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Challenges to knowledge organization in the era of social media. The case of social controversies.

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Abstract.
In this paper, we look at how social media, in particular Twitter, are used to trigger, propagate and regulate opinions, and social controversies. Social media platforms are displacing the mainstream media and traditional sources of knowledge by facilitating the propagation of ideologies and causes championed by different groups of people. This results in pressures being brought to bear on institutions in the real world which are forced to make hasty decisions based on social media campaigns. The new forms of activism and the public arena enabled by social media platforms have also facilitated the propagation of so-called "post-truth" and "alternative facts" that obfuscate the traditional processes of knowledge elaboration which took decades to arrive at. This poses serious challenges for Knowledge Organization systems (KOs) that the KO community needs to find ways to address.

1. Introduction

Controversy arises as a result of the expression of a disagreement between different rationalizations or between different conceptions of the social world in which it unfolds (Romain Badouard *et al*. 2013). Controversy appears as a counter-speech, i.e, it cannot happen without the pre-existence of a first speech that it will counter by antagonistic discourse (Ruth Amossy *et al*. 2011). The major issue of social controversy is to change its trajectory, to "move the lines" and to question self-will and beliefs in societies (Romain Badouard *et al*. 2013). To do this, protagonists of controversies exchange arguments in which they defend their position or thwart the opposing position (Patrick Charaudeau, 2015). As protagonists of a controversy who are not ordinarily in the public eye have difficulty in accessing mainstream media (digital or print press, television) in order to air their opinions, they turn more and more to "alternative media". Social media platforms have become the new public arena that enable and empower ordinary people in disseminating their opinions, beliefs and views in a free manner without the usual checks and verifications that mainstream media and

knowledge organization systems demand. The mainstream media are now playing "catch-up" with social media and have been relegated to being their echo chamber in relaying news first divulged on social media. Because of the rapidity of propagation of arguments and opinions put forward on social media, it is very difficult to counter false or approximate knowledge with the usual processes of knowledge verification and rebuttal. As a result, the notions of information and verified knowledge have never been more challenged than in the social media era where people's beliefs are fashioned more after their network of friends and followers than on scientifically established knowledge laid down in *bona fide* sources such as books, encyclopedia, scientific literature or expert opinions. Such is now the impact of unverified assertions and "alternative facts" in real life affairs that the Oxford Dictionaries chose "post-truth" as its word of the year in 2016[1]. Post-truth is defined as "a political culture in which debate is framed largely by appeals to emotion disconnected from the details of policy, and by the repeated assertion of talking points to which factual rebuttals are ignored"[2].

In this paper, we look at how social media, in particular Twitter, was used to trigger, propagate and regulate social controversies in a way that challenged real-world knowledge about the issue being debated. Twitter has become a useful channel for the 'social infomediation of news' (Smyrnaios and Rieder, 2013). As a case study, we look at the controversy resulting from a speech given by the beleaguered Nobel Prize winner, Sir Tim Hunt on the 8th of June 2015 after a luncheon with women scientists and journalists in South Korea[3]. The controversy was triggered by a tweet sent by Connie St Louis who was then an adjunct professor of scientific journalism at City University London and was attending the event:
« *Nobel scientist Tim Hunt FRS @royalsociety says at Korean women lunch « I'm a chauvinist and keep 'girls' lab* »

Connie St Louis quoted extracts of Sir Tim Hunt's speech augmented by her own comments which condemned what she perceived as a sexist comment[4]. Her tweet was retweeted more than 600 times, triggering a violent social media campaign which was amplified by the mainstream media and resulted in the destruction of Sir Tim Hunt's lifelong career in less than a week.

2. Study design

In order to understand the dynamics of this controversy and how it led to the outcome we all know, we used both qualitative and quantitative methods. We first studied the activity generated by this controversy on Twitter by extracting several

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[1] https://en.oxforddictionaries.com/word-of-the-year/word-of-the-year-2016.
[2] https://en.wikipedia.org/wiki/Post-truth_politics.
[3] More information on the incriminated speech can be found at http://www.dailymail.co.uk/news/article-3141158/A-flawed-accuser-Investigation-academic-hounded-Nobel-Prize-winning-scientist-job-reveals-troubling-questions-testimony.html#ixzz4k4ufQPP4.
[4] A full transcript of Connie St Louis's tweet and comments can be found at: https://twitter.com/connie_stlouis/status/607813783075954688/photo/1?ref_src=twsrc%5Etfw&ref_url=https%3A%2F%2Fwww.theguardian.com%2Fuk-news%2F2015%2Fjun%2F10%2Fnobel-scientist-tim-hunt-female-scientists-cause-trouble-for-men-in-labs .

attributes from tweets such as the author, the text, the date, the language, the prominent hashtags and the mentions. We then plotted the distribution of tweets on this controversy over time in order to observe the rise and decline of the controversy (§3.1). We next sought to determine the sentiments expressed in the tweets by calculating the polarity of their constituent words (§3.2).

Thirdly, we tried to identify who the main protagonists were by generating the citation network of tweets (§3.3). Finally, in §3.4, we looked at the digital footprints of the main protagonists on the web in order to understand why they were so successful in swaying public opinion on social media, thus resulting in the downfall of the "accused" and his removal from all his honorary positions (University College London and the Royal Society of England).

3. Analysis of traces of the controversy on Twitter

Because it is practically impossible to obtain all tweets on a topic *a posteriori* from Twitter, we searched a sample of 11 million tweets which represented 1% of all tweets produced in June 2015. Considering the large number of tweets searched, our observations should remain valid with respect to the tweet distribution. From these 11 millions, we extracted those tweets containing hashtags and mentions related to the controversy. By decreasing order of frequency, they were "#distractinglysexy (1705 tweets); #feminism (952); #timhunt (795); @royal_society (152); #sexism (138), @connie_stlouis" (77), although the hashtag #sexism showed an even distribution over the period studied (june 2015) and is therefore not only related to this specific controversy.

3.1 Distribution of tweets related to the controversy

The majority of the tweets were in English: 84% of tweets for #distractinglysexy and 87% of tweets for #timhunt respectively. This is not surprising given that the controversy concerned a British scientist and took place in an international setting. However, echoes were found in other languages although but at a significantly lower percentage: 7% of tweets with the hashtag #distractinglysexy were in Spanish and 1.4% in Korean. Only 4.3% of tweets with #timhunt were in Spanish. This percentage was significantly lower in Korean with only 0.3%.

Figure 1 hereafter plotted the distribution of tweets with the three major keywords "#timhunt", "@connie_stlouis" and "#distractingysexy". The latter was a hashtag coined by the feminist *VagendaMagazine* to launch memes that appeared two days after the start of the controversy. "#distractingysexy was used to deride Tim Hunt's portrayal of women as being emotional in science labs. The frequency of this hashtag rose from 28 on its first day to 449 on its second day and then to 700 occurrences on its third day. In less than a week (between 8^{th}-16^{th} June 2015), most of the keywords linked to this controversy witnessed a sharp drop in frequency on Twitter. This sharp drop corresponded to the resolution of the controversy after Sir Tim Hunt was publicly disgraced and forced to resign from all his prestigious positions in the real world.

Figure 1. The distribution of the three major keywords related to the controversy between the 9th of June and the 1st of July 2015.

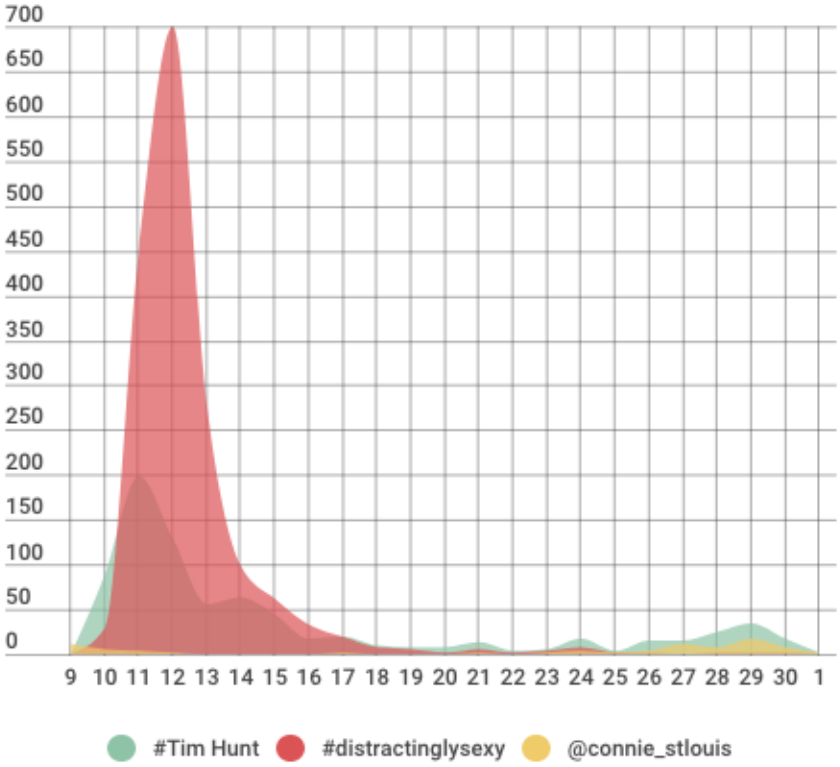


Figure 2 hereafter shows the word clouds generated from the tweets with the hashtags "#distractinglysexy" and "#timhunt" respectively. The size of a word is proportional to its frequency. Unsurprisingly, in tweets with #timhunt (Figure 2a), the hashtag "#distractinglysexy" stood out as the most prominent since it contained the memes launched by the feminist "VagendaMagazine" deriding the scientist's perceived sexist views. This hashtag also had the highest frequency in the period of the controversy (see Figure 1 above). Other frequent words found in the #timhunt cloud were "*http*" and "*rt*". While these are low semantic bearing words, they are actually quite informative in the context of social media and 144-character universe of Twitter. Http indicates links to online content on the subject of the tweet, thus showing that the topic is receiving coverage in the mainstream press or in other online communities. "*rt*" denotes retweets of a tweet, thus is a sign of its propagation on social media. Other terms that were prominent in this word cloud were "*scientists*, *womeninscience*, *female, crying, womeninstem*" which are all expected given the topic of the controversy. However, we notice the hashtag "*reinstatetinhunt*" in this cloud, referring to a counter campaign to reinstate the fallen Nobel Prize to his previous positions. The words in the "#distractinglysexy" cloud mostly relate to the memes mocking Sir Tim Hunt's outdated view of women in science labs.

Figure 2. Tagcloud for tweets with hasthags #timhunt (left) and for tweets with #distractinglysexy (right).

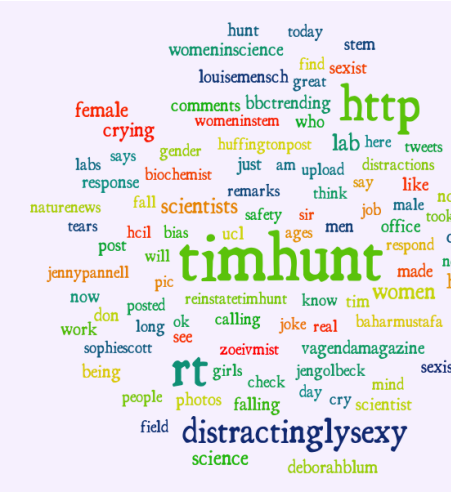


Figure 2a



Figure 2b

3.2 Estimating the sentiment polarity of tweets

We used a supervised model of a sentiment polarity analysis tool trained on tweets from Sentiment140[5] called "echo" (Hamdam *et al.* 2015). Three positions are considered: negative, neutral and positive. The tool classified the majority of tweets with "#timhunt" as neutral (45%), while only 30% were classified as positive. These tweets were mostly announcing facts given the high frequency of the word "http" in them which is why they were classified as neutral. The majority of the tweets with "#distractinglysexy" were also classified as neutral (47%), while 34% were classified as positive. A closer look at the tweets showed however that they were largely ironic or sarcastic. Irony and sarcasm are notoriously difficult to detect automatically using classification algorithms because positive sounding words are employed in a negative sense. This aspect calls for further investigation.

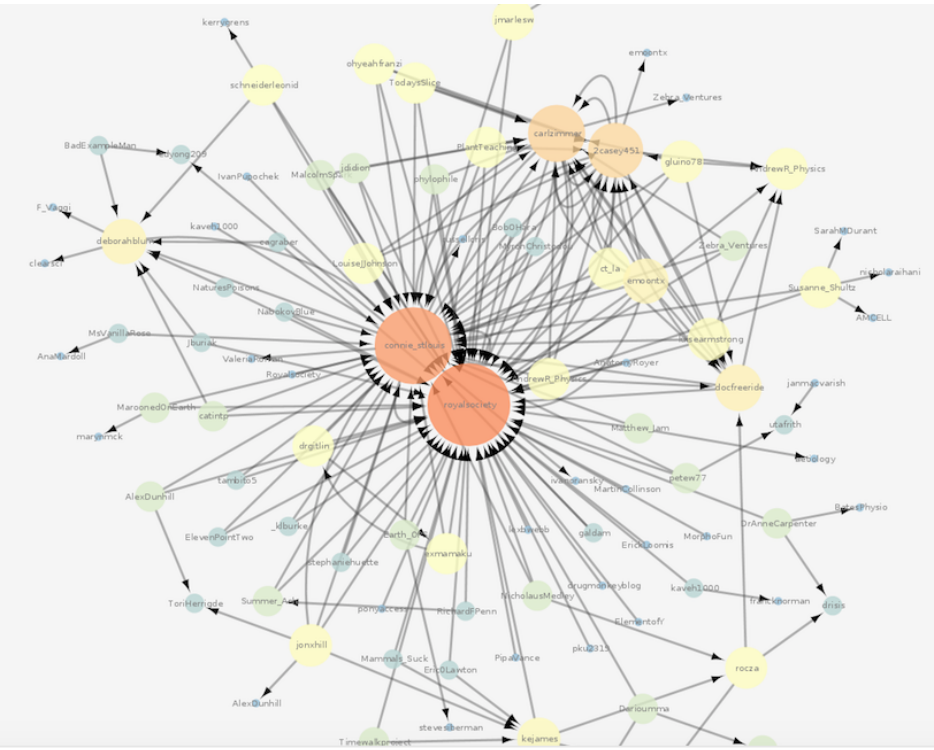
3.3 The main propagators of the controversy and their network of influence

Next, we generated an author citation network of retweets and mentions at the peak period of the controversy (Figure 3). The size of a node in this graph indicates the number of retweets and mentions received by the person or institution represented by the node. It is therefore a good indicator of the person's influence in the interaction network which led to the resolution of the controversy.

[5] http://help.sentiment140.com/for-students.

The central role played by "*@connie_stlouis*" in triggering the controversy is apparent in this network as well as that of the "*@royalsociety*" which was at the receiving end of the social media campaign to remove Tim Hunt from its members. The role played by four other protagonists, namely *@Carlzimmer, @2casey451, @Deborahblum* and *@Docfreeride* was also revealed by this graph. In fact, the controversy began as a conversation between @connie_stlouis and the four protagonists before it reached other users.

Figure 3. The citation network of authors of tweets between 9-11th June 2015.



3.4. Digital footprints and social status of the main propagators

To understand the role these prominent propagators played in constructing the narrative about the object of the controversy (Sir Tim Hunt), we searched the Internet for their digital footprints in order to determine their social capital as defined by Pierre Bourdieu[6]. We focused on the largest nodes in the citation network (minus

[6] "Social capital is the sum of the resources, actual or virtual, that accrue to an individual or a group by virtue of possessing a durable network of more or less institutionalized relationships of mutual acquaintance and recognition. (Bourdieu, in Bourdieu & Wacquant, 1992: 119) » cited in David Gauntlett, Accessible at http://www.makingisconnecting.org/gauntlett2011-extract-sc.pdf. Visited on 27/01/2018.

@Royalsociety which is an institution). We found that the majority of the main propagators (9 out of 12) were people with a high intellectual and social capital in the real world. Most were women scientists, journalists and writers who are actively engaged in fighting gender stereotypes. These influential Twitter account holders are well versed in the use of social media to advance their causes. All had a significant number of "followers".

However, none of the main propagators had reached the level of social capital and notoriety of the accused (Sir Tim Hunt) who is a Nobel prize winner and a world-leading scientist in his field. Also importantly, other leading scientists including eight other Nobel prize winners came forward in the wake of the public disgrace of Sir Tim Hunt and signed petitions asking for him to be reinstated in his official roles based on his more than 50 years of real-life unblemished scientific record rather than on his unfortunate and careless utterances at the end of a wine-laden lunch for which he has profusely apologised. Furthermore, it has since emerged that his principal accuser, the adjunct lecturer and journalist Connie St Louis had exaggerated her qualifications and work experience in her CV[7], thus raising questions about the credibility of her account of Sir Tim Hunt's utterances which some have found one-sided. All the latter facts that emerged to give a more balanced and truthful account of this controversy have been ignored and Sir Tim Hunt remains disgraced socially and professionally. Therefore, it did not seem to matter that the main propagators were not the most knowledgeable or "famous" people with a big social capital, it sufficed for them to have a forum on the web (bloggers or web sites, social media accounts), to hold extreme opinions (feminist, anti-racist, extreme right wing or left wing, etc.) and for them to have sufficient "followers" to propagate their opinions, leading to an echo chamber in the mainstream media and subsequently to public institutions making decisions under the pressure of social medial campaigns.

4. Future work

Ours is a preliminary study on how social media have become the "public arena" on which important issues are debated and resolved, leading to real-life consequences that challenge how knowledge and truth are elaborated in the 21st century. It would seem that how knowledge and truth are arrived at may well depend not so much on who you are in real life and your ability to put forward verifiable facts but on your social media network and activism in the virtual world. Further study is ongoing on other controversies also propagated on social media in order to determine if they share the same attributes. Some of the questions we seek to find answers to are: do most social media controversies have a very short life span (a matter of days) before resolution, as opposed to controversies in the real world which can last several weeks, months or even years? What are the profiles of the main protagonists and propagators? What

[7] For a full account of the post-controversy analysis bringing to light many troubling facts about Connie St Louis can be found here : http://www.dailymail.co.uk/news/article-3141158/A-flawed-accuser-Investigation-academic-hounded-Nobel-Prize-winning-scientist-job-reveals-troubling-questions-testimony.html#.unRK0d7kk.

impact do these controversies born on social media have on real life organisations and people?

Ibekwe-SanJuan and Bowker (2017) observed that « ongoing transformations in knowledge production processes entailed by Big Data and web 2.0 put pressure on the KO community to rethink the standpoint from which Knowledge Organization Yystems (KOSs) are designed. (...) Theoretically, this entails a shift from purely universalist and normative top-down approaches to more descriptive bottom-up approaches that can be inclusive of diverse viewpoints" How can this dilemma of enabling both top-down and bottom-up modalities of knowledge production be resolved in the era where "post-truth" and "alternative facts" are being propagated without jeopardising the integrity of KOs? This will call for new philosophical and methodological approaches to KOs that are adaptable and flexible, involving humans and machines working in real time to resolve contradictions.

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