is that due to the many contributors will the quality of Wikipedia be uphold. The concept of “The Wisdom of Crowds” was coined by James Surowiecki in the 2004 book *The Wisdom of Crowds: Why the Many Are Smarter Than the Few and How Collective Wisdom Shapes Business, Economies, Societies and Nations*, and Wikipedia is often regarded as a premium example of this principle.

The Wikipedia project has repeatedly been described as challenging experts in favor of amateurs (e.g., Keen, 2007). Yet, these depictions often overly simplify the complex ways in which Wikipedia relates to and validates different knowledge claims and thus require nuance. Tkacz (2014, p. 110) discusses how the policy of NPOV goes

hand in hand with “No original research” and “Verifiability” as “the three core content policies which are designed to work in unison.” The policy of *verifiability* is one way that it is used to overcome the fact that many editors write about subjects they are not always particularly familiar with. The policy stresses that any knowledge claim must be supported by a credible source outside Wikipedia itself. Together with the policy of *No Original Research*, “verifiability means that other people using the encyclopedia can check that the information comes from a reliable source” (Verifiability, 2019, March 24). In fact, citing sources is seen as a core policy in Wikipedia, which means that Wikipedia is actually dependent on traditional publishing (Forte & Bruckman, 2005; König, 2013; Sundin, 2011; Tkacz, 2014). Likewise, Forte and colleagues (2018) describe Wikipedia citation practices as means to argue for certain content as *information fortification*. In a similar line of thought, König (2013, p. 172) asserts that “[a]lthough laypeople apparently play a significant part in the text production, this does not mean that they favor lay knowledge”.

An important characteristic of the Wikipedia community is a strong belief in the power of knowledge, a belief that it shares with earlier utopian knowledge projects (Reagle, 2011; Sundin, 2011). Specifically, the idea that anyone can contribute should be considered against the background established by the call for verifiability and more precisely of how to achieve verifiability by means of citing reliable sources rather than personal views or experiences, or even original research. The reliability and trustworthiness of these sources in turn is established in relation to other vetting systems, most notably those recognized in science and in the academy more broadly. It could even be argued, as for instance Sanger (2009, p. 62) does, that “if anything, Wikipedia’s own policies actually reinforce the epistemic prerogatives of experts.” This process has also been described as a type of “source positivism” (Haider & Sundin,

2010). In this way, the Wikipedia community is prone to a far more traditional view of knowledge than is often posited (see also O’Neil, 2010). How Wikipedia is produced might challenge the role of experts, but the manner by which knowledge is sourced and stabilized does not (Sundin, 2011).

The Wikipedia community has identified citing sources as one of the main ways of strengthening the encyclopedia’s trustworthiness. There is a template for keeping track of missing references that is used for collaboration during article writing. On encounter of an unsupported knowledge claim, editors can either add a reference themselves or use the template for others to add a reference. There is even a bot called CitationHunt specifically for identifying missing citations, another example of the significant role non-human contributors have in Wikipedia. Sundin (2011) showed how citing external sources is a tool for instituting knowledge claims very much akin to the way that Latour (1987, p. 41) described the making of facts in science: “Fact construction is so much a collective process that an isolated person builds only dreams, claims and feelings, no facts.” More specifically, Latour identifies three strategies for constructing facts: (1) “Bringing in friends,” (2) “Referring to former texts,” and (3) “Being referred to by later texts” (Latour, 1987, pp. 31-44). In the context of Wikipedia, the latter two points are most relevant. Referring to former texts is exactly what citing valid sources in Wikipedia implies, and to a certain degree, its peer production model constitutes a structured form of collaborative referencing. Inversely, while Wikipedia articles are not generally referred to as sources in research and science (Lindgren, 2014), they are referred to from the outside by the various platforms such as Google, YouTube, and Facebook, to an extent and in a form that has contributed to instituting Wikipedia as one of the most fundamental parts of today’s networked media ecology and one that has come to signal trustworthiness and factuality, which we discuss in the next section.

8. Wikipedia and the Media Ecology

The mutual interdependence between Wikipedia and search engines also needs to be understood within the broader context of the contemporary digital media ecology, which is dominated by a handful of giant commercial platforms. One particularly powerful actor in this media ecology is Google. Part of Wikipedia's popularity results from the fact that search engines, and specifically Google, prioritize links to Wikipedia (Höchstötter & Lewandowski, 2009). At the same time, Google and other platform enterprises owned by the same holding company use Wikipedia's open content in their efforts to not only convey links to other resources, but to develop into fact providers themselves. A prominent example of this is the Google Knowledge Graph, which compiles open data sources, such as Wikipedia, and provides users with factual information in response to a query directly on the search results page.

According to Alexa Internet, about 55% of Wikipedia's visitors arrive there through a search engine; no other website within the 20 most popular websites in the world has so many visitors from searches (Wikipedia.org: Competitive Analysis, Marketing Mix and Traffic, n. d.). The trust placed in Wikipedia depends to a large extent on how visible Wikipedia is in search engines, which Shirky (2009) describes in terms of the "algorithmic authority" attributed to Google rather than to Wikipedia itself. Most often, ordinary users in everyday life follow the order that the search engine provides without carrying out any further assessment of the credibility of the sources presented (Haider & Sundin, 2019). Increasingly, for the typical Google user, a quick look at the right upper side of the screen of the search results often provides a sufficient answer for many queries. Here, Google presents factual information compiled from different open data sources, but mostly it draws on Wikipedia. In many cases, this

listing on the Google search results eliminates the need to go to the actual Wikipedia article. As a result, the organic traffic from Google to Wikipedia has decreased (Hamit, n. d.). Since the Wikipedia project is not financed by advertising, this lack of traffic might not have immediate repercussion, but it is likely to have implications for the number of contributors, potentially weakening its peer production model. The success of Wikipedia as a freely available, CC licensed (CC-BY-SA), collaboratively-constructed encyclopedia also makes it vulnerable. Wikipedia content can be used for any purposes, including commercial ones, as long as the content is not legally or technically locked in. Google is clearly aware that Wikipedia and various other Wikimedia projects and peer production models are crucially important, and Google is on the list of major donors to the Wikimedia foundation alongside Apple and Microsoft (Benefactors, 2020, January 10).

Collaboratively-created Wikipedia content is circulated also beyond Google through its algorithms to other sites. Langlois and Elmer (2009) showed that Wikipedia content is collected, recycled, and published together with advertisements on other sites as a way to attract traffic from search engines. The authors call these commercial sites “Wikipedia leeches” and argue that “automated content reproduction is not so much about the large-scale dissemination of meaning as it is about the redistribution of flows of users and flows of traffic through new commercial channels” (p. 780). Wikipedia is an open source project both in terms of software and content, but Wikipedia is also firmly embedded in a capitalist media system (Lund, 2017; Tkacz, 2015). Indicative of this ambiguous position are of course the donations by Google, Apple or Microsoft, but increasingly, Wikipedia is also being held up by commercial platforms in its role as the bearer of vetted, trustworthy knowledge. In their attempts to address problems with misinformation and the spread of what is in the public debate often called “fake news,”

social media sites YouTube and Facebook use Wikipedia to combat misinformation; for example, anti-vaccination videos on YouTube now include information panels with links to Wikipedia articles on the subject (O'Donovan, 2019, February 22). Not only do these sites use Wikipedia's data, they promote Wikipedia's role as a batch of truthfulness. The non-commercial peer production model, which at the turn of the century was seen to be the encyclopedia's weakness, has (discursively) turned into a stable and accurate knowledge base drawn upon to correct the work of algorithmic recommender systems and to provide the data for artificial intelligence systems. Yet this also puts Wikipedia in an exposed position of power with clear (geo-) political implications, as for instance China's growing interest in controlling narratives and processes of fact-creation concerning Chinese interests shows (Miller, 2019, October 5).

9. Conclusion

Wikis and Wikipedia can be characterized by a number of tensions emerging from its peer production model. Some of these concerns pertain to wikis in general, while others pertain to Wikipedia more specifically. The first tension is the one between amateurs and experts. Wikis and Wikipedia came about when a number of internet applications were built on user-generated content, and legacy media and the traditional role of experts have been challenged constantly ever since. The second important tension is that between openly licensed content and proprietary content that is subject to copyright.

The Wikipedia community consists of various groups with different levels of authority, where a small group of elite editors are doing most of the content work while the majority of editors are considerably less active. There is another tension between human editors and bots, although Wikipedia is an excellent example of how technology

can enhance knowledge production where humans and bots are peers working side by side. Wikis are in general built on a kind of post-publication-review, where the content is tested only after publication, but, particularly in the German-language Wikipedia, a kind of pre-publication peer review has been introduced to avoid vandalism. There is also a tension between lay knowledge and academic knowledge, where the core policies of Wikipedia give priority to academic publication, thus showing the dependence of Wikipedia on peer production and traditional academic writing (peer-reviewed or not). Finally, trust in Wikipedia is not only shaped by Wikipedia itself, but it is also promoted by other online actors that refer to Wikipedia either implicitly through search results or explicitly through links.

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