Do you have a source for that? Understanding the Challenges of Collaborative Evidence-based Journalism

Sheila O'Riordan
Business Information Systems, University College Cork, Ireland
sheila.oriordan@ucc.ie

Gaye Kiely
Business Information Systems, University College Cork, Ireland
Gaye.Kiely@ucc.ie

Bill Emerson
Business Information Systems, University College Cork, Ireland
B.Emerson@ucc.ie

Joseph Feller
Business Information Systems, University College Cork, Ireland
jfeller@ucc.ie

ABSTRACT
WikiTribune is a pilot news service, where evidence-based articles are co-created by professional journalists and a community of volunteers using an open and collaborative digital platform. The WikiTribune project is set within an evolving and dynamic media landscape, operating under principles of openness and transparency. It combines a commercial for-profit business model with an open collaborative mode of production with contributions from both paid professionals and unpaid volunteers. This descriptive case study captures the first 12-months of WikiTribune's operations to understand the challenges and opportunities within this hybrid model of production. We use the rich literature on Wikipedia to understand the WikiTribune case and to identify areas of convergence and divergence, as well as avenues for future research. Data was collected on news articles with a focus on the time it takes for an article to reach published status, the number and type of contributors typically involved, article activity and engagement levels, and the types of topics covered.

Author Keywords
WikiTribune; collaborative journalism; IT-enabled openness; peer production; news; open digital platforms.

INTRODUCTION
Distinguishing between truth, myth, and lies in our current media landscape is as difficult as ever (see [10,29]). With the emergence of new digital channels, an even more dynamic and fragmented system of news production, distribution, and consumption has evolved [25]. There has been a move towards digital news with increasing user involvement as well as the use of social media platforms for accessing and discussing current affairs [14,39,43]. As such, the boundaries are shifting between professional and amateur contributions. Traditional news organizations are adding interactive features as participatory journalism practices rise (see [8,42]) and the technologies that allow citizens to interact *en masse* provide new avenues for engaging in *democratic deliberation* [19]; the "process of reaching reasoned agreement among free and equal citizens" [6:322].

With these changes, a number of challenges have arisen. Not only is trust in information eroding, media reputation is in decline in both traditional and digital forms [24,32]. The sheer amount of information available reduces the benefits that traditional gatekeeping has to offer [2], coupled with a new reliance on social media algorithms for addressing these gatekeeping functions. Where once journalists held a "jurisdictional control over producing, filtering, and distributing news content on behalf of society" [39:690], now algorithms on large social media platforms and other online intermediaries compile and present news feeds with no filter for accuracy or objectivity [9]. It is a business model that focuses on monetizing attention over quality of information [23]. But more than that, the algorithms are often out of user control and lacking in transparency [15]. As a news source, digital platforms have the power to control the visibility of news content [11] and influence user behavior [7,18]. The consumer is left with the job of verifying and fact-checking the information they encounter, challenged by a rise in both disinformation (i.e. the deliberate propagation of false information or "fake news") and misinformation (i.e. sloppy reporting and unintentionally inaccurate reports) [13]. It has become nontrivial to distinguish between professional and amateur contributions, accurate and false reporting, and evidence and opinion-based information. Fake news, in particular, represents an ongoing research challenge [40] that intentionally interferes with our ability to engage in democratic deliberation, potentially affecting political outcomes and a person's understanding and perception of current affairs [35].

To address this and the other challenges that have arisen in the current media system, a *collaborative journalism* project called WikiTribune was crowdfunded and launched on 30th October 2017. WikiTribune is founded by Jimmy Wales and attempts to replicate the success of Wikipedia and its mass open production of knowledge goods. Collaborative journalism can be thought of as open-source-editing, operating with non-market principles and a culture of collaboration and consensus [28]. It is distinctive from citizen journalism defined by ideals of participatory democracy and an engaged citizenry [28] where the authority of the professional journalist has been removed [21]. But, likewise differs from mainstream journalism, often marred by a profit-driven focus and "high-minded ideals of journalism's role in a democracy" [28:197].

In this case, the pilot project WikiTribune represents a hybrid model of journalism, whereby paid professional journalists and a community of unpaid volunteers work together to produce news collaboratively. WikiTribune's goal is to

produce high quality neutral evidence-based news, with no ads and no paywall using a for-profit donation-based revenue model [46]. The project leverages open, transparent, and inclusive practices similar to Wikipedia and other open production communities. It represents a unique case for understanding the viability of co-creating evidence-based news articles in an inclusive collaborative way and whether this has potential for tackling some of the media-related challenges discussed above. As the WikiTribune project is still in its pilot phase, it represents an interesting case documenting the creation and development of a community and digital platform in its early stages. As such, we seek to analyze a range of data and capture a holistic view of WikiTribune to identify any challenges and opportunities that have arisen throughout its development. We present Wikipedia and its extensive theoretical grounding in the following section, as a lens from which to understand the WikiTribune case and highlight areas for future investigations.

THEORETICAL GROUNDING

IT-enabled openness marks a transition from a culture of exclusion to that of inclusion with ever increasing competencies in large-scale human collaboration [34]. Wikipedia represents an intriguing phenomenon in this space, as a service based on the contributions of large numbers of digital volunteers, who create, curate, and share content and knowledge with the world. It also very well researched [33] and provides a solid foundation with which to analyze WikiTribune, as they both share a number of characteristics. This section presents our current understanding of Wikipedia and the critical success factors identified in the literature, as well as some of the potential issues that arise in these types of communities.

Wikipedia is a free encyclopedia built collaboratively using open source MediaWiki software and operated by the not-for-profit Wikimedia Foundation. It was also founded by Jimmy Wales. In Wikipedia's own words, the essence of Wikipedia is to harness "the collective intelligence and collaborative efforts of editors who hold opposing points of view" [47:1]. Wikipedia is considered the world's leading source of Web reference information [33] and is currently ranked number five in the Alexa global site rankings, preceded only by Baidu, Facebook, YouTube, and at the top, Google [48]. In addition, it has been hailed as one of the largest and most successful examples of open production on the web [1,16,17] achieving quality similar to the leading print-based encyclopedia [3]. It only took Wikipedia five years after its launch to be ranked in the top ten most visited sites in the world [16]. Wikipedia is firmly embedded in society, with an average of 7.5 billion articles viewed each month at the time of this writing [49]. The interests of the world are captured through Wikipedia articles, in both their creation and readership, and provide a unique insight into the zeitgeist and trending cultural topics of any given day, month, or year[1]. Wikipedia is not just limited to English speaking countries. There are 291 different language Wikipedias so far, with the English Wikipedia representing the largest site, accounting for 5,675,431 articles out of the 48,242,419 [51].

From an economic perspective, Wikipedia is not grounded in market-based exchanges or firm-based hierarchies as with traditional forms of production. Rather, Wikipedia like open source software, is best described as a "distributed model of non proprietary production by peers who do not interact either through a firm or through a market" [4:4]. Wikipedia is a unique example of an open production community, as unlike open source software or other more genre specific communities, the articles created span all areas of human knowledge and thus require input from a diverse community [33]. This form of production is most often run by volunteers, who commit varied amounts of time and effort to a project and range in background and levels of experience [27]. According to Mindel et al. [31:608], these types of decentralized systems have three key characteristics: (1) high accessibility to content consumers (typically at no cost), (2) high accessibility to content producers who, in most cases, engage without payment, and finally, (3) as a result of these high accessibility characteristics (that let individuals join for free and leave anytime) there is high volatility in both consumer and producer participation. These conditions enable sudden growth in community and content, but on the flip side are vulnerable to the sudden exit of content producers. Thus, these communities face a sustainability issue and also a *start-up paradox* due to their emergent nature. At the beginning of a project a community may not reach a critical mass of active members to generate enough content and value to both attract new members and sustainably grow the community over time [37,45]. Thus, both community size and community sustainability are important factors to consider in the initial stages of community development [12]. Wikipedia has overcome these issues, moving away from a state of exponential growth to that of more constant growth. It is now in a stage of maturity with a new community focus on enhancing content quality and managing project scalability [45]. To illustrate this, the English Wikipedia was launched in January 2001 and by the end of 2002 a total of 19,700 articles had been created. This number increased each year; peaking in its fifth year in 2006 with an average of 50 to 60 thousand new articles added each month, (or approximately 700,000 articles annually). In 2004 (its fourth year of operation), Wikipedia boasted 2,743 active members and 521 "very active" members (those who contributed at least 100 edits

[1] The top 100 list on Wikipedia presents a multiyear ranking of most viewed pages from December 2007 to March 2018 [50]. At the top of this list are articles on: the United States (177 million views), Donald Trump (135 million views), Barack Obama (119 million views), India (108 million views), World War II (103 million views), and Michael Jackson (101 million views).

per month) [26]. This grew and fluctuated to current figures of 33,952,561 users with a registered username, of which 121,841 actively edited in the last 30 days [52]. It is a minority of the registered users and an unknown number of unregistered users who regularly contribute to Wikipedia and further participate in community discussions.

Research has shown that over time in these distributed online information systems the level of user engagement and overall activity eventually declines substantially [31]. This holds true for Wikipedia as even though the number of articles in Wikipedia does continue to grow, it is at a much slower pace of 20,000 articles per month. However, even with the rate of decline in new articles (at 33% to 40%), the additions to existing articles continue with average article size "growing faster than the number of articles" [53:2]. Wikipedia has been able to reach a critical mass of active users and generate a sizable amount of content to ensure growth and sustainability over time. The literature has attributed this success to the increasing size and diversity of the contributor base (in terms of background and interests), high levels of participation (i.e. each page has a number of edits), the resulting improvements in content quality because of the previous points, but also elements related to increasing participation through the elimination of barriers (for example, allowing users to post anonymously) and ensuring mechanisms are in place to ensure the independence of users' opinions [3].

Key to the growth of Wikipedia article size are the talk pages used by editors to reach consensus and improve article content [22]. Research has recognized the slowdown in terms of the number of articles, edits, and active users, but identified the continued growth of article talk pages [22,38] and their critical importance in the development of articles and for quality improvement [5,30]. A key policy that informs the use of these talk pages to reach consensus amongst various editors is the neutral point of view (NPOV) policy. The NPOV, according to Wikipedia guidelines, "attempts to present ideas and facts in such a fashion that both supporters and opponents can agree" (as cited in [26]). NPOV is particularly relevant to the operation of professional news organizations, which also seek high levels of credibility and information accuracy. This policy ensures that users can work together to create objective evidence-based knowledge artifacts. Like with news, encyclopedic content is traditionally associated with single authors as a "deeply individualistic craft" [36]. In order to enable anonymous individuals to work together on these complex objects, the talk pages that facilitate user coordination and the NPOV policy promoting the use of credible and established sources are especially important in the context of controversial and sometimes divisive topics.

In summary, based on our understanding of Wikipedia and its 18 years of evolution, it will be necessary for WikiTribune to reach a critical mass of active users during its growth phase, provide a stable and reliable infrastructure, generate up-to-date and interrelated content, integrate new members, and ensure ongoing transparency [45]. It is also worth considering the factors that negatively affect a community's value and sustainability, some of which include government censorship, insufficient Internet infrastructure, competition from other communities, poor design, information overload, and a lack of capital [31]. It has even been suggested that the introduction of new features, changes in policy, and general mismanagement of such issues may endanger the very existence of the community [45].

As such, content generation, user coordination, community governance, and content quality will all play a role in understanding the WikiTribune case as it unfolds. To study WikiTribune, it will be necessary to understand the growth in the number of articles and community members, average article size and average number of edits per article over time, as well as the use of talk pages for coordinating the work and reaching consensus in the face of diverging opinions [5,26]. In addition, the nature and topics of the articles created will play a role, as though the quality in the case of Wikipedia is high, the coverage and accuracy varies widely across the various knowledge domains [16] and is particularly relevant in the context of news reporting and journalism. Guided by this theoretical underpinning, the following section outlines the methodology used to examine the collaborative evidence-based journalism project, WikiTribune.

METHODOLOGY

WikiTribune is a pilot project that seeks to create an evidence-based news service using an open collaborative journalism platform. The goals set forth by WikiTribune [46] are to produce: (1) fact-based articles (high quality, neutral, and evidence-based), (2) articles that have a real impact in both local and global events, (3) stories that can be easily verified and improved. It is a newly developed platform with an innovative approach to news creation and thus is likely to demonstrate novel and rapidly changing behaviors [41]. To capture the details of this unique project, a single "extreme" case study approach was selected to study the phenomenon in its natural setting using multiple sources of evidence (see [44]). Two sets of data were collected from the developed WikiTribune platform (www.wikitribune.com) on a complete set of WikiTribune news articles (~900 articles) with a limited number of data points and a sampled set (33 articles) with a larger number of data points. This paper presents findings from one aspect of a larger study into WikiTribune, and as such is focused on the first 12 months of WikiTribune's operation. The WikiTribune project developed over three phases: (1) Crowdfunding (1 month: April to May 2017), (2) Pre-launch (6 months: May to November 2017), (3) Version 1 Pilot Launch (6 months: November 2017 to May 2018). The second year of WikiTribune's operation is followed by Version 2 Pilot Redesign, which is beyond the scope of this paper.

The data points for the complete set captured the total number of articles (draft and published), the number of

unique article creators, the types of article authors (staff versus volunteers) and the number and type of categories and tags used in all of the WikiTribune articles captured. More detailed metric data was gathered on a sampled set of "published" articles as a representative of this larger set. This data reveals the estimated time and number of contributions it takes for an article to reach a published status (hence exclusion of draft articles from analysis), the typical number of contributors for each article, the type of contributors (staff or volunteer), and the level of engagement (talk comments) an article accrues. The data collected from WikiTribune is publicly available under a creative commons license and this study received ethical approval from our institutional review board for collection. Random stratified sampling was used to select a sample from each productive month over the 12-month period from May 2017 to May 2018. This ensured that articles were analyzed for comparison across the entire life cycle of the sampling period. Table 1 displays the representative sample sizes for each month based on the total articles at the time of sampling in October 2018 (sampling was undertaken on a larger set excluded from this paper). This sampling resulted in data on 33 published articles.

Date	**Total**	*Sample*	**Date**	**Total**	*Sample*
May-17	1	*1**	Nov-17	84	*3*
Jun-17	0	*0*	Dec-17	108	*4*
Jul-17	3	*1**	Jan-18	182	*6*
Aug-17	20	*1*	Feb-18	115	*4*
Sep-17	64	*2*	Mar-18	117	*4*
Oct-17	82	*3*	Apr-18	124	*4*
			Total:	**900**	**33**

**where sample was less than 1 or greater than 0.01, one article was selected*

Table 1. Stratified random sampling of articles by month

The size of WikiTribune's community was captured using data from the crowdfunding campaign supporter numbers and the number of people joining and using the WikiTribune Slack workspace (a separate public communication platform created in June 2017 for organizing and discussing the WikiTribune project). Table 2 displays the estimated community size based on these details. These sources do not capture reader or audience numbers; only representing the potential number of paid staff members and unpaid volunteers, or the more active community members. During this period, up to 27 staff member profiles were posted on WikiTribune and identified in the author/contributor information from both data sets. The article data presented in the following sections focuses on the pre-launch (six months from May to November 2017) and post-launch (six months from November 2017 to May 2018) phases, during which articles were created and published on the platform.

Phase	**Estimated Community Size**		
Crowd-funding	Reaches approximately **12,000** supporters during crowdfunding campaign		
Pre-launch	Slack workspace reaches **178** members by end of October 2017		
	Jun 2017	5	*+5*
	Aug 2017	93	*+88*
	Oct 2017	178	*+85*
Post-launch	Slack workspace reaches **285** members by end of April 2018		
	Dec 2017	180	*+2*
	Feb 2018	274	*+94*
	Apr 2018	285	*+11*

Table 2. Estimated community size of WikiTribune

FINDINGS

WikiTribune included 898 articles from May 2017 to the end of April 2018 (number of articles reduced during actual data collection from sampling date). There are two status labels assigned to WikiTribune articles: (1) draft or (2) published, as an article goes through a draft, review, and publish cycle. An article must be approved by a trusted contributor to be published. A published article may continue to be worked on, in which it will have "pending edits" awaiting approval. Table 3 displays the total number of articles from both the complete and sampled sets of data, including details on the total number of unique authors and the breakdown between the different types of article creators – whether staff, volunteer, or unknown (deleted user). This table highlights the consistency between the data captured in the sampled set versus the complete set. Both sets show that on average approximately 79% of articles were created by staff members, with the remaining 21% attributed to volunteers (19%) and deleted users (2%). Volunteers were associated with a larger number of draft articles at 57% versus 43% attributed to staff members (a larger sample excluded from this paper of 1541 articles of which of 136 were drafts confirms this finding).

Given a total of 898 articles during a 12-month period, on average this represents a rate of 75 articles created per month. However, in reality there was greater variation in productivity during this time as the project was officially launched and the community grew. The average number of articles created pre-launch was 28 articles per month. While post-launch averages increased to 122 articles per month. To illustrate this, Figure 1 presents the total number of articles each month broken down by the type of article creator. The highest number of articles created in this time was 182 (181 of which were published) in the ninth month of operation (January 2018) or three months' post-launch. In that month, staff were responsible for creating 77% of the articles, with the remaining 23% attributed to volunteers (21%) and deleted users (2%). In the first three months, 100% of the articles created were by staff, but a beta platform was opened up for volunteers to begin participating after this (these

volunteers included donors and WikiTribune survey participants). During this three-month period pre-launch, volunteer contributions ranged between 13% and 20% (with an average of 16%). In the six months' post-launch, volunteers created between 10% and 27% of articles (with an average of 20%). February 2018 saw a significant drop in volunteer created articles (with just 10%), but grew in subsequent months from 16% in March 2018 to 27% in April 2018 (the highest level of volunteer created articles to date). After the peak of total articles in January 2018, overall productivity fell, even though articles created by volunteers grew. To illustrate this, in the first three months from May to July 2017 (pre-launch), an average of one article was created and published. With the beta version of the platform opened up to a group of volunteers, the subsequent three months from August to October 2017 (pre-launch) grew to an average of 55 articles. The three months' post-launch (November 2017 to January 2018), saw a 50% or more increase in productivity with an average of 125 articles created, while this fell in the final three months (February to April 2018), to an average of 118 articles.

The reason for this slowed growth could be attributed to various barriers put in place by the WikiTribune community that may have hindered participation and a sense of inclusion. These barriers range in terms of platform design, community governance, and member policies. For example, all users are required to register to contribute to articles and on talk pages; a real names policy is in place because of the nature of the news article and in the case of original reporting; only trusted members (normally staff) are permitted to publish articles from a draft status; and the design of the website affords more *readability* than *editablility*. In addition, the perceived difference between professional journalists (paid staff) and the amateur volunteers may have contributed to some of the participation issues and created some asymmetries within the community. Thus, for the first 12 months of operation before and after platform launch, the majority of the work was undertaken by up to 27 staff members.

Articles and creators		**Published (sampled set)**	**Published (complete set)**	**Draft (complete set)**	**Total (complete set)**
Total number of articles		33	891	7	898
Total unique article creators		16	96	6	98
Started by	staff	27 (82%)	703 (79%)	3 (43%)	706 (79%)
	volunteers	6 (18%)	167 (19%)	4 (57%)	171 (19%)
	unknown (deleted user)	0 (0%)	21 (2%)	0 (0%)	21 (2%)

Table 3. Article author details (complete and sampled set)

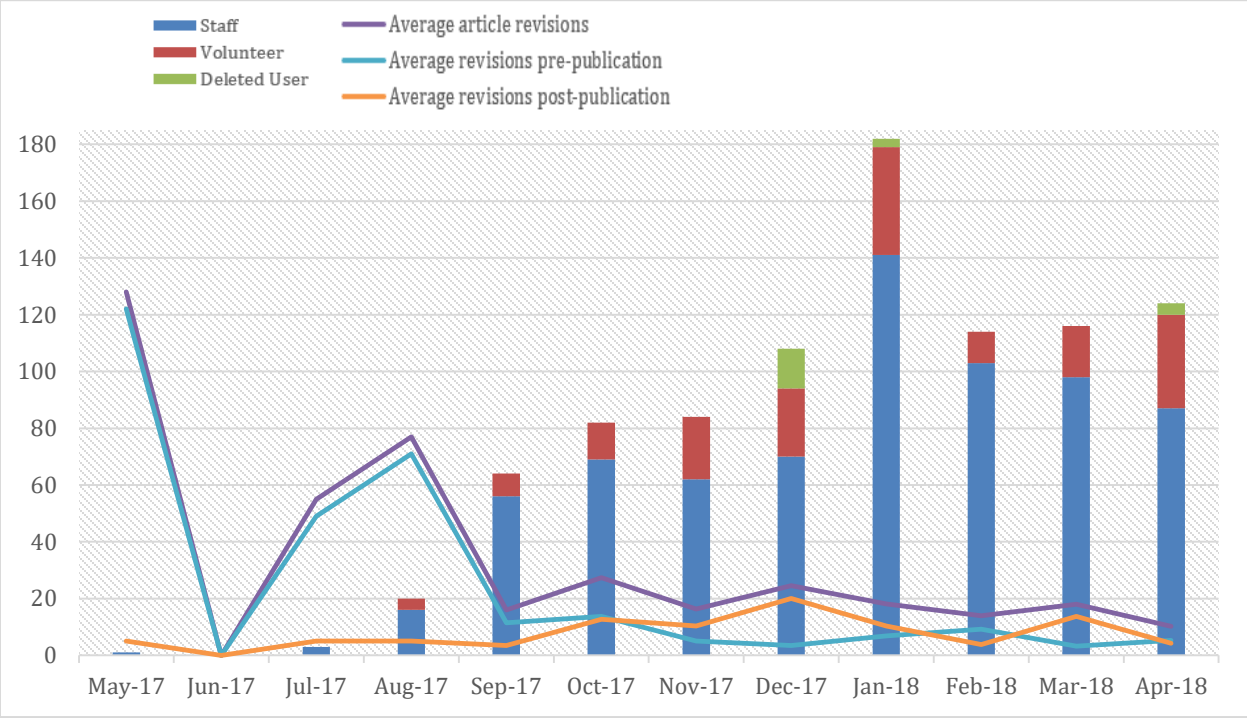

Figure 1. Total articles and type of article creator (complete set) with breakdown of average article revisions (sampled set)

Article details	*Min*	*Max*	*Mode*	*Average*	*Total*
Word count (article size)	134	3832	897	827	27315
Article revisions	2	128	9	24	799
Revisions pre-publication	0	122	2	14	447 (56%)
Revisions post-publication	1	59	1	10	320 (40%)
Time to publish (days)	0 days	199 days	0 days	16 days	
Start date to last edit (days)	0 days	445 days	0 days	46 days	
Publish date to last edit (days)	0 days	246 days	0 days	30 days	
Unique contributors	2	13	6	6	190
Staff contributions	1	128	8	22	714 (89%)
Volunteer contributions	0	20	0	3	85 (11%)

Table 4. Details on article revisions and contributors (sampled set)

Though the estimated size of the community (on Slack) reached 285 by the end of April 2018 (see Table 2), there were just 98 unique article creators identified in the complete data set (see Table 3). An estimate would put the volunteer community willing to actively create articles at approximately 71 individuals. However, this figure only represents article creators, not the number of contributions and edits made to each article by different users (this will be examined in later sections using the smaller sampled set and article history logs). It is unknown if unique article creators regularly started new articles and/or only engaged in specific topic areas, representing an aspect to explore in future analyses.

Article Size and Revision History

This section presents details on the typical size of articles and the various details related to an article's revision history and contributor breakdown as displayed in Table 4 (based on the sampled set). In terms of article size, the average word count across the sampled time period was 827 words per article, ranging from 134 words to 3832 words overall. A larger word count, number of revisions, and number of revisions pre-publication were evident in articles created in the pre-launch period. This began to level out and slowly decrease from September 2017 on (see Figure 1). Staff created the majority of those articles and contributed the largest number of edits also (see Figure 1 and Table 3). Total article revisions averaged at 24 per article during the 12-month period. However, splitting this into pre-launch and post-launch changes the average from 47 revisions in the pre-launch period to 17 revisions post-launch, indicating a dramatic decrease. A majority of the revisions in the pre-launch period were before an article reached a published status, with an average of 38 revisions recorded before publication (and eight after). This changed post-launch, with an average of six revisions recorded before an article was published (and 10 after). Likewise, the days to publication varied, with an average of 16 days to reach a published status, however in general many of the articles were published the same day they were created (the mode is 0 days overall); taking just the post-launch phases reduces the average to 5 days. It is unknown if the change in the number of revisions before and after publication and time to publish is due to increases in volunteer contributions or as a result of staff speeding up internal processes. However, it is undeniable that a shift occurred and the revision and publication process changed.

The number of unique contributors to an article was an average of six people (see Table 4). These six people normally contributed multiple times, with staff contributions averaging at 22 per article and volunteer contributions averaging at three. However, there was a large variance in the contributions, with staff contributions ranging from one to 128, and volunteers 0 to 20. Similar to the breakdown of article creators, 89% of contributions were made by staff and 11% by volunteers. Following from this, the number of people who contributed to an article after its creation ranged from a minimum of two to a maximum of 13 (from the sampled set).

Article Talk Pages and Community Coordination

To comment on an article's talk page, it is necessary to register an account and log in to the WikiTribune platform (similar to article creation and editing). It is explicitly stated on the community pages that the talk page is for "discussion about how to improve the article and for planning future articles" [54]. It is not intended for "one-off comments or a general discussion of the news like most news site comment areas". They also use a separate communication platform, Slack, to discuss the WikiTribune project and the development of news articles. Across the complete WikiTribune data set there was a total of 3172 talk comments (see Table 5). On average this represented four comments per article, but ranged from 0 to a maximum of 55 comments. Out of 898 articles, 396 (44%) had no comments (hence the mode was 0). This was followed by 11% (96) of articles with two comments, 9% (82) of articles with one comment, and 6% (56 and 57 respectively) of articles with both three and four comments (numbers declined the higher the number of comments). In examining the data, 24 articles had over 20 comments and just nine articles had over 30 comments. Of these nine articles, 78% were started by staff, and just 22% by volunteers. The article with the highest number of comments (55) was written by a staff member about the concept of a Russian hybrid war. Other topics (highest to lowest) included sex and power, Antifa, rights activist in

Turkey, Russian spy nerve agent attack, Davos, bitcoin, Catalan independence, and gun ownership in America.

The sampled set shares an average of four comments, but with a range of 0 to 23. In the sampled set, 13 articles (39%) had no comments (the mode was also 0), followed by one comment (15%), two comments (9%), three comments (6%) and eight comments (6%). The data shows that volunteers contribute a larger portion of the comments than staff (67%) and roughly half of the comments are threaded in reply to other users. It is also evident that a number of discussions are occurring on the Slack workspace as opposed to the WikiTribune platform. Slack is used as an alternative space for coordinating the development of articles. The total number of users on Slack grew to 285 by the end of April 2018 since its creation in June 2017. Likewise, a total of 15,106 messages were sent in that period. These messages were posted in public channels (6395 messages), private channels (1706 messages), and also in direct messages (7005 messages). Daily active users fluctuated before and after launch with an average of 17 daily active users and six daily users posting messages on the Slack workspace across the 12-month period. The number of public channel messages peaked in February 2018, just after the peak in number of articles in January 2018 (see Figure 1). These numbers declined in subsequent months, but still represent more active posting than the initial periods. It is planned to explore this data in more detail to understand the impact of fragmented community discussions and general article engagement.

Article Topics and Coverage

This section presents the most popular categories and tags, and ranks them based on a word frequency analysis to understand the main types of articles the project and its developing community created. It is planned to further analyze this data set in future studies to understand if there is any relation to specific topics and the level of engagement and participation. Especially given news is a unique and complex artifact and the topics covered will range in quality and appeal. Since the beginning of WikiTribune the type of news covered has mainly fallen within the current affairs and political issues spectrum. There were seven main categories on display on the homepage during the initial platform launch period (October 2017): (1) Current Affairs, (2) Politics, (3) Culture, (4) United States, (5) Europe, (6) Asia, and (7) Middle East. Over time this list expanded with the ongoing development of the platform and the increase in participation and growing number of articles. Two of the ways that topic metadata is assigned to an article is through a taxonomy of categories and tags. The “categories” method includes a drop-down list within the editing platform for contributors to select topics from (expanded over time from project inception). The second method is “tags”, which are open and user-generated. These categories and tags help to group and filter the news articles for both readers and contributors.

Talk pages		***Min***	***Max***	***Mode***	***Average***	***Total***
Complete set	Talk comments	0	55	0	4	3172
Sampled set	Talk comments	0	23	0	4	131
	Comment threads	0	9	0	2	62
	Staff comments	0	11	0	1	43 (33%)
	Volunteer comments	0	13	0	3	88 (67%)
	Comments pre-publication	0	4	0	0	10 (8%)
	Comments post-publication	0	23	0	4	118 (90%)

Table 5. Talk comment details (complete and sampled set)

	Pre-launch			**Post-launch**	
#	**Categories**	**Count**	#	**Categories**	**Count**
1	Politics	46	1	↑ United States	272
2	United States	27	2	Current Affairs	263
3	Europe	18	3	↓ Politics	224
4	Human Rights	14	4	United Kingdom	136
5	Diplomacy	14	5	Technology	134
#	**Tags**	**Count**	#	**Tags**	**Count**
1	Donald Trump	21	1	Donald Trump	132
2	Stories needing images	15	2	Facebook	48
3	Catalonia	11	3	Data	44
4	Brexit	7	4	Putin	41
5	Independence Referendum	6	5	Rights	40

Table 6. Top ranked categories and tags pre and post-launch (complete set)

On average, across the complete data set, there were approximately five categories and five tags assigned to a given article. However, the range was large and could be anywhere from 0 to 21 categories and 0 to 52 tags. In terms of the mode, an article was most likely to have three categories and four tags. Overall, during the sampled time period a total of 4042 categories and 4269 tags were collected (with approximately 200 unique categories and 2800 unique tags). To better understand the changes in topics, Table 6 presents the top five categories and tags during the pre-launch and post-launch periods. The tags are more variable based on the specific topic of a news article. However, due to the structured nature of the categories, certain trends can be observed based on the frequency in which they are included. In general, the United States (299), current affairs (274), politics (270), United Kingdom (143), technology (142), diplomacy (127), human rights (106), law (91), internet (81), Europe (77), North Korea (75), and the European Union (73) stood out during the entire 12-month period. Likewise, Donald Trump (153) remained an extremely popular tag throughout the entire life cycle of the project, followed by Facebook (50), Putin (45), rights (45), data (44), United (42), Cambridge (40) or Cambridge Analytica (36), Theresa May (39), Skripal (35), Brexit (33), and Sexual (32).

DISCUSSION

Due to the dynamic and emergent nature of peer production communities, the background literature has emphasized the importance of reaching a critical mass of participants [12,37,45] and for achieving community diversity [3]. It is unclear if WikiTribune has achieved these goals as it is still at an early stage in terms of its development. However, the findings presented in this study suggest that production plateaued near the end of the first year and an imbalance between the number of contributions made by staff versus volunteers is evident. Staff represent the majority of article creators and also provide the majority of contributions to each article, whereas volunteers are associated with the creation of a larger number of draft articles and more engagement on talk pages. Volunteer contributions did begin to rise in the final three months of the data set, perhaps representing a future upswing as the project and platform become more established.

While the causes of user (non-)participation issues are not clear, these issues were recognized by WikiTribune. In May 2018, a proposed platform redesign – to make WikiTribune "more wiki" – was initiated. The redesign includes a change to the homepage interface affording more editing capabilities (over the websites' *readability*) with the intention to make it easier for visitors to identify the status of each article (draft or published) and properly signal the editing capabilities and promote inclusivity and levels of participation. In addition, a number of policies have been changed or updated, including the permissions on who can publish an article (changed in October 2018). Allowing only certain members to publish articles may have slowed down production and hindered the potential participation of volunteers; perhaps due to misunderstandings of a community member's role and a perceived divide between staff and volunteers. It was noted that the success of Wikipedia in some ways was due to the independence of users' opinions (see [3]) – having these distinct permissions may have created an invisible hierarchy that hindered this quality.

In general, the findings point to low levels of volunteer contributions overall, with much of the production left to the 27 or so paid staff members. Engagement was higher by volunteers in terms of the talk pages. However, a majority of articles had zero engagement. This may be due to the controversial nature of some topics over others, as is the case in Wikipedia [5,26] or just a lack of interest in certain topics, amongst a number of possible factors. However, prior research suggests that the use of talk pages is key to article improvement and overall quality in Wikipedia [22]. It will therefore be interesting to see if the redesign of the WikiTribune platform increases participation and engagement and if this correlates with improvements in article quality. However, the study's findings also suggest that engagement may be occurring on a different platform, namely Slack. Much of the transparency may be lost if some of the article negotiations are not occurring directly on article pages. This also makes it difficult to assess coordination, when not captured through a visible and semantically linked historical log. It is yet to be seen if staff contributions are of higher quality than volunteer contributions, and whether article quality improves with more or less participation (see [20] for an analysis of this in the context of Wikipedia). News is a complex knowledge object, and its capacity to be collaboratively built by diverse distributed community members is worth investigating further. News is current, fast, and culturally dependent; it differs to encyclopedic articles and slow production may present a challenge as a result.

CONCLUSIONS

WikiTribune is a collaborative evidence-based journalism project that encompasses a hybrid model, whereby both professional and amateurs can work together to create the news, modeled on open production communities like Wikipedia. This study describes and analyzes the first 12 months of WikiTribune's operations, pre- and post-launch of the developed platform. The study makes several contributions to our current knowledge by (1) providing an empirical description of the ongoing levels of participation, engagement, and article topic coverage, (2) highlighting key challenges faced by WikiTribune in terms of size, diversity, and levels of engagement, and (3) identifying key differences between WikiTribune and Wikipedia that may be salient to addressing these challenges.

As well as contributing to the open collaboration/platform research communities, the work also contributes to a wider discourse around the media, and whether it is possible to combine the reputation and credibility of professional news

organizations with the power of the crowds for enhancing relevance and quality of news articles.

Further research is needed to investigate the challenges identified in this hybrid model in a more explanatory way, as well as to investigate the impacts of the WikiTribune re-design. Likewise, we would call for future research into the factors related to content generation (quantity), user coordination, community governance, and content quality, and replication of the study across a larger sample of articles in order to more broadly generalize the findings.

ACKNOWLEDGMENTS

This research is funded by the Lewis Charitable Foundation (USA) via the TOTO Research Project (2012-2019).

REFERENCES

1. Judd Antin and Coye Cheshire. 2010. Readers are not free-riders: reading as a form of participation on Wikipedia. In *Computer Supported Cooperative Work* (CSCW '10), 127–130.
2. O. Arazy, R. Kopak, and I. Hadar. 2017. Heuristic Principles and Differential Judgments in the Assessment of Information Quality. *Journal of the Association for Information Systems* 18, 5: 403–432.
3. Ofer Arazy, Wayne Morgan, and Raymond Patterson. 2006. Wisdom of the Crowds: Decentralized Knowledge Construction in Wikipedia. In *16th Annual Workshop on Information Technologies & Systems*.
4. Yochai Benkler. 2002. Coase's Penguin, or, Linux and "The Nature of the Firm." *The Yale Law Journal* 112, 3: 369–446.
5. Taryn Bipat, David W. McDonald, and Mark Zachry. 2018. Do We All Talk Before We Type?: Understanding Collaboration in Wikipedia Language Editions. In *Proceedings of the 14th International Symposium on Open Collaboration - OpenSym '18*, 1–11.
6. James Bohman and William Rehg. 1997. *Deliberative Democracy: Essays on Reason and Politics*. MIT Press.
7. Robert M. Bond, Christopher J. Fariss, Jason J. Jones, Adam D. I. Kramer, Cameron Marlow, Jaime E. Settle, and James H. Fowler. 2012. A 61-million-person experiment in social influence and political mobilization. *Nature* 489, 7415: 295–298.
8. Shayne Bowman and Chris Willis. 2003. We Media: How Audiences are Shaping the Future of News and Information. *The Media Center, American Press Institute*.
9. Engin Bozdag and Jeroen van den Hoven. 2015. Breaking the filter bubble: democracy and design. *Ethics and Information Technology* 17, 4: 249–265.
10. Petter Bae Brandtzaeg, Asbjørn Følstad, and María Ángeles Chaparro Domínguez. 2018. How Journalists and Social Media Users Perceive Online Fact-Checking and Verification Services. *Journalism Practice* 12, 9: 1109–1129.
11. Taina Bucher. 2012. Want to be on the top? Algorithmic power and the threat of invisibility on Facebook. *New Media & Society* 14, 7: 1164–1180.
12. Brian S. Butler, Patrick J. Bateman, Peter H. Gray, and E. Ilana Diamant. 2014. An Attraction-selection-attrition Theory of Online Community Size and Resilience. *MIS Q.* 38, 3: 699–728.
13. Andrea Carson and Kate Farhall. 2018. Understanding Collaborative Investigative Journalism in a "Post-Truth" Age. *Journalism Studies* 19, 13: 1899–1911.
14. Carlos Castillo, Mohammed El-Haddad, Jürgen Pfeffer, and Matt Stempeck. 2014. Characterizing the life cycle of online news stories using social media reactions. In *ACM conference on Computer supported cooperative work & social computing - CSCW '14*, 211–223.
15. Michael A. DeVito. 2017. From Editors to Algorithms: A values-based approach to understanding story selection in the Facebook news feed. *Digital Journalism* 5, 6: 753–773.
16. Andreea D. Gorbatai. 2011. Exploring underproduction in Wikipedia. In *Proceedings of the 7th International Symposium on Wikis and Open Collaboration - WikiSym '11*, 205.
17. Aaron Halfaker, Aniket Kittur, and John Riedl. 2011. Don't bite the newbies: how reverts affect the quantity and quality of Wikipedia work. In *Proceedings of the 7th International Symposium on Wikis and Open Collaboration - WikiSym '11*, 163.
18. Jason J. Jones, Robert M. Bond, Eytan Bakshy, Dean Eckles, and James H. Fowler. 2017. Social influence and political mobilization: Further evidence from a randomized experiment in the 2012 U.S. presidential election. *PLOS ONE* 12, 4: e0173851.
19. Michael Karlsson, Annika Bergström, Christer Clerwall, and Karin Fast. 2015. Participatory journalism – the (r)evolution that wasn't. Content and user behavior in Sweden 2007–2013. *Journal of Computer-Mediated Communication* 20, 3: 295–311.
20. Aniket Kittur and Robert E. Kraut. 2008. Harnessing the Wisdom of Crowds in Wikipedia: Quality Through Coordination. In *Proceedings of the 2008 ACM Conference on Computer Supported Cooperative Work* (CSCW '08), 37–46.
21. Farooq A. Kperogi. 2011. Cooperation with the corporation? CNN and the hegemonic cooptation of citizen journalism through iReport.com. *New Media & Society* 13, 2: 314–329.
22. David Laniado, Riccardo Tasso, Yana Volkovich, and Andreas Kaltenbrunner. 2011. When the Wikipedians Talk: Network and Tree Structure of Wikipedia Discussion Pages. *Assoication for the Advancement of Artificial Intelligence*: 8.
23. David M. J. Lazer, Matthew A. Baum, Yochai Benkler, Adam J. Berinsky, Kelly M. Greenhill, Filippo Menczer, Miriam J. Metzger, Brendan Nyhan, Gordon Pennycook, David Rothschild, Michael Schudson, Steven A. Sloman, Cass R. Sunstein, Emily A. Thorson,

Duncan J. Watts, and Jonathan L. Zittrain. 2018. The science of fake news. *Science* 359, 6380: 1094–1096.
24. C.M. Lazo and P.F. Batlle. 2019. Information quality and trust: From traditional media to cybermedia. *Studies in Systems, Decision and Control* 154: 185–206.
25. S. Lewandowsky, U. K. H. Ecker, and J. Cook. 2017. Beyond Misinformation: Understanding and Coping with the "Post-Truth" Era. *Journal of Applied Research in Memory and Cognition* 6, 4: 353–369.
26. Andrew Lih. 2005. Wikipedia as Participatory Journalism: Reliable Sources? Metrics for evaluating collaborative media as a news resource. *5th International Symposium on Online Journalism*: 31.
27. Kurt Luther, Kelly Caine, Kevin Ziegler, and Amy Bruckman. 2010. Why it works (when it works): success factors in online creative collaboration. In *Proceedings of the 16th ACM international conference on Supporting group work - GROUP '10*, 1.
28. Shawn McIntosh. 2008. Collaboration, Consensus, and Conflict. *Journalism Practice* 2, 2: 197–211.
29. R. Mejia, K. Beckermann, and C. Sullivan. 2018. White lies: a racial history of the (post)truth. *Communication and Critical/Cultural Studies* 15, 2: 109–126.
30. M. Mesgari, C. Okoli, M. Mehdi, F. Å. Nielsen, and A. Lanamäki. 2015. "The Sum of All Human Knowledge": A Systematic Review of Scholarly Research on the Content of Wikipedia. *Journal of the Association for Information Science and Technology* 66, 2: 219–245.
31. Vitali Mindel, Lars Mathiassen, and Arun Rai. 2018. The Sustainability of Polycentric Information Commons. *MIS Quarterly* 42, 2: 607-A14.
32. Niv Mor and Zvi Reich. 2018. From "Trust Me" to "Show Me" Journalism. *Journalism Practice* 12, 9: 1091–1108.
33. C. Okoli, M. Mehdi, M. Mesgari, F. Å. Nielsen, and A. Lanamäki. 2014. Wikipedia in the eyes of its beholders: A systematic review of scholarly research on Wikipedia readers and readership. *Journal of the Association for Information Science and Technology* 65, 12: 2381–2403.
34. F. Xavier Olleros. 2018. Antirival goods, network effects and the sharing economy. *First Monday* 23, 2.
35. Tanja Pavleska, Andrej Školkay, Bissera Zankova, Nelson Ribeiro, and Anja Bechmann. 2018. Performance analysis of fact-checking organizations and initiatives in Europe: a critical overview of online platforms fighting fake news. *Social media and convergence*: 29.
36. Roy Rosenzweig. 2006. Can History Be Open Source? Wikipedia and the Future of the Past. *Journal of American History* 93, 1: 117–146.
37. Nina-Birte Schirrmacher, Jan Ondrus, and Thomas Kude. 2017. Launch Strategies of Digital Platforms: Platforms with Switching and Non-Switching Users. In *ECIS 2017 Completed Research*, 17.
38. Jodi Schneider, Alexandre Passant, and John G Breslin. 2010. A Content Analysis: How Wikipedia Talk Pages Are Used. In *Web Science Conference*, 8.
39. W. Shin. 2015. Being a truth-teller who serves only the citizens: A case study of Newstapa. *Journalism* 16, 5: 699–704.
40. K. Shu, A. Sliva, S. Wang, J. Tang, and H. Liu. 2017. Fake News Detection on Social Media: A Data Mining Perspective. *SIGKDD Explor. Newsl.* 19, 1: 22–36.
41. Emmanuelle Vaast and Geoff Walsham. 2013. Grounded theorizing for electronically mediated social contexts. *European Journal of Information Systems* 22, 1: 9–25.
42. Igor Vobič and Peter Dahlgren. 2013. Reconsidering Participatory Journalism in the Internet Age. *Medijska istraživanja : znanstveno-stručni časopis za novinarstvo i medije* 19, 2: 9–30.
43. David Westerman, Patric R. Spence, and Brandon Van Der Heide. 2014. Social Media as Information Source: Recency of Updates and Credibility of Information. *Journal of Computer-Mediated Communication* 19, 2: 171–183.
44. Robert K. Yin. 2009. *Case study research design and methods*. Thousand Oaks, Calif Sage Publications.
45. Pujan Ziaie and Medin Imamovic. 2013. Lifecycle-based evolution of features in collaborative open production communities: the case of Wikipedia. In *ECIS 2013 Completed Research*.
46. About Us. Retrieved February 11, 2019 from https://www.wikitribune.com/about/
47. Wikipedia:The essence of Wikipedia. *Wikipedia*. Retrieved March 5, 2017 from https://en.wikipedia.org/w/index.php?title=Wikipedia:The_essence_of_Wikipedia
48. Alexa Top 500 Global Sites. *Alexa*. Retrieved July 3, 2018 from https://www.alexa.com/topsites
49. Siteviews Analysis. *Wikimedia*. Retrieved July 3, 2018 from https://tools.wmflabs.org/siteviews/
50. Wikipedia:Multiyear ranking of most viewed pages. *Wikipedia*. Retrieved June 28, 2018 from https://en.wikipedia.org/w/index.php?title=Wikipedia:Multiyear_ranking_of_most_viewed_pages
51. List of Wikipedias. *Wikipedia*. Retrieved July 4, 2018 from https://meta.wikimedia.org/w/index.php?title=List_of_Wikipedias
52. Wikipedia:Wikipedians. *Wikipedia*. Retrieved July 4, 2018 from https://en.wikipedia.org/w/index.php?title=Wikipedia:Wikipedians
53. Wikipedia:Size of Wikipedia. *Wikipedia*. Retrieved July 4, 2018 from https://en.wikipedia.org/w/index.php?title=Wikipedia:Size_of_Wikipedia
54. Conduct on WikiTribune -- what you can expect, what we expect. *WikiTribune*. Retrieved July 3, 2017 from https://www.wikitribune.com/project/conduct-on-wikitribune-what-you-can-expect-what-we-expect/