Transparency, Control, and Content Generation on Wikipedia: Editorial Strategies and Technical Affordances

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1 Introduction

Wikipedia is perhaps the most culturally influential example of "peer production" principles in action, and is certainly the most visible. As the sixth most popular web site on the Internet, Wikipedia has become an important source of information, not only for students, but also for academics, physicians, and many others (Hughes, Joshi, Lemonde, & Wareham, 2009).

Wikipedia is a radically inclusive way of creating an encyclopedia. With few exceptions, Wikipedia lives up to its promise as "the encyclopedia that anyone can edit". Every page has an option to "edit" the page, and edits appear immediately. In addition to being radically democratic, Wikipedia is, at least in principle, radically transparent. Again, with a few exceptions, every edit made to every page is publicly visible. The governance is also very open, with nearly all of the conversations about the policies and direction of the site held on public Wikipedia pages or public IRC channels and listservs.

Despite this prima facie inclusiveness and transparency, Wikipedia is both hierarchical and opaque in some important ways. While "anyone can edit" Wikipedia, not just anyone does. A relatively small number of contributors produce the vast majority of content, both across the entire Wikipedia project, and for most individual articles (Kittur, Chi, Pendleton, Suh, & Mytkowicz, 2007; Matei, Bruno, & Morris, 2015; Voss, 2005). While the tools for editing Wikipedia are available to everyone, the practical power of maintaining articles or categories on a certain

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"line" is held by a small "adhocracy" (Matei, Tan, Zhu, Bertino, & Liu, 2014). These editors, like other active editors on Wikipedia, are much more likely to be male, young, well-educated, and from the Global North than the general population (Hill & Shaw, 2013).

In addition to this unexpected inequality on Wikipedia, there are the more obvious problems of vandalism, propaganda, and poorly researched information, which have attracted attention and reduced the credibility of the encyclopedia since its founding. Much content is simply copied and never checked (Rector, 2008). Other content, although controversial, is defended from removal by small coteries of interested individuals (Matei & Dobrescu, 2010).

Despite these concerns, the interface of Wikipedia remains simple in design and opaque with respect to authorship. It de-emphasizes everything except for the current content of a given article. While this design choice may be defended by the need to communicate the content of the article in the most direct way, it hides the social origin and potential biases of the what is written. As the value of the content depends, to a certain degree, on the nature of the collaborative process, it could be asked whether Wikipedia should reconsider its information delivery priorities. Featuring information about the nature of the collaborative process more prominently on the page could serve to make this process more transparent, and increase the perception of the content itself as accurate, credible, and unbiased.

In this chapter, we explore some of the major visualizations created to try to make Wikipedia more transparent, and theoretically more trustworthy. We also examine the conversations Wikipedians have had about whether one of these visualizations should be adopted by the site, and identify a number of possible reasons that the makers of these tools have been unsuccessful in having their visualizations accepted into the main interface. We conclude with a discussion of some possible strategies for creating and implementing visualization tools that would both increase transparency and be accepted by the Wikipedia community.

2 History of Interface Changes

Since becoming a popular site, the Wikipedia interface has changed very, very little. The Wikipedia page about the history of Wikipedia (https://en.wikipedia.org/wiki/History_of_Wikipedia#Look_and_feel) lists only nine changes to the look and feel of the encyclopedia. Three of these are changes to how the site is organized; four are changes to the look of the home page; one is a change to the logo. Only one change, made in May 2010, is a major change to the interface itself.

The way that the actual content is displayed in articles has changed very little indeed. From the beginning, content has been the focus of the page, with three tabs at the top of the page. The first is a Talk page for the article, the second opens the article for editing, and the third shows the history of changes made. However, the tabs and the information they contain are far more important than their "optional"

vocabulary seems to suggest. They are entry points for understanding the social and intellectual processes that generate Wikipedia.

A number of researchers and programmers have worked to make these processes more visible. Some of them are intended as standalone visualizations, which give insight into Wikipedia, but are not intended to be part of the interface. They are mentioned here to give context to the goals and scope of visualizations that have been created. Our primary focus is on the second category of visualizations, meant to be more directly integrated in the editorial and content consumption workflow.

3 Standalone Visualizations

The first category of standalone visualizations attempt to situate Wikipedia contributions geographically. For example, Yasseri, Spoerri, Graham, and Kertész (2014) identified the most controversial articles in each language edition of Wikipedia, and then used maps to visualize where the articles with a geographic component were located (Figs. 1 and 2).

Omnipedia, a project by Bao et al. (2012), visualizes how different topics are treated differently in different language editions on Wikipedia. The topics which are linked to in a given language, but not in other languages, are highlighted. Both of these projects help to show that the way knowledge is constructed and experienced is culturally contingent (Fig. 3).

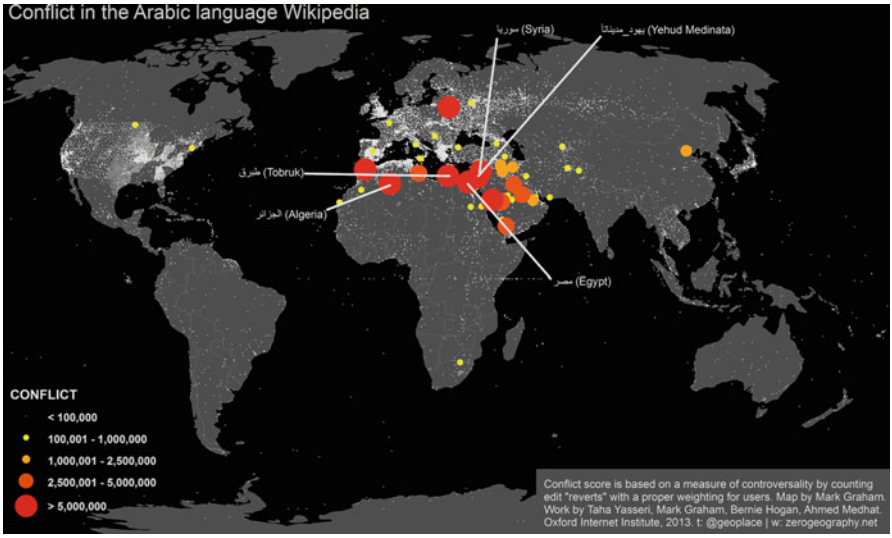


Fig. 1 Map of conflict in Czech edition of Wikipedia. Size of the *dots* is proportional to the controversy measure M

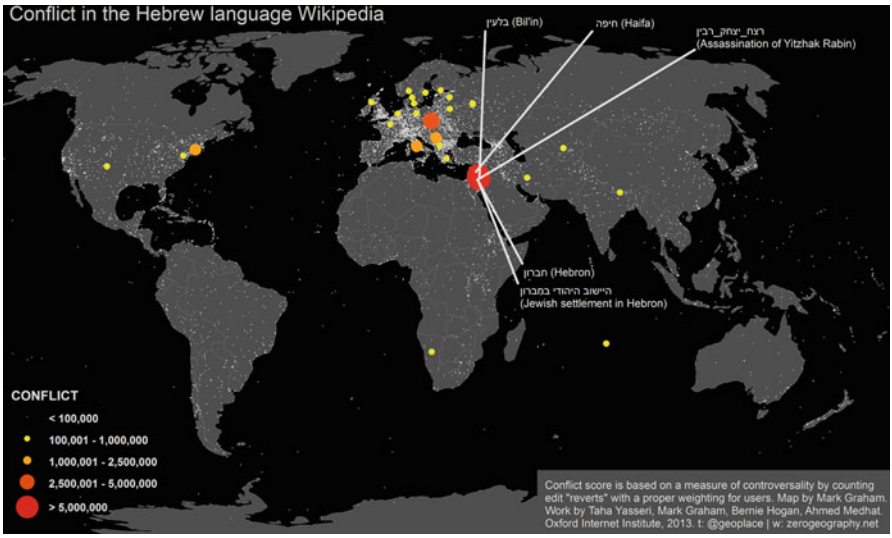


Fig. 2 Map of conflict in Hebrew edition of Wikipedia. Size of the *dots* is proportional to the controversy measure M

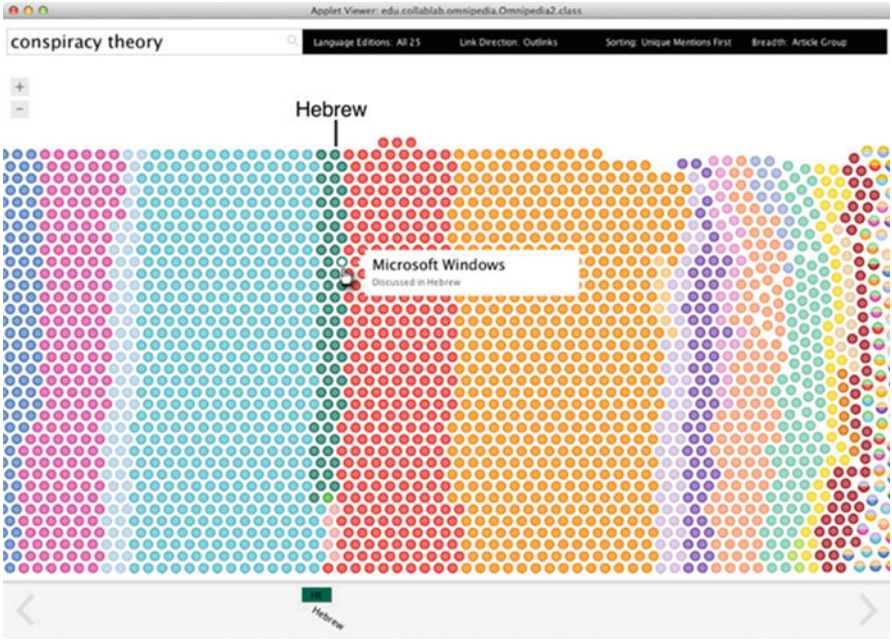


Fig. 3 This view of Omnipedia shows which articles are linked to from one language's version of an article, but not any others. In this example, "Microsoft Windows" is linked to only from the Hebrew Wikipedia's "conspiracy theory" article

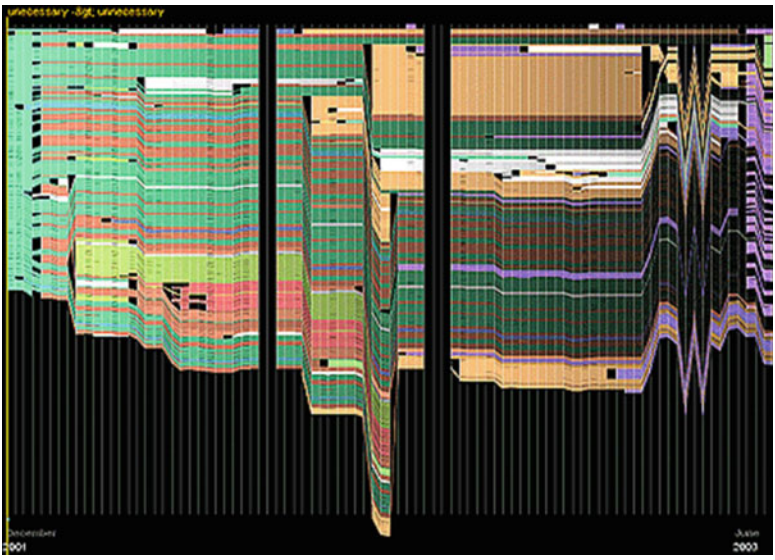


Fig. 4 history flow for "abortion" page, versions equally spaced

Other research focused on visualizing the community of editors, through summary statistics and graphs (e.g., Voss, 2005), mapping co-editing patterns by category (Biuk-Aghai, Pang, & Si, 2014), and network graphs of contributors (Keegan, Gergle, & Contractor, 2013).

Finally, Viégas and Wattenberg have worked on a number of visualizations to make the history of both articles and users more accessible. Their History Flow visualizes the way that an article has been developed over time, showing both the timing and location of revert wars, as well as giving insight into how this knowledge is produced and negotiated (Viégas, Wattenberg, & Dave, 2004). Their Chromogram visualization shows the types of edits made by users, giving a new way to identify different patterns of editing (Wattenberg, Viégas, & Hollenbach, 2007) (Figs. 4, 5, 6, and 7).

Such projects seek to provide a high-level view of Wikipedia, showing large-scale cultural differences or project-level biases or statistics. In general, they do not appear to have been created with the goal of being integrated into Wikipedia.

4 Article-Level Inequalities

While the projects so far discussed focus primarily on project-level dynamics and visualizations, much more interesting for the purposes of this inquiry are the projects that aim to visualize in a direct way the inequality of contributions to an article. This issue of paramount importance. As the bulk of most articles on Wikipedia are edited by a very small number of contributors, it could be said that while a given Wikipedia article does not have "an author" it does have a selected group of authors, who are responsible for the shape, tone, focus and often wording

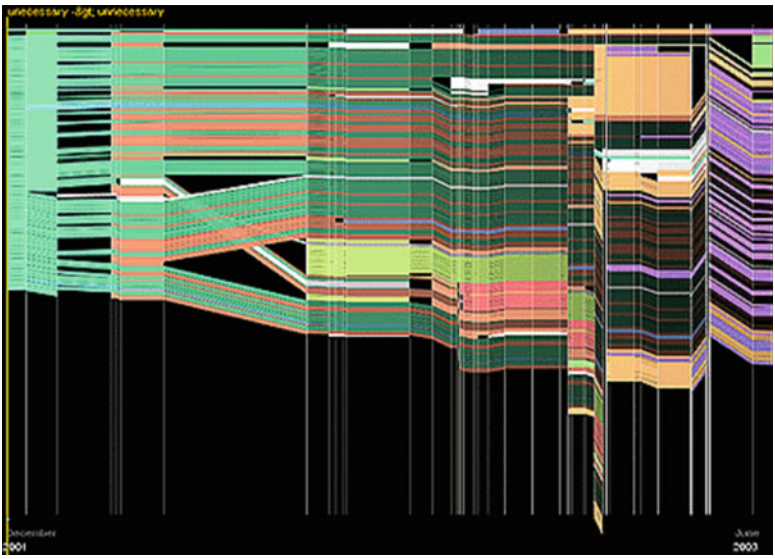


Fig. 5 history flow for "abortion" page, spaced by date

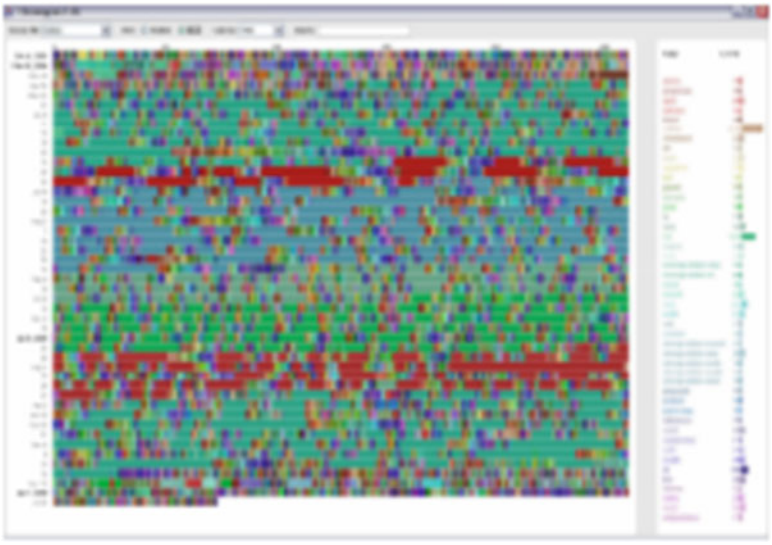


Fig. 6 The Chromogram application: block view

of the article. One would reason that the presence and identity of these selected contributors should be clearly and directly visible on each page. It is not only an issue of transparency, but also of trust. Trust in traditional encyclopedias relied on a the authority of the authors. Wikipedia is shaped in an ad hoc basis, by a group of top contributors. Trust in the content is based on trust in the social and technical structures which surround the project, by which this group emerges and works (Slattery, 2009; Swarts, 2009).

Fig. 7 The Chromogram application: time-line view, same date as Fig. 6

The issue here is not one of "unmasking" the top editors or denouncing them as frauds. While some concerns have been expressed that a system which does not rely on experts at any point in the process could not produce reliable information, research has shown that, along dimensions that are verifiable, Wikipedia's reliability is comparable to that of the Encyclopedia Britannica for certain types of content (Giles, 2005), although not for others (Rector, 2008).

However, there are still opportunities for biases. These are functional and "perspective" biases. For example, the mere decision to create an article about a topic like a specific person's reported alien abduction legitimizes the idea (see the article on Travis Walton's abduction at https://en.wikipedia.org/wiki/Travis_Walton). Interested individuals or corporate authors do not shy away from repeatedly intervening to maintain some basic facts for certain articles in a certain way. For example, recent documentary evidence appeared that the Russian KGB might have reused some of the Nazi bosses for Cold War espionage, especially the head of the Gestapo, Heinrich Müller. The claim is made by Tennent Bagley, a senior retired CIA officer, who interviewed and published the biography of a major KGB leader during the Cold War, Viktor Kondrashev, the head of the American counter-espionage division of the KGB (Bagley, 2013). Attempts by one of the authors of this article (SA Matei) to include this information in the Wikipedia article about Müller were met with fierce resistance from the most prolific editor of the article, an editor with the user name Kierzek. Kierzek's user page (https://en.wikipedia.org/wiki/User:Kierzek) reveals that he is a circuit court mediator who contributes to many World War II articles (For the debate regarding the edit proposed to the Muller page see https://en.wikipedia.org/wiki/Talk:Heinrich_M%C3%BCller_(Gestapo)#Muller_recovered_and_used_by_the_ Russians:_We_need_consensus_on_adding_this_section_to_the_article). Furthermore, the debate about the

KGB—Muller connection remains hidden from view, as does the fact that the most productive contributor to the article has become a de facto gatekeeper. In this, as in the case of many other Wikipedia articles, the nature of the authorship process remains hidden in plain sight.

Of course, the edits and the debates are still on the site (see edits on July 29, 2014 at https://en.wikipedia.org/w/index.php?title=Heinrich_M%C3%BCller_(Gestapo)&action=history), but merely looking through a list of edits makes it very difficult to discern that most pages follow an uneven distribution, or that some authors have an important role in shaping the tenor and direction of an article. This dramatic inequality of contribution and narrative direction means that for a given article, while many people may make small contributions, a few people contribute most of it, and therefore have much more control over the nature of the document. This reality is qualitatively different from the assumption that most people hold, which is that Wikipedia is fairly open and democratic.

Because the true nature of how articles are created is hidden, most readers and new contributors believe that Wikipedia's content is simply the aggregation of edits from nearly random others. This serves as a motivator of sorts. People honestly try to add new content all the time. Typically, however, only the tidbits or raw material that fit with the narrative controlled by the overall editors is preserved. Ordinary casual users never know this. Those who attempt to make more consistent contributions ultimately learn that they need to befriend the leaders and become "one of them." They can become effective editors only by recognizing that there is a community behind the content, and that Wikipedia articles are the product of a large amount of coordination, conversation, and contention (Bryant, Forte, & Bruckman, 2005).

In addition, there are a number of policy decisions, technical decisions, and administrative decisions, all of which are hidden from the typical user. Deciding, for example, which types of articles should be deleted and which should be kept, or whether a certain user should be banned, all occur in the open, but in spaces on the site that are nearly impossible for new users to find.

In brief, authorship on Wikipedia is regulated by power structures. Some are explicit while other implicit. Some users have the explicit power to ban other users, lock articles, look up the IP address of other users, etc. These are the so-called admins (a few thousand), sysops, or bureaucrats (a few dozen). In addition, there is something of an "adhocracy": a small group of editors which makes many of the edits on the site. This group has been active on the site for a long period of time, with low turnover in membership (Matei et al., 2014). Although there is a large amount of overlap with the explicit leadership, these editors are not nominated, but they also shape the nature of the content and the community. This group is composed of under .1 % of the current mass of Wikipedia editors [of which there are over 20 million, according to a study for the period 2001–2010 by Matei et al. (2014)].

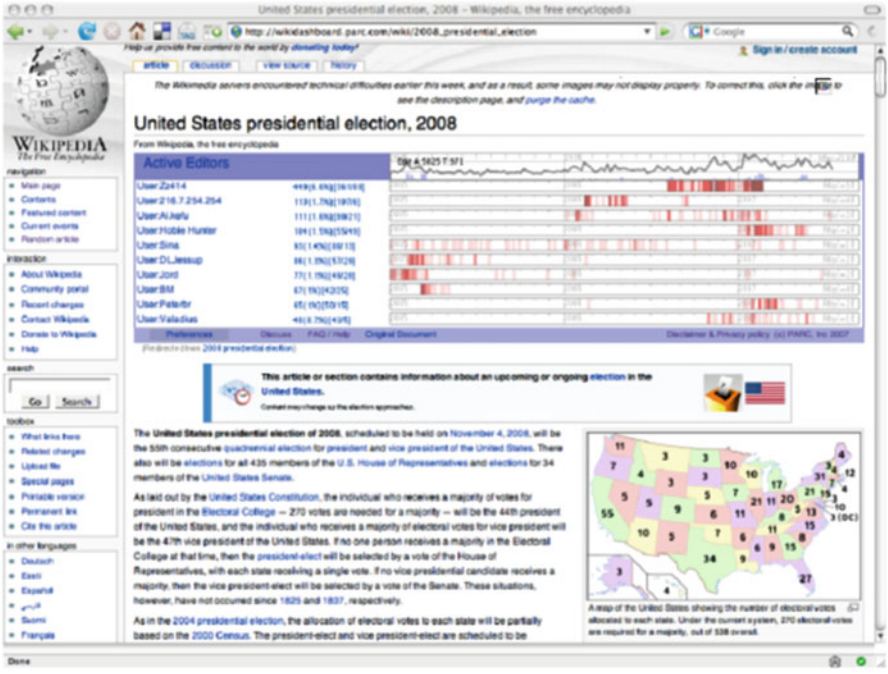
Power structures do not exercise their controls in a direct way all the time. Many times, power is inscribed in the design of the editorial tools. The edit page itself includes a number of features that are not obvious to new users. Despite the goal of transparency, the actual article page hides a lot. It doesn't show the history on the main page, doesn't show the talk page (a space for conversations about what the page should say), and doesn't show who edited each part of the article (Slattery, 2009).

The tabs the point to these features are minimalist and appear to be mere optional tools. These sorts of non-obvious features of a website are more likely to be discovered by those who already use the Internet in diverse ways (Hargittai, 2010).

5 Article-Level Visualizations

In response to these issues, a few visualizations have been proposed which are intended to actually be shown on the article page itself. These visualizations are designed to give information to readers and editors to make some of the inner workings of Wikipedia more transparent, and to help readers make more informed decisions about how credible the content is.

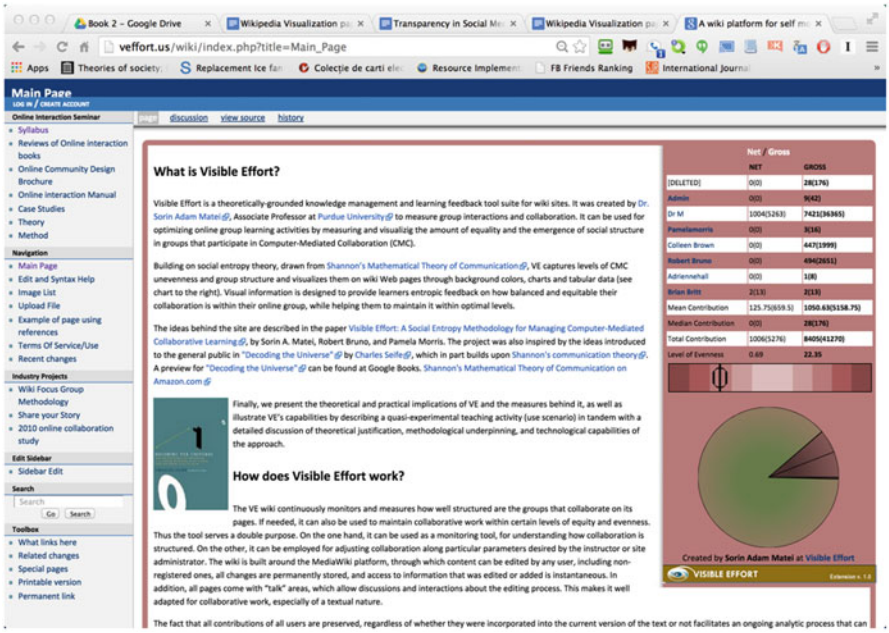
Suh, Chi, Kittur, and Pendleton (2008) created what they called WikiDashboard, a tool which includes a number of visualizations, one of which is active on the article page itself. It displays a list of each of the Wikipedians who have contributed to an article, together with a temporal visualization of their contributions.



Taking a different approach, WikiTrust is a project that attempts to add transparency to the actual content of Wikipedia articles (Adler et al., 2008). It changes the background color of the article text based on a trustworthiness algorithm, which takes into account how long text has been there and who authored it. New text, or text from less trusted users, is highlighted in a brighter color, while text that has been there for a long time (and has theoretically been reviewed by many others) is not highlighted at all.

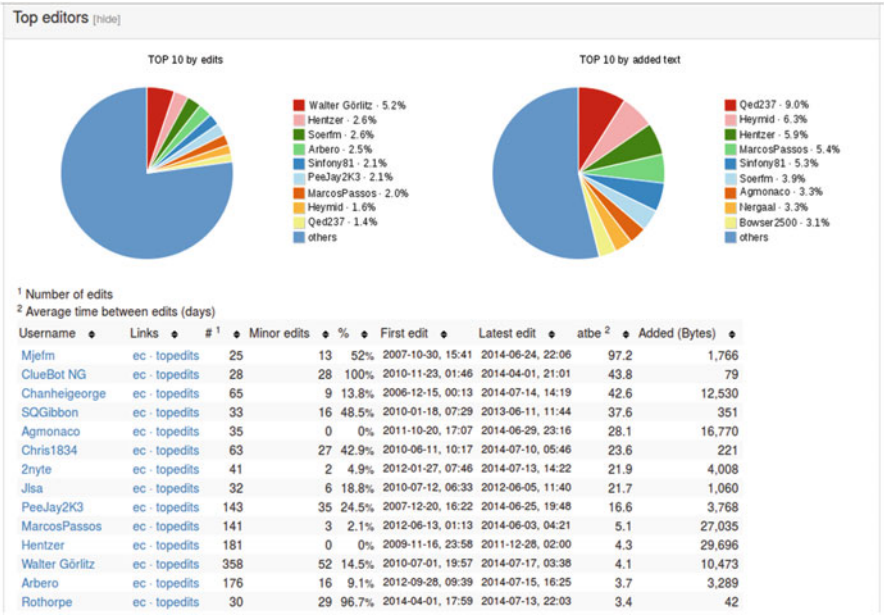
The WikiTrust interface highlights portions of Wikipedia articles which have recently been edited, indicating aspects of the article which may be less trustworthy

A related project, Visible Effort, makes the distribution of effort more visible on content pages. The project calculates the entropy for each page, lists the contribution amounts from the top editors, and changes the background color based on how unequal the contributions are. A horizontal bar indicates the level of entropy for each page, on a standardized scale between 0 and 100. This allows readers to identify pages which are primarily the work of one or a few people (Matei & Dobrescu, 2010 and chapter "Transparency, control, and content generation on Wikipedia: Editorial strategies and technical affordances" in this volume). At another level, it suggests the level of social structuration of any given article, since entropy is considered to be an index of social structuration, as explained in chapter Transparency, control, and content generation on Wikipedia: Editorial strategies and technical affordances of this volume.



6 Why Visualizations Haven't Been Accepted

As mentioned, even now, Wikipedia includes a few visualizations and statistics that are linked to from the article history page. These include the top editors, the number of views, and a chronological history of edits. These are much simpler than the tools proposed by academics, but they do still provide additional insight into the production of article content.



Username	Links	# [1]	Minor edits	%	First edit	Latest edit	atbe [2]	Added (Bytes)
Mjefm	ec · topedits	25	13	52%	2007-10-30, 15:41	2014-06-24, 22:06	97.2	1,766
ClueBot NG	ec · topedits	28	28	100%	2010-11-23, 01:46	2014-04-01, 21:01	43.8	79
Chanheigeorge	ec · topedits	65	9	13.8%	2006-12-15, 00:13	2014-07-14, 14:19	42.6	12,530
SQGibbon	ec · topedits	33	16	48.5%	2010-01-18, 07:29	2013-06-11, 11:44	37.6	351
Agmonaco	ec · topedits	35	0	0%	2011-10-20, 17:07	2014-06-29, 23:16	28.1	16,770
Chris1834	ec · topedits	63	27	42.9%	2010-06-11, 10:17	2014-07-10, 05:46	23.6	221
2nyte	ec · topedits	41	2	4.9%	2012-01-27, 07:46	2014-07-13, 14:22	21.9	4,008
Jlsa	ec · topedits	32	6	18.8%	2010-07-12, 06:33	2012-06-05, 11:40	21.7	1,060
PeeJay2K3	ec · topedits	143	35	24.5%	2007-12-20, 16:22	2014-06-25, 19:48	16.6	3,768
MarcosPassos	ec · topedits	141	3	2.1%	2012-06-13, 01:13	2014-06-03, 04:21	5.1	27,035
Hentzer	ec · topedits	181	0	0%	2009-11-16, 23:58	2011-12-28, 02:00	4.3	29,696
Walter Görlitz	ec · topedits	358	52	14.5%	2010-07-01, 19:57	2014-07-17, 03:38	4.1	10,473
Arbero	ec · topedits	176	16	9.1%	2012-09-28, 09:39	2014-07-15, 16:25	3.7	3,289
Rothorpe	ec · topedits	30	29	96.7%	2014-04-01, 17:59	2014-07-13, 22:03	3.4	42

However, none of the transparency visualizations created have made it onto Wikipedia article pages themselves. The pages remain as opaque as they have ever been, and indeed, they look nearly the same as they have always looked. If these tools are helpful in promoting trust and transparency, then we are led to ask why nothing has actually been incorporated into the article page, where users are likely to see it.

The discussion around WikiTrust gives some clues. In 2009, a *Wired* article reported that Wikipedia would soon be adding WikiTrust to article pages. Soon, users began discussing the proposed changes on the wikien-l mailing list. The conversation centered around a few themes. First, a few posters worried about the effect that this would have on the editors. For example, one poster said:

What's interesting about WikiTrust is that a trust score is computed for each individual. I wonder if these will be made public, and if so, how they will change the community of editors. It seems likely that they will not be made public. However, since the algorithm is published and I believe the source code as well anyone with the hardware could compute and publish how trusted each community member is.

Others questioned the validity and complexity of the algorithm for highlighting less trustworthy content. Finally, and relatedly, many of the commenters wrote about how the interface would be too confusing or too complex for readers.

One poster wrote:

The moment you give people a tool, many people will simplistically assume what it does or rely unthinkingly on it.

- WikiTrust might be described as "a way to see how long an edit endured and how much trust it seems to have"; in most users' hands it'll be "its colored red/blue so its right/wrong."
- People won't think, they'll assume and rely.

Another said:

If I understand this correctly, wouldn't trust coloring inevitably mark all new users and anonymous IPs as untrustworthy?
So, basically, wouldn't trust coloring be a way of failing to assume good faith for all anonymous IPs and new users, and institutionalising this in the software?

The overall tenor was certainly one of trepidation about making changes, and multiple posters wrote about maintaining the current experience for new and inexperienced users. While it is never written, there is a sense that these community members are concerned about pulling back the curtain, and in showing new users more than they are ready for. The implicit fear was that revealing too much would prevent new users from joining the project. In the end, the conservative viewpoint won out, and the plan to incorporate WikiTrust was abandoned.

Ideals of openness and freedom are cited as reasons that active participants edit in Wikipedia (Nov, 2007). However, there may be an unacknowledged, or even unconscious, fear of making some parts of Wikipedia more visible and transparent. Transparency might be dangerous to the project. As seen in the discussion about WikiTrust, Wikipedians are very wary about altering the experience for new users. Perhaps if readers see how uneven the levels of contribution are, or if new users know that their edits are likely to be reverted, they will be less likely to contribute. In a sense, Wikipedians may believe that the project is best served by keeping certain aspects somewhat hidden, until contributors have developed a stronger connection and dedication to the project, at which point the true nature is revealed.

Ironically, the reluctance to add greater visibility may also be driven by the hidden power structures on Wikipedia. Running these sorts of visualizations at scale on a site as large as Wikipedia requires both computing resources and programmer support. Researchers are generally not part of the programming

community on Wikipedia, and may have difficulty convincing the community to take on the responsibilities of scaling and maintaining these projects. Indeed, many of the visualizations and statistics that do exist on the History page are external links to pages owned and maintained by individual programmers, supporting the idea that finding internal support for programming projects is difficult. The fact that other resource-intensive operations, such as full history dumps of the Wikipedia data, have been discontinued due to expense and difficulty, provides further evidence.

A final, related explanation for resistance to change is suggested by Shaw and Hill (2014), who looked at thousands of Wikia.com communities, and found that communities are inherently conservative, with early contributors holding much of the power. We can assume that those who are active on these sites participate because they agree with the overall goals of the site. In addition, they have spent time becoming expert in the current configuration. Therefore, suggestions of major changes to the site are more likely to be rejected by these users.

7 Possible Solutions

We offer a number of suggestions for those wishing to introduce tools to increase the transparency of Wikipedia articles, in a way that is beneficial both to contributors and to readers. Contributors and project leaders have an interest in recruiting new contributors, and maintaining current contributors, while readers have an interest in judging the trustworthiness of content, and in seeing how the encyclopedia is produced.

We suggest that tools need to be unobtrusive. The main goal of Wikipedia is the production and dissemination of knowledge, and modifications which seem to undermine or distract from this purpose are unlikely to be implemented. For example, a small warning that appears only if entropy is greater than a certain threshold, or if there are untrustworthy edits, may be more likely to be accepted. There are already manually created warnings about needed citations, articles that need to be cleaned up, etc. Automated warnings could fit this same framework, and provide increased transparency.

Academics should also be encouraged to work more closely with Wikipedia developers throughout the process of developing tools. These projects require integration into the Wikipedia socio-technical system, and researchers who work with current developers will be much more likely to overcome the technical and political barriers to successful implementation. Working together, researchers and the Wikipedia community can provide tools to make the processes of Wikipedia as open and transparent as its content.

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