



City Research Online

City, University of London Institutional Repository

Citation: Thurman, N. (2017). Social media, surveillance and news work: On the apps promising journalists a “crystal ball”. *Digital Journalism*, 6(1), pp. 76-97. doi: 10.1080/21670811.2017.1345318

This is the submitted version of the paper.

This version of the publication may differ from the final published version.

Permanent repository link: <https://openaccess.city.ac.uk/id/eprint/17599/>

Link to published version: <https://doi.org/10.1080/21670811.2017.1345318>

Copyright: City Research Online aims to make research outputs of City, University of London available to a wider audience. Copyright and Moral Rights remain with the author(s) and/or copyright holders. URLs from City Research Online may be freely distributed and linked to.

Reuse: Copies of full items can be used for personal research or study, educational, or not-for-profit purposes without prior permission or charge. Provided that the authors, title and full bibliographic details are credited, a hyperlink and/or URL is given for the original metadata page and the content is not changed in any way.

SOCIAL MEDIA, SURVEILLANCE, AND NEWS WORK

On the apps promising journalists a “crystal ball”

Neil Thurman

Social media platforms are becoming an indispensable resource for journalists. Their use involves both direct interaction with the platforms themselves and, increasingly, the use of specialist third-party apps to find, filter, and follow content and contributors. This article explores some of the ways social media platforms, and their technological ecosystems, are infusing news work. A range of platforms and apps—including Geofeedia, Spike, and Twitter—were critically examined, and their use by trainee journalists ($N=81$) analysed. The results reveal how journalists can—and do—surveil social network users and their content via sophisticated, professional apps that are also utilised by the police and security forces. While journalists recognise the value of such apps in news work, they also have concerns, including about privacy and popularism. And although the participants in this study thought the apps they used could help with verification, there were warning signs that an over-reliance on the technology could develop, dulling journalists’ critical faculties.

Keywords

Algorithms; artificial intelligence; computational journalism; geolocation; social media monitoring; surveillance; third-party apps; verification

Introduction

For majorities of journalists in many countries, social media has become an indispensable professional tool, employed on a daily or weekly basis to monitor events, find sources, and verify information. Heravi and Harrower (2016) found that almost 99 per cent of Irish journalists used social media in a professional capacity. In the wider milieu of seven Western European and North American countries, 85 per cent of journalists utilised social media at least weekly to find news sources, with almost as many, 74 per cent, monitoring events via social media in a typical week and 68 per cent using it in processes of verification (Gulyas 2016). Across all seven countries, bar one—Germany—over half of the journalists agreed with the statement: “I would not be able to carry out my work without social media”.

However, journalists face a number of challenges in utilising social networks professionally. Fundamentally, the problem is one of scale. The sheer volume of material being produced has made it impossible, using the social networks’ own interfaces, to monitor and verify all the contributors and content that might match a journalist’s interests. This problem has been known for some time. Schifferes et al. (2014) interviewed journalists in 2012 and found they were dissatisfied with the search and filtering functions offered by social networks, calling them “very hit and miss”.

The breadth of social networks’ reach, the frequency with which they are used, and the quantity and character of information uploaded by users have made them a unique resource, with the data they carry of interest not only to journalists but to a wide range of other users. Social networks realised quickly that they could not, on their own, meet the myriad demands users had for the content they carried, so they started to provide access to their data—mostly via APIs (Application Programming Interfaces)—enabling third-parties to build software applications (or “apps”) that offered a multitude of services. This process transformed the social media *network* or

site involved into a *platform* on top of which “new forms of value” could be built (Diakopoulis 2017, 178).

Twitter turned itself into a social media platform relatively early, just months after its launch (Stone 2006), and five years later, in 2011, more than a million third-party apps were registered (Twitter 2011). Facebook opened up its data to external developers a little later, earning platform status in 2007. By 2015 its founder was reporting that more than 30 million third-party apps had been created (Novet 2015).

Journalists found that the so-called “ecosystem” of apps being built on top of social media platforms contained some tools that were particularly useful. One popular app was TweetDeck, which allows journalists and others to find, filter, and interact with contributors and content on Twitter in ways not supported by the platform’s own apps.¹ A 2013 survey of Irish journalists found 23 per cent to be using TweetDeck (Heravi, Harrower, and Boran 2014).

Despite the relatively high levels of adoption of such tools, much of the academic research into journalists’ use of social media makes no distinction between the social networks themselves and the apps that are, often, the interface between those journalists and people and posts on platforms like Twitter and Facebook (see, e.g., Santana and Hopp 2016; Heravi and Harrower 2016; Larsen 2016; Gulyas 2016; Wallsten 2015; Broersma and Graham 2013; Van Leuven, Deprez, and Raeymaeckers 2014; Skogerbo et al. 2016; Artwick 2013; Vis 2013; and Hermida, Lewis, and Zamith 2014).

Social media management and monitoring apps have, however, been covered by journalism’s trade press (see, e.g., Edge 2015 and Silverman 2014). When such apps are mentioned in the journalism studies literature, though, it is usually in passing (see, e.g., Johnston 2016). An exception is Brandtzaeg et al.’s (2016) study of 24 European journalists, in which the computational tools used to help verify social media are enumerated, and the context of their use examined.

This article argues that it is important to better understand the capabilities of such apps, how they are employed, and the possible consequences on journalistic routines and output. This is particularly the case since the apps have grown in sophistication, with some now offering their users the ability to surveil citizens anytime, anywhere, and others employing algorithms that scan social networks and make judgements, autonomously, on which events have news value.

This article explores some of these advanced social media monitoring apps, examining their technical capabilities; exposing them, in an experimental setting, to a sample ($N=81$) of trainee journalists to see how they might be adopted; and analysing what the consequences of any such adoption could be.

Selection of apps

As has already been mentioned, millions of apps have been built on the platforms that social networks have established. Although most apps are unlikely to be of professional interest to journalists, scores of them are. For example, Joanna Geary, Twitter’s “Head of Curation”, has published a list of 34 “useful 3rd-party Twitter tools for journalists” (Geary 2014); and in “The Social Media Reporter”, Cordelia Hebblethwaite (2016) recommends over 30 apps journalists can use to detect trends on social networks, and search, verify, and locate content and contributors. Hebblethwaite picks out an app called Banjo for particular praise calling it an “incredibly powerful tool for finding geolocated social media from a specific location”. Banjo’s founder, Damien Patton, has claimed that his company is “building the world’s first crystal ball” (YouTube 2016).

The wide variety of apps used by journalists meant that this study had to be selective about which to include in its analysis and experiment, and it was decided that any more than four would place too large a cognitive burden on the experiment’s participants. The apps chosen do not make up a representative sample of those used by journalists; rather, the selection was made with the purpose of reflecting two developments of growing importance in the ecosystem of apps relevant to news work:

1. Apps that allow location-based monitoring of social networking activity, with the plotting of geo-tagged posts on a map a common feature, and
2. Apps that incorporate elements of artificial intelligence or algorithms in order to automatically detect events or stories that are trending.

Location is vital to much reporting, with many newsworthy events, such as natural disasters and demonstrations, inextricably linked to specific geographical locations. Social media networks themselves have not, historically, provided, within their own apps or interfaces, functionality to allow journalists or others to accurately find posts from, or locate posts to, particular locations.² This has limited their utility as a means by which journalists can search for and verify potentially newsworthy information. The ability to conduct location-based social media monitoring and research is also of interest in other industries, for example marketing, corporate security (see, e.g., Lecher and Brandom 2016), and public safety (see, e.g., Wieczner 2016).

Table 1: A selection of third-party social media apps that allow location-based social media monitoring

App	Founded¹	Total funding¹ (millions USD)
Trendsmap	2009	—
Dataminr	2009	183.4
Banjo	2011	121
Geofeedia	2011	23.8
Picodash	2011	—
Snaptrrends	2012	1.13
Echosec	2013	—
SAM	2013	0.69

1. Source: Crunchbase (2017).

Table 2: A selection of third-party social media apps that automatically detect newsworthy events and/or stories that are trending

App	Founded/launched	Total funding¹ (millions USD)
Dataminr	2009 ¹	183.44
Spike	2011 ¹	9.1
SocialSensor	2011 ²	9.6 ²
Tame	2012 ¹	0.32
CrowdTangle	2012 ¹	2.2
BuzzSumo	2014 ¹	—
Facebook Signal	2015	—
Reuters Tracer	2016	—

1. Source: Crunchbase (2017).

2. Source: Cordis (2017).

The addition of artificial intelligence or algorithms to third-party social media apps in order to automatically detect events or stories that are trending is a second important development. Although social media networks have, for some time, included lists of trending topics, these have little utility to journalists. For example, Twitter's "Trends" list is limited to ten topics and offers no useful control to the professional user. Again, the ability to be alerted to relevant trends via automated analyses of social networks is something that not just journalists but also those in other industries—e.g. finance (see, e.g., Wieczner 2015)—are interested in.

The demand for location- and trends-based monitoring of social networks has resulted in hundreds of millions of dollars of investment being put into the development of a range of apps, a selection of which are listed in Tables 1 and 2. Furthermore, at least one of the social networks—Facebook—has developed its own application ("Signal"), designed specifically to help journalists "surface relevant trends" (Facebook 2015), and even some professional end-users are developing their own. Reuters, for example, has built "Tracer", an in-house system "to detect news events on Twitter and [assess] their veracity" (Liu et al. 2016).

The three particular apps selected for this study included what were, at the time, two of the market leaders in each category—Spike and Geofeedia—as well as a technologically advanced newcomer—SocialSensor—that had been designed specifically with journalists in mind. Twitter was also included in order to have one social media platform—the most important in terms of news work (see, e.g., Santana and Hopp 2016 and Heravi and Harrower 2016)—represented in its unmediated form. Spike and SocialSensor were free to use—Spike via a two-week trial—while access to Geofeedia was negotiated for the duration of the study. At the time this study began, Geofeedia and Spike were used by a range of large news organisations including the BBC, Associated Press, and *The Guardian*. Journalists using such apps have described them as an important part of their professional routines. The *Huffington Post* believes Spike is a "huge aid" (Newswhip n.d.-a), and a social news reporter at BuzzFeed said it is a "big part of my routine" (Newswhip n.d.-b). An employee of the BBC's user-generated content "hub" thought Geofeedia enabled the corporation to find higher quality user-generated content more quickly (Johnston 2016), while the VP of CNN International called it an "early warning system" (Stone 2014).

While there is an increasing body of literature on the technical development of such apps (see, e.g., Aiello et al. 2013; Fletcher, Schifferes, and Thurman 2017; and Liu et al. 2016), there are scant surveys of their capabilities and how they are used, or discussions about the possible consequences. This study is an attempt to start to fill these gaps, by focussing on—in Lewis and Westlund's (2016) terms—the "technological actants" and the "human actors" involved; in other words, the apps and some of their intended end users. Social media platforms, and in particular their ecosystem of professional apps, are extending and even partially supplanting, journalists' roles in news selection and verification. Questions arise, therefore, about the degree of dependence journalists have on the technology. This is especially the case where the apps incorporate elements of artificial intelligence, identifying newsworthy events from the chatter on social networks and making assessments on the credibility of social media contributors.

Methodology

A mixture of methods were used to explore the functionality of social media platforms and apps in a journalistic context; their use in the discovery and assessment of news events, stories, and sources; and the professional, ethical, and societal implications of such use. Firstly, a sample of the social media platforms and apps (hereafter referred to as SMPAs) involved was examined using content analysis. Secondly, the use made of those SMPAs by trainee journalists was investigated via analysis of self-reports produced following a two-week experiment during which the participants used a variety of SMPAs for journalistic activities. This section describes these methods in more detail.

Content Analysis

Here content analysis is used in its contemporary sense to include the examination of the “minutiae of communication ... [including] interfaces” (Krippendorff 2004, xvii), in particular the “enabling and networked properties of communication media” (Thurman 2017). The sampling units were the four SMPAs. Analysis was carried out by the author during September and October 2015. The recording/coding stage of the content analysis was almost inseparable from the process of unitising the units to be recorded/coded. This was a result of the absence of taxonomies and coding rules to describe the functionality of the sampling units being analysed. Although no formal reliability testing was carried out, it is argued that because the aim of the content analysis was to record the existence of functionality, rather than test for more subjective coding categories (such as levels of violence in media content), the process was relatively objective, producing reasonably dependable results.

Selection and Characteristics of Experimental Participants

A sample of 81 postgraduate journalism students was used to investigate the use made of the SMPAs in news work. The participants were students on the MA in International Journalism at City, University of London. Although they were students at the time of the experiment, it was considered that their experiences and opinions could help explore the character and consequences of the use of SMPAs in a journalistic context for two reasons. Firstly, because the master’s programme on which they were enrolled is highly practical. On the course, students “learn how to gather and report [news] in various styles ... [becoming] adept at print, broadcast and online journalism”, and they are “encouraged to complete [a journalism] internship” (City, University of London 2017). Secondly, because in order to be admitted onto the programme, students are required to have work experience in journalism (ibid.). The participants had a median age of 23, 80 per cent were female, and they originated from 25 different countries. Three-quarters came from countries in the EU, with the largest number—ten—from the United Kingdom.

Experiment Design and Analysis

The participants received instruction on the journalistic use of Geofeedia, Spike, SocialSensor, and Twitter from two faculty members in the Department of Journalism at City, University London during a three-hour lecture and workshop. They were then asked to spend a period of two weeks using the SMPAs, and write a report of 800 words or more based on their experiences. The participants undertook the task between 28 January and 18 February 2015. In their reports they were instructed to assess the extent to which the SMPAs enabled them to:

- Identify potentially newsworthy events on social networks before they were mentioned in the mainstream media,
- assess the reliability of social network contributors,
- identify published stories that were popular on social networks before that popularity became obvious in mainstream media channels,
- get updates on stories, including multimedia elements and potentially useful sources,
- identify sentiment around a story.

A total of 81 reports were completed, which were loaded into the NVivo 10 software in order to code and retrieve text, build theories, and conduct data analyses. The coding and analysis followed a fairly standard process, such as described by Weiss (1994, 151–182), of iterative issue identification, mark-up, and theme development.

Figure 1. A screenshot of the Geofeedia app showing social media posts from the vicinity of the UK Houses of Parliament

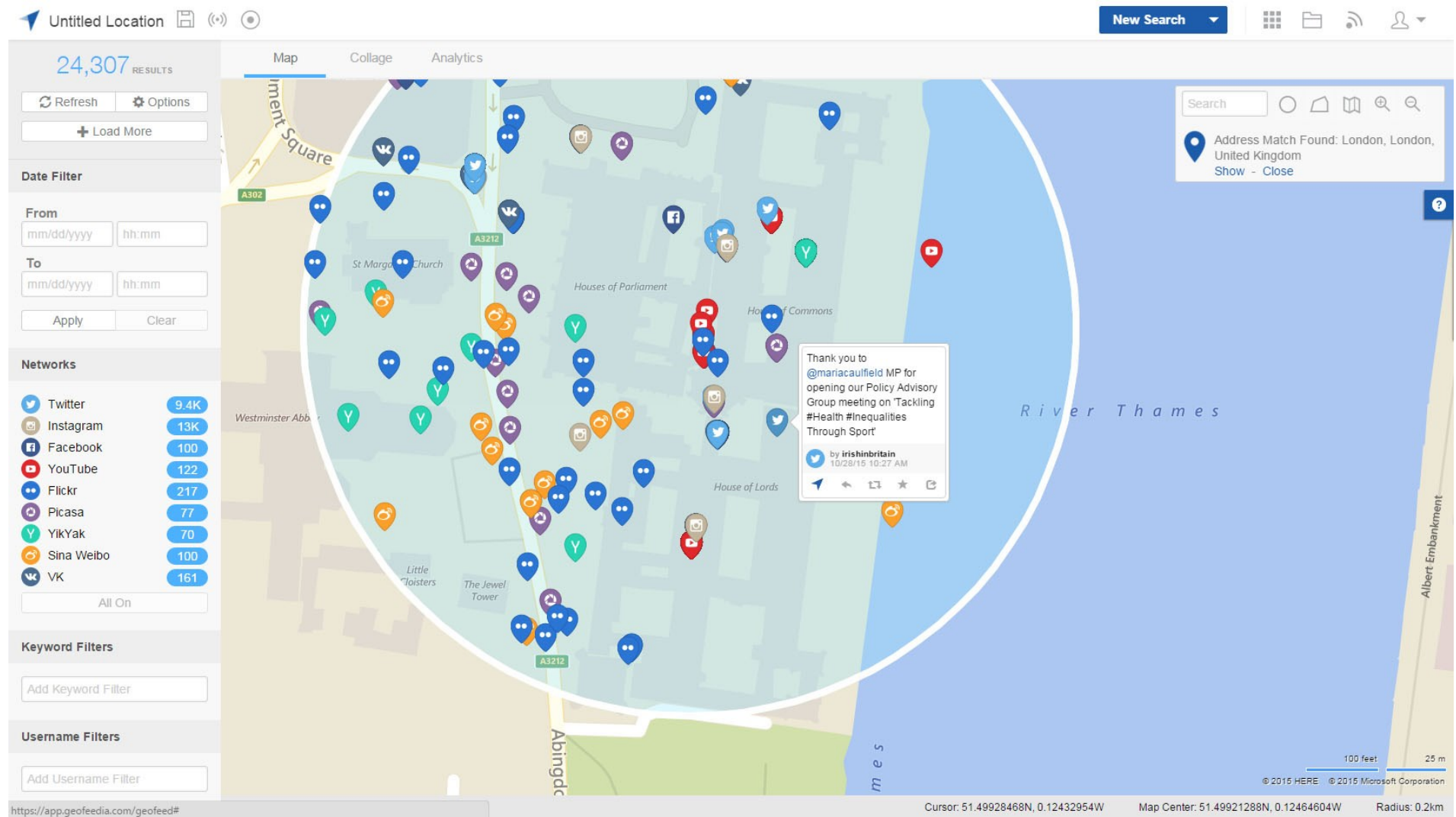
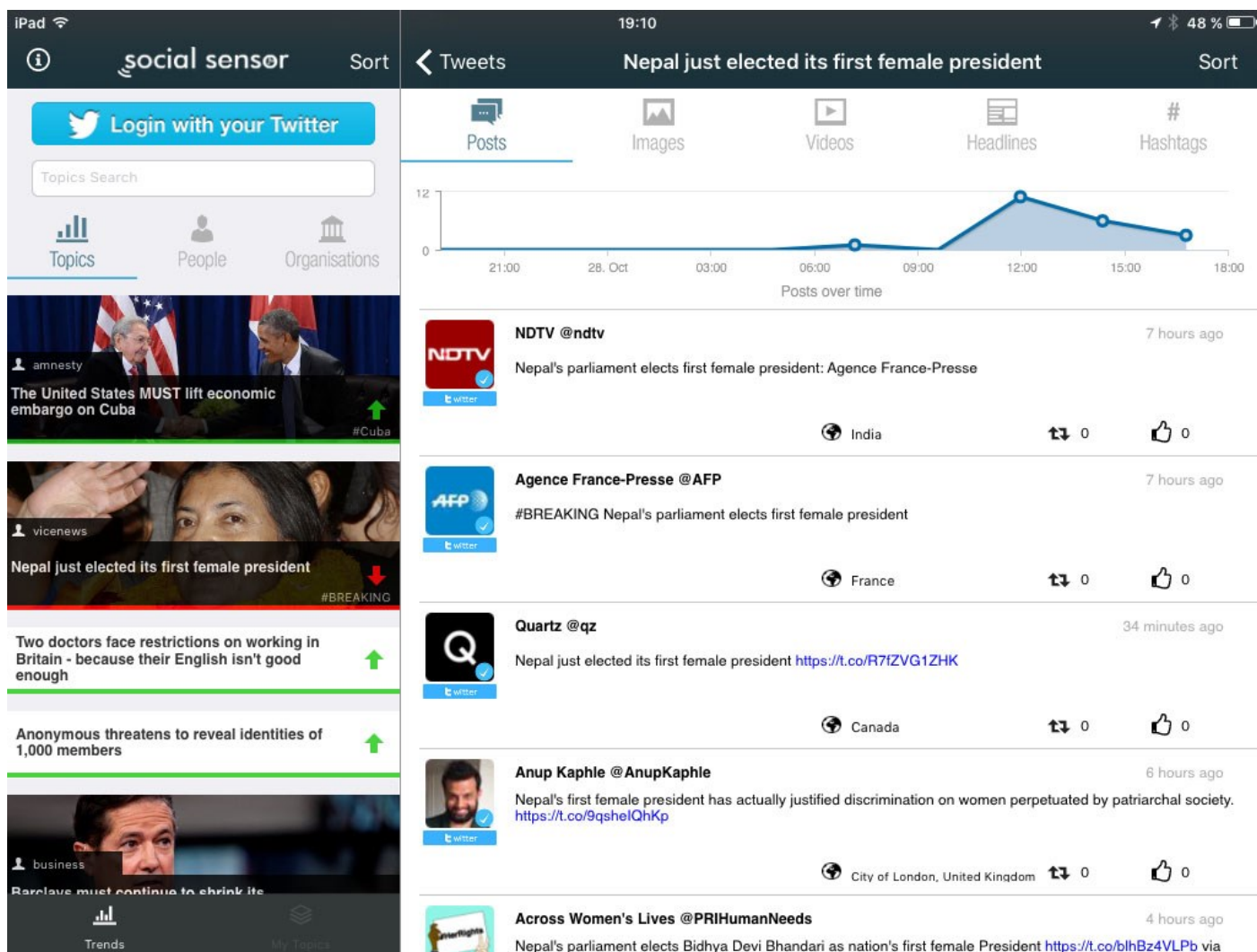


Figure 2. A screenshot of Spike showing news stories trending on Twitter filtered by location (East England) and time (the previous 24 hours)

The screenshot displays the Spike web application interface. The top navigation bar includes links for 'Attend a Webinar', 'Add Facebook Page', 'Add Instagram Account', 'Tour', 'Help', and 'Account Settings'. The main header features the Spike logo and a search bar with the placeholder text 'Search for a phrase, domain, person, ...'. Below the search bar, there are filters for 'Current Filters' (24h, East England) and a 'SAVE AS NEW PANEL' button. The left sidebar contains a 'BROWSE' section and a 'PANELS' section with a list of locations: WORLD, NORTH AMERICA, EUROPE, GERMANY, UNITED KINGDOM, BIRMINGHAM, EAST ENGLAND (highlighted), EDINBURGH, LIVERPOOL, LONDON, MANCHESTER, MIDLANDS, NORTH ENGLAND, NORTHERN IRELAND, SCOTLAND, SOUTH EAST ENGLAND, SOUTH WEST, WALES, YORKSHIRE & HUMBER, ALBANIA, and AUSTRIA. The main content area shows a list of trending stories. The first story is 'Amazing young people are celebrated at the 2015 Bernard Matthews Youth Awards' with 30 tweets. The second story is 'Mental health should be taught in schools, says Cambridgeshire student diagnosed with depression' with 22 tweets. The third story is 'Chief constable warns cuts to Norfolk police could see fewer bobbies on the beat and detectives not sent to every burglary' with 22 tweets. The fourth story is 'Julian Assange should receive the Nobel Peace Prize' George Galloway tells Cambridge Union' with 22 tweets. The interface also includes a 'PUBLISHED IN LAST' filter (1h, 3h, 12h, 24h, 1w, 1m) and a 'TOPICS' filter (PRE-VIRAL, YOUTUBE, US ELECTION 2016, CANADIAN ELECTION, NEWS, ENTERTAINMENT, CULTURE, LIFE, FUN, OPINION, TECH, SCIENCE, BUSINESS, INDUSTRIES, MARKETS, SPORTS, BRANDS).

Figure 3. A screenshot of the SocialSensor iOS app showing trending news topics (in the left panel) and the social media posts related to a selected story (the Nepalese presidential election) in the right panel along with the distribution of those posts over time



Results: content analysis

This section reports the results of the content analysis by describing the four SMPAs individually and comparing them against each other.

Geofeedia

Geofeedia is a subscription-only, third-party app that takes a location-based approach to social media monitoring. Users of Geofeedia can view social media posts emanating from a wide area down to very specific locations. Social media posts are displayed either on a map, with each post represented by an icon which can be expanded on hover, or in a collage form, with posts tiled across the window (see Figure 1). Filters are available to narrow down searches by:

- time and date,
- keyword(s), and
- social network account username(s) (see Table 3).

Users can set up a number of predefined queries, known as “streams”, in order to watch developments in a particular area over time. They can also follow individual social network users (on Twitter and Instagram) by mapping their social network activity geographically or by seeing who likes or comments on their posts.

Spike

Spike is a third-party app that is marketed to journalists and others as a way of spotting stories that are trending on social networks and identifying those social network users who are spreading and/or commenting on those stories (see Figure 2). Stories are aggregated, mainly, from a large database of online news publications—about 100,000 in total (Spike 2015)—including well-known, international news brands; local news organisations; and specialist digital news publications.³ Users can filter stories by:

- location,
- topic,
- time published,
- language, and
- whether the story is a video or not (see Table 3).

SocialSensor

SocialSensor is a third-party web and mobile app produced as part of an EU FP7 research project.⁴ The app automatically discovers and clusters news topics from across a number of social networks. Three broad categories of news can be selected: “UK”, “US”, or “Celebrity”; as well as the time window for trends. It is also possible to browse trends related to “People” and “Organisations” rather than “Topics” (see Figure 3).

When users click on a topic they are able to see the individual social network posts that relate to that topic and sort them by:

- relevance,
- recency,
- popularity,
- trustworthiness,
- time posted,

- source,
- location,
- and sentiment (see Table 3).

A “Near me” function gives users the ability to see geo-tagged social network posts displayed on a map within a radius of up to 50 km of the user’s current location. Users can set up personalised topics to follow using keywords or phrases, and, in the web version of the app, which was not used in the experimental element of this study, discover SocialSensor’s estimate of the reliability of each contributor (see Fletcher, Schifferes, and Thurman [2017] for more information).

Twitter

Because Twitter is the most important social media platform for journalists (see, e.g., Santana and Hopp 2016 and Heravi and Harrower 2016), it was deemed important to include Twitter’s own apps in this study. Twitter’s user interface has a number of features that are useful to journalists wanting to find, filter, and follow content and contributors on the platform. For example, Twitter allows users to create specific “lists” of Twitter accounts. When users view a list, only posts from those account holders on the list are shown. Journalists often create such lists in order to be able to focus on particular topics or locations. Twitter users can also see “Trends”, a Twitter-generated list of approximately ten keywords, phrases, or hashtags that are trending on Twitter at any given moment, although it is not possible to set trends around narrow geographical areas, only whole countries or large cities. Twitter’s search box and advanced search page allow users to search tweets by hashtag, keyword, or phrase, or filter tweets based on factors including their:

- recency,
- news value,
- multimedia content,
- proximity to the user’s current location,
- date posted,
- sentiment, and
- language (see Table 3).

Social Media Platforms and Apps Compared

The functionality of each of the four SMPAs was analysed using a series of criteria relating to the social media platforms whose content they carry, the filters they offer to allow sorting of both individual social media posts and news stories, and their general functionality. It was found that SocialSensor offered the widest range of functionality across all three categories (see Table 3). Although the differences between Twitter and the three specialist apps were not great in quantitative terms, the qualitative differences were significant. For example, although, like SocialSensor and Geofeedia, Twitter filtered social network posts by location, it only gave vague control (“Near me”) compared with the fuller control of SocialSensor and the much fuller control offered by Geofeedia.⁵

Table 3. Comparison of the functionality of four social media platforms and apps (SocialSensor, Geofeedia, Spike, and Twitter) used to find, filter, and follow content and contributors for journalistic purposes, September–October 2015

SOCIAL MEDIA PLATFORM OR APP	SOURCE OF CONTENT														
	Groups social media posts into stories	Follow specific social media accounts	Filters out non-news content	Indexes non-geotagged content	Social network										Published media
					Twitter	Facebook	Instagram	Flickr	Google+	Tumblr	YouTube	Picasa	Viddy	Yammer	
SocialSensor ^C	Y		Y	Y	Y	Y	Y	Y			Y				
Geofeedia		Y			Y	Y	Y	Y		Y		Y	Y	Y	
Spike			Y	Y		Y ^I	Y ^J								Y ^K
Twitter	Y ^P	Y ^Q	Y ^R	Y	Y										

Table 3 continued...

SOCIAL MEDIA PLATFORM OR APP	FILTERS FOR INDIVIDUAL SOCIAL MEDIA CONTRIBUTIONS													Location filters		
	Keyword / phrase search	Relevance	Recency	Popularity	Trustworthiness	Social network	Sentiment	Media type	Specific time	Specific date	Topic	Language	By specific social media account	Vague (e.g. "Near me")	Some user control	Full user control
SocialSensor ^C	Y	Y	Y	Y	Y	Y	Y	Y							Y ^D	
Geofeedia	Y		Y			Y			Y	Y			Y			Y ^H
Spike	Y		Y ^L	Y ^M		Y					Y ^N	Y	Y		Y ^O	
Twitter	Y	Y ^S	Y				Y ^T	Y ^U		Y		Y	Y	Y		

Table 3 continued...

SOCIAL MEDIA PLATFORM OR APP	FILTERS FOR STORIES ^{A, B}																
	By topic	Location	Recency	By publication title / web domain / Facebook page	Can follow story	Media type (e.g. video)	Language	Passively personalised	Popularity on								
									Facebook	Twitter	LinkedIn	Pinterest	Instagram	Flickr	Tumblr	The Web	
SocialSensor ^c	Y ^E	Y ^F	Y ^G		Y	Y			Y	Y				Y	Y	Y	Y
Geofeedia	-----Geofeedia does not group social media posts into stories-----																
Spike	Y ^N	Y ^O	Y ^L	Y		Y	Y		Y	Y	Y	Y					
Twitter	Y ^V	Y ^W	Y ^X		Y			Y ^Y		Y							

Notes to Table 3:

- A. Here, “stories” refers either to groups of social media posts that relate to the same news story, or news stories previously published in online news publications.
- B. Twitter’s “Moments” is included here, although the stories it surfaces are, unlike the stories on Spike or SocialSensor, wholly or in part manually curated. Also included, Twitter’s “Trends”.
- C. The social networks monitored by SocialSensor’s iOS and web apps differ. The iOS version used by the participants in this study monitored a smaller number of social media networks.
- D. A radius of up to 50 km from the user’s current location.
- E. By “UK”, “US”, or “Celebrity” trends and by “People”, “Topics”, or “Organisations”.
- F. “US” or “UK”.
- G. 15 or 30 mins, 1 or 4 hours, 1 day or 2 months.
- H. Circle or polygon of as little as 100 m in diameter.
- I. On 5 March 2015, after the experimental element of this study concluded, Spike added some native Facebook content (including from news publishers and from other accounts such as Arsenal FC and the US Navy) to their tool (Newswhip 2015). By March 2017 original posts from Twitter, Reddit, and YouTube were also available on the platform.
- J. Spike added some content from Instagram (5,500 accounts, such as Michelle Obama’s) to their tool, but only on 23 June 2015, after the experimental element of this study concluded (Corcoran 2015).
- K. “100,000” published sources according to Spike (2015).
- L. 1, 3, 12 or 24 hours, 1 week, or 1 month.
- M. Measured by Facebook likes, shares, and comments and Instagram likes and comments.
- N. Multiple topic filters offered including, for example, “INDUSTRIES > OIL AND GAS”.
- O. Location filters offered allowing mostly country-level specificity, although region or large city-level specificity is offered for some countries.
- P. Twitter started to group tweets around specific news events (its “Moments” feature), but only on 6 October 2015, after the experimental element of this study concluded (Muthukumar 2015).
- Q. Via Twitter’s “Lists” function.
- R. All content is shown by default in Twitter, although search results can be filtered to show only “news” related tweets, and Twitter “Moments” has a “News” tab.
- S. What Twitter calls “Top tweets”.
- T. “Positive”, “Negative”, or “Questioning”.
- U. “Photos and videos”.
- V. Twitter “Moments” offers a small number of topics, such as “Entertainment”, “Fun”, “News”, and “Sports”.
- W. It is possible to filter “Trends” to the country or large-city level.
- X. Twitter “Moments” offers a “Today” tab.
- Y. Twitter “Trends” are, by default, tailored to a user’s location and who they follow. The number of “Trends” shown is limited to about ten.

Results: experiment

Introduction

As already discussed, the development and use of apps such as Geofeedia, SocialSensor, and Spike has been prompted by the huge volume of content on social networks that journalists and others encounter, and the fact that much of it is irrelevant to their professional interests. This was confirmed by some of the participants who found that “[newsworthy] posts are often submerged by other non-relevant posts about people’s tastes and personal lives”.

Some participants recognised the potential of specialist apps to help filter the “huge amount” of content on social networks: “without any sophisticated algorithms aiding me, it would take vast amounts of manual labour before I would be able to get into a story in depth or even ascertain its first appearance”.

SMPAs can be used in news work in a number of ways. For example, social media platforms are often discussed in terms of their ability to “break news”, with a small number of well-known examples often given by way of evidence: the Hudson River plane crash or the Boston Police capture of the marathon bombing suspect. In reality, it is relatively rare for high-impact stories to appear on social networks ahead of mainstream news channels (Osborne and Dredze 2014). This was confirmed in the experiment. The trainee journalists were asked to try to find breaking news on social networks before it appeared in the mainstream media, a task they found difficult, although, as will be shown later, not impossible for some types of news.

Although it may be relatively difficult to find major “original stories” on social networks, social networks still have an important place in the newsroom as a means of:

- providing updates on stories that have already broken,
- finding original stories of a smaller scale,
- providing illustrative content,
- putting journalists in contact with individuals who might comment on a story,
- seeing which stories are trending on social networks so that journalists and editors can decide on story placement and follow-ups,
- gauging reaction (sentiment) to stories, and
- helping with factual verification.

Apps like SocialSensor, Geofeedia, and Spike may help in these areas by aggregating and filtering the activity on social networks in various ways. The section that follows will report and analyse the participants’ feedback on using each third-party app as well as Twitter in its unmediated form.

SocialSensor

Finding original news. Participants gave mixed feedback on the utility of SocialSensor in the detection of “original” news. They found that news carried by SocialSensor but not reported on mainstream media channels tended to be “local and niche” in character:

Although I was able to find two more or less original stories, it was an exception rather than a rule. SocialSensor ... can provide you with news tips for local and niche stories, but most of the time it plays the role of a news aggregator.

However, one student journalist reported that she was able to use SocialSensor to find an original news story on social media “a few hours” before it broke out on “official media websites”.

Detecting trends. Participants found the ability to detect trends in SocialSensor very useful. In particular they appreciated being able to see how a story was becoming popular before that popularity was evident in mainstream media channels. They felt that this could give them a head start in being able to pitch a story covering an emerging trend to an editor:

I noticed a lot of people were tweeting about the movie “The Imitation Game”, “Alan Turing”, and “gay pardon”. The mainstream media only covered the Gay Pardon campaign very briefly.

Sensing sentiment. Sentiment detection is a built-in function of SocialSensor. Several participants found this useful, although they saw how the app had limits in its understanding of colloquial language and sarcasm:

I tried the “sentiment” tool on [a story] ... about the death of 300 migrants and attempted to filter the stories by “positive sentiment”, but found tweets that were quite clearly not “positive”.

Verification. An important part of the SocialSensor project was the development of functionality to help users assess the credibility of social network content and contributors (see Fletcher, Schifferes, and Thurman [2017] for more information). However, in the SocialSensor mobile app that the participants used, only a partial set of this functionality was available, limited to allowing social media posts to be sorted by “trustworthiness”. It was probably for this reason that most participants did not find the tool very useful in processes of verification.

One concern with tools such as SocialSensor is that the appearance of social media content within them may confer credibility on that content where, perhaps, that credibility is not deserved. For example, two participants thought that the sources SocialSensor uses were “purely trustworthy” and “reliable”, and that content was “automatically verified”, which it is not.

Other strengths and weaknesses. Some participants found SocialSensor useful as a means to get in contact with potential sources, to monitor multiple events, and to research a story’s development over time. Participants also found the multimedia content that SocialSensor presents on the stories it identified useful.

However, some participants were confused by how the individual social network contributions that appeared on SocialSensor were selected and suggested that the sources it uses should be widened.

Geofeedia

Finding original news. A number of participants responded positively to Geofeedia as a tool with which they could find original news and updates on running stories, although their positive responses were directed as much at its potential as at the results it actually produced for them. Where they did find original news it was often small-scale, local stories. Participants’ evaluation of Geofeedia’s ability and potential to find original content was usually associated with undertaking searches around specific locations. For example:

I was able to identify that Emily Purser, from Sky News, was tweeting from the European Commission (EC) building. With 30 tweets over the two days I covered [the story], Purser was the most frequent contributor in the immediate area.

However, other participants did not find it a useful way of finding original news. Some attributed this to the preponderance of mainstream media content that social network users were (re)posting, the fact that many potentially useful social media posts do not appear (as they are not

geo-tagged), or the fact that Geofeedia is optimised to work around known locations rather than specific topics.

Detecting trends and sentiment. Participants did not find Geofeedia very useful as a means of discovering trends, but it was more positively evaluated for its ability to help journalists detect sentiment around a story:

Zooming in on the area surrounding the place of the attacks meant I was able to see how local communities were reacting to the tragedy.

Verification. There was generally positive reaction to how Geofeedia helped in the task of verification of factual content. Participants liked being able to confirm that a social network post came from a particular physical location, to avoid, for example, being misled, as one of the participants said, “by someone ‘pretending’ to tweet from the heart of the Egyptian revolution, while in reality drinking his cup of tea somewhere in London”.

Other strengths and weaknesses. At least one participant preferred Geofeedia over Twitter because it could narrow searches down to specific hours of the day, and another felt it useful for identifying potential sources near the location of an event.

Even though apps such as Geofeedia provide relatively advanced filters with which journalists can interrogate activity on social networks, some of our participants reported that, when searching for a story on Geofeedia, they were presented with a significant amount of irrelevant content:

To find relevant content, I needed to scroll through dozens of Instagram selfies and love confessions on Twitter, before I finally recognized something serving my requirements.

Some of the participants expressed concern about the ease with which it was possible to track individual users. One said that although the feature that follows users’ movements could be “extremely useful” in the case of “politicians or celebrities, or even business personalities”, they also said it seemed “slightly morally wrong and stalker-esque”. Most of the social media content that could be found on Geofeedia did not come from public figures. And many (one participant said “most”) posts were from Instagram users, a platform one participant thought was “heavily used by young people”, where privacy is especially precious.

Spike

Finding original news. Given its focus on trends detection—and the fact that at the time of the experimental element of this study its inputs consisted of 100,000 online media publications rather than social network accounts—it is no surprise that participants were less than impressed by Spike’s ability to detect original breaking news:

The vast majority of the content comes from other news organisations, so there is little scope to find new updates or sources that haven’t already been covered.

Detecting trends. Spike is primarily designed to spot trends, and our participants were largely positive in their evaluation of its potential in this regard:

It is very easy to see if and where a story is trending ... I included the data from Spike in my final decision for the three story ideas I would like to pitch concerning London Fashion Week.

Some participants liked the ability to search over a specific time frame and others liked that Spike showed which news stories covered by the local media were trending, which might be an indication of their eventually getting national or international pick-up.

Sensing sentiment and use in verification. Participants had mixed feelings about how useful Spike was in detecting sentiment around stories, and few participants made mention of using Spike directly for verification purposes.

Other strengths and weaknesses. Some participants found that Spike, compared with Twitter, was less useful for following a story over time, though participants had generally positive reactions as to how useful Spike was as a tool with which they could connect with sources:

One user, Imraan Siddiqi, a blogger, activist and head of a non-profit, was a key original source for me, found through Spike.

Comparison with Twitter

Participants reported that Twitter, when compared against Geofeedia, Spike, and SocialSensor, continued to be useful, although some felt that it was not optimised for spotting breaking news, following running stories, or easily determining credibility. Some participants thought that the algorithm Twitter uses to determine which posts appear, and with what priority, in users' timelines was not optimised for journalists to spot breaking news, with posts from established news outlets taking priority over other sources.

A number of participants found that Twitter, in its unmediated state, continued to be useful even when more specialised apps were available. Reasons mentioned included ease of use, the list of Trends, and the ability to create focussed "lists". Although some participants thought Twitter lists were useful, others found that they quickly lost their relevance, and some participants found Twitter limited in its ability to provide information on contributors that would allow journalists to assess their credibility.

Cross-Cutting Themes

The experiment revealed, to some participants, how there can be a mismatch between the news values of the mainstream media and the public, and they saw these SMPAs as a way journalists could more closely align their news agenda with public tastes:

Using those four tools, I noticed that this story [the Chapel Hill shootings] massively appeared on social media before there was any mention of it on US mainstream media websites or even TV channels.

However, some participants were concerned about the consequences of being influenced by what was popular:

I am a bit sceptical about detecting trends through social media, because I believe that what media should be doing is quite the opposite. The outlets should be trendsetters themselves.

My biggest reservation about using social media to construct and research stories is that I become lazy and focus only on what is trending and what interests people at a precise moment in time. I believe journalism should not just be about writing what pleases people; it should also be about writing important stories, no matter how unpopular stories they might be.

One interesting observation was the extent to which the participants quickly became aware of how the SMPAs could be used in combination to good effect. Some participants, for example, used Spike to spot a trending story before switching to Geofeedia in order to do a localised search for user-generated content.

Conclusion

This study extends our understanding of the ways in which social media platforms, and, in particular, their ecosystems of third-party apps, can infuse news work. It has revealed the capabilities of a sample of apps that are representative of wider trends towards forms of location- and trends-based social media monitoring that incorporate elements of automation. Examination of these tools over time has shown a growing convergence in their functionality, no doubt based on the growing demand from journalists and other clients for a fuller range of functions to help them sort and evaluate the increasing amounts of information on social media platforms. I believe that this convergence will continue, as will attempts by the social networks themselves, in particular Twitter and Facebook, to enter this space, either through acquisitions or through the development of their own apps. For example:

- In October 2015 Twitter started to cluster tweets into stories (via their “Moments” feature), bringing it closer in functionality to Spike and SocialSensor in allowing users to explore clustered stories, not just curated lists of Twitter accounts or a limited number of trending keywords or hashtags.
- Since this study’s substantive content analysis was conducted, Spike has added native Facebook, Twitter, Reddit, YouTube, and Instagram content to its platform. This moves it closer to SocialSensor as a tool that is not just useful for seeing how previously published content is trending, but also allows users to discover native content from social media.
- In September 2015 Facebook launched “Signal”, a service that allows journalists to “surface relevant trends, photos, videos, and posts from Facebook and Instagram for use in their storytelling and reporting” (Facebook 2015).

This study has also shown how such apps might be adopted by journalists and analysed their reactions to the technology and its outputs. Although a small minority of the trainee journalists saw no benefits, the majority found the four social media platforms and apps to be of use, although in different ways. Some were extremely positive, suggesting that such tools “must” be used to cover some types of news event:

Coverage of New York Fashion Week (NYFW) has been entirely transformed by the use of social media. In order to successfully cover such events, journalists must use tools like Twitter and Geofeedia.

However, this experiment also confirmed findings from previous research (Thurman et al. 2016) that social networks, even when mediated by specialist apps such as Geofeedia and SocialSensor, are of less use for finding original breaking news than for discovering updates on stories that have already broken, contacts and multimedia relevant to those stories, and trends and sentiment around them.

Overall, it appears that, at the moment, there is still no one-stop shop for finding news and trends in social media and getting guidance on verification. Participants preferred SocialSensor and Spike over Geofeedia for detecting sentiment and trends, whereas Geofeedia scored highly in its ability to provide updates on stories that had already broken in a known location, and in the processes of verification—in particular allowing journalists to check if social media content had been posted from the claimed location. Despite Twitter’s lack of journalist-focussed tools, it was still preferred by some participants, in particular for its ability to detect sentiment around stories, a lesson, perhaps, in the value of familiarity, availability, and simplicity.

The SMPAs described here are in a state of flux, and even those that had been fully commercialised had limitations, mostly a result of the fundamental challenges inherent in attempts, in close to real time, to collect, process, and filter the hundreds of millions of social media posts broadcast every day. Nevertheless, even at this relatively early stage of development, we see the potential of such tools to change journalistic practice and, ultimately, news output itself.

As such tools improve and infuse news work further, careful attention will need to be paid to the consequences. The dangers were clear to this study's participants. Firstly, there is concern over the privacy and ethical implications of being able to monitor individuals, including young people, very closely, with unprecedented speed and at unprecedented scale (see postscript for further discussion). Secondly, there are risks that these tools will drive journalists and editors to give the public more of what is popular on social networks, rather than, in the words of two of the participants, "being trendsetters" or "writing important stories, no matter how unpopular ... they might be". Indeed, when the participants were surveyed ten months after the experiment, they were, on average, more worried than not that this would be the case. A third danger, not mentioned by the participants themselves, is misplaced trust in such tools: a failure to question their output. Much as pilots can become over-reliant on cockpit automation, journalists must be wary not to fall into the trap, as a number of our participants did, of thinking material appearing on such tools has been automatically verified. When the participants were surveyed ten months after the experiment, more than 20 per cent thought that the information found on each of the SMPAs was "automatically verified" "always" or "often" with another 56 per cent thinking such automatic verification occurred "sometimes". None of the SMPAs attempt to do any automatic verification of the content they publish. However powerful such platforms and apps might be or are likely to become, the capacity for human ingenuity to fool them, and their inability to anticipate every eventuality, mean that journalists will always have to take final responsibility for the veracity of what they publish.

The SMPAs addressed by this study depend on particular inputs and sets of instructions in order to operate. In the selection of those inputs and the creation of those instructions, the introduction of biases is inevitable. One of our participants identified the western bias in the inputs SocialSensor used. What was less obvious was SocialSensor's "bias" towards male, metropolitan, and mainstream media sources (Thurman et al. 2016 and Kunert and Thurman 2017). SocialSensor was not unique in having such biases; rather, its biases happened to be in the public domain because of the particular nature of its development. As SMPAs like Geofeedia and Spike become a bigger part of news work, greater levels of transparency are needed in order that journalists and news consumers can be better informed about the operation of these new gatekeepers of the digital media age.

Postscript

Since the data for this study was collected, the privacy and civil liberties implications of monitoring individuals' activities on social networks via apps such as those discussed in this article have become topics of some controversy. In October 2016, the American Civil Liberties Union revealed that Geofeedia was being used by over 500 "law enforcement and public safety agencies", including to monitor "activists and protesters" (Cagle 2016). Subsequently, Facebook, Twitter, YouTube, and other social networks withdrew Geofeedia's access to their data (Lecher and Brandom 2016). Facebook said it had terminated access because Geofeedia had used Facebook data in "ways that were not authorised" (ibid.). However, there have been suggestions that Facebook was aware of the capabilities of Geofeedia and was using it as part of its own corporate security operations (ibid.). Furthermore, although Twitter also blocked Geofeedia's data access, Twitter continues to allow its data to be used by other service providers, notably Dataminr, which they part-own (Dent 2016). Dataminr is marketed to journalists for its ability to analyse all tweets in real time to surface story "leads based on topic and areas of coverage" (Dataminr n.d.). However, it also has a "Geospatial Analysis Application" (Lamb 2016), very similar to that offered by Geofeedia, and has

signed contracts to supply its services to the FBI and the US Department of Defense (Brandom 2016 and Emptywheel 2016). It appears, therefore, that, as Kalev Leetaru (2016) writes:

the tech press' portrayal of Geofeedia as an isolated case of social monitoring gone wrong could not be further from the truth ... The massive data ecosystems provided by the major social media platforms make it impossible for them to prevent this kind of social surveillance.

NOTES

1. Although starting life as an independent third-party app, TweetDeck was acquired by Twitter in 2011 (Halliday 2011).
2. For example, at the time data for this study was collected Twitter provided no means for journalists to search for tweets from a precise location within its own apps.
3. "Native" social network posts from Instagram and Facebook have also been included since June 2015, and, as of March 2017, posts from Twitter, Reddit, and YouTube were also available on the platform.
4. <http://www.socialsensor.eu>
5. By March 2017, Twitter's advanced search page was offering more precise geographical filtering down to the level of "neighbourhood or city" (Twitter 2017).

ACKNOWLEDGEMENT

The author would like to thank Geofeedia for making their app available for this study and Steve Schifferes for his useful contributions to an earlier draft of this article.

FUNDING

This work was supported by the VolkswagenStiftung.

REFERENCES

- Aiello, Luca Maria, Georgios Petkos, Carlos Martin, David Corney, Symeon Papadopoulos, Ryan Skraba, Ayse Göker, Ioannis Kompatsiaris, and Alejandro Jaimes. 2013. "Sensing Trending Topics in Twitter." *IEEE Transactions on Multimedia* 15 (6): 1268–1282.
- Artwick, Claudette G. 2013. "Reporters on Twitter: Product or Service?" *Digital Journalism* 1 (2): 212–228.
- Brandom, Russell. 2016. "The FBI Just Got Its Hands on Data that Twitter Wouldn't Give the CIA." *The Verge*, 14 November. <http://www.theverge.com/2016/11/14/13629248/fbi-dataminr-twitter-surveillance-contract-scanning-police>.
- Brandtzaeg, Petter Bae, Marika Lüders, Jochen Spangenberg, Linda Rath-Wiggins, and Asbjørn Følstad. 2016. "Emerging Journalistic Verification Practices Concerning Social Media." *Journalism Practice* (10) 3: 323–342.
- Broersma, Marcel, and Todd Graham. 2013. "Twitter as a News Source: How Dutch and British Newspapers Used Tweets in their News Coverage, 2007–2011." *Journalism Practice* 7 (4): 446–464.
- Cagle, Matthew. 2016. "Facebook, Instagram, and Twitter Provided Data Access for a Surveillance Product Marketed to Target Activists of Color." *ACLU blog*, 11 October. <https://www.aclu.org/blog/free-future/facebook-instagram-and-twitter-provided-data-access-surveillance-product-marketed>.

- City, University of London. 2017. "International Journalism." Accessed 20 March 2017. <http://www.city.ac.uk/courses/postgraduate/international-journalism>.
- Crunchbase. 2017. Accessed 7 April 2017. <https://www.crunchbase.com>.
- Dataminr. n.d. "About Dataminr." Accessed 13 March 2017. <https://www.dataminr.com/about>.
- Dent, Steve. 2016. "FBI Using Twitter's Raw 'Firehose' Data to Monitor Users." *Engadget*, 15 November. <https://www.engadget.com/2016/11/15/fbi-twitter-dataminr-monitoring/>.
- Diakopoulos, Nicholas. 2017. "Computational Journalism and the Emergence of News Platforms." In *The Routledge Companion to Digital Journalism Studies*, edited by Bob Franklin and Scott Eldridge II, 176–184. Abingdon: Routledge.
- Edge, Abigail. 2015. "10 Apps and Tools for Monitoring a Location or Local Patch." *Journalism.co.uk*, 30 March. <https://www.journalism.co.uk/news/10-apps-and-tools-for-monitoring-a-location-or-local-patch/s2/a564547/>.
- Emptywheel. 2016. "Why Is DOD Paying Dataminr \$13m for Data It Claims to Believe Twitter Won't Deliver?" *Emptywheel*, 22 September. <https://www.emptywheel.net/2016/09/22/dod-paying-dataminr-13m-data-claims-believe-twitter-wont-deliver/>.
- Facebook. 2015. "Signal." Accessed 1 November 2015. <https://www.facebook.com/facebookmedia/get-started/signal>.
- Fletcher, Richard, Steve Schifferes, and Neil Thurman. 2017. "Building the 'Truthmeter': Training Algorithms to Help Journalists Assess the Credibility of Social Media Sources." *Convergence: The International Journal of Research into New Media Technologies*. doi: 10.1177/1354856517714955.
- Geary, Joanna. 2014. "Useful 3rd-Party Tools." *Twitter*. Accessed 9 April 2017. <https://twitter.com/JoannaG/timelines/491934107853938688>.
- Gulyas, Agnes. 2016. "Hybridity and Social Media Adoption by Journalists: An International Comparison." *Digital Journalism*. doi: 10.1080/21670811.2016.1232170.
- Halliday, Josh. 2011. "Twitter Buys UK's TweetDeck for £25m." *Guardian*, 27 May. <https://www.theguardian.com/business/2011/may/27/twitter-buys-tweetdeck>.
- Hebblethwaite, Cordelia. 2016. "The Social Media Reporter: A Guide to Using Social Media for Newsgathering." *Medium*. Accessed 9 April 2017. <https://medium.com/the-social-media-reporter>.
- Heravi, Bahareh Rahmanzadeh, Natalie Harrower, and Marie Boran. 2014. *Social Journalism Survey: First National Survey on Irish Journalists' Use of Social Media*. Galway: National University of Ireland. Accessed 5 April 2017. <http://hujo.deri.ie/publications/Irish-social-journalism-2014.pdf>.
- Heravi, Bahareh Rahmanzadeh, and Natalie Harrower. 2016. "Twitter Journalism in Ireland: Sourcing and Trust in the Age of Social Media." *Information, Communication & Society* 19 (9): 1194–1213.
- Hermida, Alfred, Seth C. Lewis, and Rodrigo Zamith. 2014. "Sourcing the Arab Spring: A Case Study of Andy Carvin's Sources During the Tunisian and Egyptian Revolutions." *Journal of Computer-Mediated Communication* 19 (3): 479–499.
- Johnston, Lisette. 2016. "Social News = Journalism Evolution? How the Integration of UGC into Newswork Helps and Hinders the Role of the Journalist." *Digital Journalism* 4 (7): 899–909.
- Krippendorff, Klaus. 2004. *Content Analysis: An Introduction to Its Methodology*. Thousand Oaks: Sage Publications.
- Kunert, Jessica, and Neil Thurman. 2017. "Male, Metropolitan, and Mainstream: Bias in Algorithmic News Sourcing from Twitter." Paper presented at ECREA Journalism Studies Conference 2017, University of Southern Denmark, 23–24 March.
- Lamb, Jonah Owen. 2016. "Twitter Stops Giving Feds User Data, but Social Media Surveillance Persists in SF." *San Francisco Examiner*, 16 December. <http://www.sfoxaminer.com/twitter-stops-giving-feds-user-data-social-media-surveillance-persists-sf>.

- Larsen, Anna Grøndahl. 2016. "Investigative Reporting in the Networked Media Environment: Journalists' Use of Social Media in Reporting Violent Extremism." *Journalism Practice*. doi: 10.1080/17512786.2016.1262214.
- Lecher, Colin, and Russell Brandom. 2016. "Facebook Caught an Office Intruder Using the Controversial Surveillance Tool It Just Blocked." *The Verge*, 19 October. <http://www.theverge.com/2016/10/19/13317890/facebook-geofeedia-social-media-tracking-tool-mark-zuckerberg-office-intruder>.
- Leetaru, Kalev. 2016. "Geofeedia Is Just the Tip of the Iceberg: The Era of Social Surveillance." *Forbes*, 12 October. <https://www.forbes.com/sites/kalevleetaru/2016/10/12/geofeedia-is-just-the-tip-of-the-iceberg-the-era-of-social-surveillance/#3e2d4e275b90>.
- Lewis, Seth C., and Oscar Westlund. 2016. "Mapping the Human-Machine Divide in Journalism." In *The SAGE Handbook of Digital Journalism*, edited by Tamara Witschge, C.W. Anderson, David Domingo, and Alfred Hermida, 341–353. London: Sage Publications.
- Liu, Xiaomo, Quanzhi Li, Armineh Nourbakhsh, Rui Fang, Merine Thomas, Kajsa Anderson, Russ Kociuba et al. 2016. "Reuters Tracer: A Large Scale System of Detecting and Verifying Real-Time News Events from Twitter." Proceedings of the 25th ACM International Conference on Information and Knowledge Management, 207–216.
- Muthukumar, Madhu. 2015. "Moments, the Best of Twitter in an Instant." *Twitter blog*, 6 October. <https://blog.twitter.com/2015/moments-the-best-of-twitter-in-an-instant-0>.
- Newswhip. n.d.-a. "The Huffington Post." Accessed 3 April 2017. <https://www.newswhip.com/case-studies-huffingtonpost/>.
- Newswhip. n.d.-b. "BuzzFeed." Accessed 3 April 2017. <https://www.newswhip.com/case-studies-buzzfeed/>.
- Newswhip. 2015. "We've Added Trending Facebook Posts to Spike." Accessed 21 January 2016. <http://blog.newswhip.com/index.php/2015/03/weve-added-trending-facebook-posts-to-spike#45z0wKjXvT2gqR7w.99>.
- Corcoran, Liam. 2015. "How to Find Trending Instagram Posts in Spike." *Newswhip blog*, 23 June. <http://blog.newswhip.com/index.php/2015/06/latest-trending-instagram-content-in-spike#LI01jKBEJuWoavlp.97>.
- Novet, Jordan. 2015. "Facebook Has Paid Out \$8B to Developers." *VentureBeat*, 25 March. <https://venturebeat.com/2015/03/25/facebook-has-paid-out-8b-to-developers/>.
- Osborne, Miles, and Mark Dredze. 2014. "Facebook, Twitter and Google Plus for Breaking News: Is There a Winner?" ICWSM-14 The 8th International AAAI Conference on Weblogs and Social Media, Ann Arbor, MI, USA, 2–4 June 2014.
- Santana, Arthur D., and Toby Hopp. 2016. "Tapping into a New Stream of (Personal) Data: Assessing Journalists' Different Use of Social Media." *Journalism & Mass Communication Quarterly* 93 (2): 383–408.
- Schifferes, Steve, Nic Newman, Neil Thurman, David Corney, Ayse Göker, and Carlos Martin. 2014. "Identifying and Verifying News through Social Media: Developing a User-Centred Tool for Professional Journalists." *Digital Journalism* 2 (3): 406–418.
- Silverman, Craig, ed. 2014. *Verification Handbook*. Maastricht: European Journalism Centre.
- Skogerbø, Eli, Axel Bruns, Andrew Quodling, and Thomas Ingebretsen. 2016. "Agenda-Setting Revisited: Social Media and Sourcing in Mainstream Journalism." In *Routledge Companion to Social Media and Politics*, edited by Axel Bruns, Gunn Enli, Eli Skogerbø, Anders Olof Larsson, and Christian Christensen, 104–120. New York: Routledge.
- Cordis (2017) "SocialSensor." 22 April. http://cordis.europa.eu/project/rcn/100725_en.html
- Spike. 2015. "Our Sources." Accessed 2 October 2015. <https://help.spike.newswhip.com/kb/article/55-our-sources>.
- Stone, Biz. 2006. "Introducing the Twitter API." *Twitter blog*, 20 September. <https://blog.twitter.com/2006/introducing-the-twitter-api>.

- Stone, Martha L. 2014. *Big Data for Media*. Oxford: Reuters Institute for the Study of Journalism. Accessed 3 April 2017.
http://reutersinstitute.politics.ox.ac.uk/sites/default/files/Big%20Data%20For%20Media_0.pdf.
- Thurman, Neil. 2017. "Mixed Methods Communication Research: Combining Qualitative and Quantitative Approaches in the Study of Online Journalism." *SAGE Research Methods Cases*.
<http://openaccess.city.ac.uk/16652/>
- Thurman, Neil, Steve Schifferes, Richard Fletcher, Nic Newman, Stephen Hunt, and Aljosha Karim Schapals. 2016. "Giving Computers a Nose for News: Exploring the Limits of Story Detection and Verification." *Digital Journalism* 4 (7): 838–848.
- Twitter. 2011. "One Million Registered Twitter Apps." *Twitter blog*, 11 July.
<https://blog.twitter.com/2011/one-million-registered-twitter-apps>.
- Twitter. 2017. "Advanced Search." Accessed 29 March 2017. <https://twitter.com/search-advanced?lang=en>.
- Van Leuven, Sarah, Annelore Deprez, and Karin Raeymaeckers. 2014. "Networking or Not Working? A Comparison of Arab Spring Coverage in Belgian Newspapers and TV News." *Journalism Practice* (8) 5: 552–562.
- Vis, Farida. 2013. "Twitter as a Reporting tool for Breaking News: Journalists Tweeting the 2011 UK Riots." *Digital Journalism* 1 (1): 27–47.
- Wallsten, Kevin. 2015. "Non-Elite Twitter Sources Rarely Cited in Coverage." *Newspaper Research Journal* 36 (1): 24–41.
- Weiss, Robert S. 1994. *Learning from Strangers*. New York: The Free Press.
- Wieczner, Jen. 2015. "How Investors Are Using Social Media to Make Money." *Fortune*, 7 December. <http://fortune.com/2015/12/07/dataminr-hedge-funds-twitter-data/>.
- Wieczner, Jen. 2016. "CIA Director Is 'Disappointed' in Twitter and Dataminr." *Fortune*, 20 June. <http://fortune.com/2016/06/20/twitter-dataminr-cia/>.
- YouTube. 2016. "How a Former Nascar Mechanic Built a Startup to Track World Events in Real Time." *Inc.*, 22 January. <https://www.youtube.com/watch?v=qPuUOerhLbQ>.