Using Social Media To Inform Policy Making: To whom are we listening?

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Abstract: Domination of social media is giving today's web users a venue for expressing their views and sharing their experiences with others. With well over a billion active users, social networking sites (SNS) have become dynamic sources of information on peoples' interests, needs and opinions and are considered an extremely rich source of content to reach out to many millions of people. This is creating a revolutionary opportunity for governments to learn about the citizens and to engage with them more effectively. The potential is there for eParticipation applications to go from simply informing the public to unprecedented levels of interaction and engagement between Policy Makers (PMs) and the community, involving the public in deliberation processes leading to legislation.

Despite its great potential, several concerns arise from the exploitation of social media, especially when used to inform policy making. Among these issues we can highlight *the lack of awareness of the characteristics of those citizens discussing policy topics in social media, and lack of awareness of the characteristics of their discussions*. Although some studies have emerged in the last few years that aim to capture the demographics of social media users (e.g., gender, age, geographical locations) they tend not to focus on those specific users participating in policy discussions. Understanding who are the users discussing policy in social media and how policy topics are debated could help assessing how their views and opinions should be weighted and considered to inform policy making.

Aiming to provide a step forward in this direction, this paper investigates the characteristics of over 8K users involved in policy discussions in Twitter. These discussions were collected by monitoring, for one week, 42 different political topics selected by sixteen PMs from different political institutions in Germany. Our results indicate that: (i) a high volume of conversations around policy topics does not come from citizens, but from news agencies and other organisations, (ii) the average user discussing policy topics in Twitter is more active, popular and engaged than the average Twitter user and, (iii) users engaged in social media conversations around policy topics tend to be geographically concentrated in constituencies with high population density. Regarding the analysed conversations, a small subset of topics is extensively discussed while the majority go relatively unnoticed.

Keywords: eGoverment, eSociety, Social Media

1. Introduction

Governments have traditionally made use of eParticipation platforms to engage with citizens, to obtain their views and opinions, and to involve them in policy debates. However, several studies have observed that the use of specific online government services is remarkably low (Miller & Williamson, 2008; Dutton & Blank, 2011) and that users produce deliberations on exiting web platforms that are more familiar to them. One remedial strategy that many western governments are increasingly adopting is the use of popular social media systems to reach out to the public and to involve them more effectively in policy-making dialogues.

According to The IBM Center for The Business of Government "Next Four Years: Citizen Participation" (IBM, 2012) published in October 2012, more and more people are turning to social media to discuss their political views. However, while social media has the potential to improve the quality and timeliness of the evidence base

that informs public policy (Leavy, 2013), several concerns arise from its usage. In September 2012, the Handsard Society (http://www.hansardsociety.org.uk/), the UK's leading independent political research and education charity, organized an event in Westminster where a panel of stakeholders discussed the underlying issues of using social media to support policy making (http://www.bbc.co.uk/news/uk-politics-19555756). One of the key issues that emerged from those discussions was *the lack of awareness of the characteristics of those citizens discussing policy topics in social media:* Who are those users? What are their main concerns or topics of interest? What is their location/constituency? Understanding who are the users discussing policy in social media, and what are the general dynamics and relevance of policy debates around different topics can help PMs decide to which level the social media dialogs represent public opinion and should be used to inform the policy making process.

To this end, this paper investigates Twitter discussions around 42 different policy related topics and the characteristics of the 8,296 users involved in those discussions. The 42 topics were selected by sixteen PMs who are members of different political institutions in Germany. We selected Twitter for this study because of its popularity and reach (http://www.alexa.com/topsites), counting over 500 million registered users contributing over 400 million tweets daily.

Our results show that a small percentage of users are responsible for most of the generated discussions (*less than 6% of the users are responsible for more than 36% of all the collected tweets)* and that these users are mainly news agencies and organisations and not individual citizens. Our results also indicate that the average Twitter user discussing policy topics is more active, popular and engaged than the average Twitter user and tends to be geographically concentrated in constituencies with high population density. Similarly to users, a small subset of topics is extensively discussed but most of the topics are under represented.

The rest of the paper is structured as follows: Section 2 describes existing work intended to characterize users and policy debate in social media. Section 3 describes the data collection process and the final dataset used for this study. Section 4 explains the analyses performed over the data and the extracted insights. Section 5 presents our conclusions and outlines future work.

2. Related work

Statistics about the citizens' participation on ePlatforms are studied regularly. These statistics are computed globally (E-Gov Survey, 2012), at EU level (http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/E-government_statistics#Publications), and for individual countries (http://www.hansardsociety.org.uk/wp-content/uploads/2012/10/Digital-Citizens-and-Democratic-Participation-2010.pdf). While such studies highlight the benefits of eParticipation platforms, they also indicate that participation via specific online government services is generally low. The last report of the United Nations (E-Gov Survey, 2012) points out that within the 27 EU countries, only 32% of individuals aged 16 to 74 have used the Internet for interacting with public authorities. These reports also emphasize the need of using social media to improve public services, reduce costs and increase transparency.

Several studies have been conducted that investigate the characteristics of users participating in social media (Madden, 2010; Poblete et al., 2011; Honigman 2012; Beevolve 2012). Regarding Twitter, the SNS selected for this study, Beevolve concluded that: (i) there is 6% more of women than men in Twitter, (ii) 75% of users fall between 15 to 25 years of age and, (iii) the average Twitter user follows 102 users, is followed by 50 users and post 307 times during her Twitter life. While these works extract important insights and demographics *they aim to characterise the average social media user, and not those particular users engaged with policy debates*. A deep review of the use of social media for eGoverment can be found in (Magro, 2012). While this review includes a historic overview of the use of social media for eGoverment, none of the works referenced in this study investigates the characteristics of those users participating in policy discussions.

Additionally, some works have studied the dynamics of policy discussions in social media. However, policy discussions have been analysed in the context of concrete political events, such as elections (Adamic & Glance, 2005; Tumasjan et al., 2010; Conover et al., 2011) or revolutions (Aday, 2010; Bhuiyan, 2011). While these works focus on analysing debates around a particular event our goal is to provide an overview of how policy topics are discussed; which topics are more interesting for the general public and what is the level of positive and negative sentiment expressed about those topics.

3. Data collection and processing

To support Policy Makers (PMs) to analyse policy discussions in social media it is important to understand first what are the key topics from which they would like to obtain the citizen's opinions. Following this premise, we contacted 16 PMs, all members of different political institutions in Germany: the German Bundestag, the State Parliament North Rhine-Westphalia, the state Chancellery of the Saarland and the cities Cologne and Kempten. Each of these PMs indicated four or five topics that were of particular interest to them, generating a total of 76 policy-related topics including issues such as nuclear power, unemployment, or immigration. We filtered 34 out of the 76 initial topics, remaining with at total of 42. The purpose of the filtering process was to discard very generic topics such as "women", which led to the collection of Twitter discussions not related to policy topics. This filtering process allowed us to reduce the noise of the collected data sample. Table 1 shows the filtered list of topics, available as part of the released dataset (ECSMDataset, 2014). Please note that these topics were selected by German PMs and therefore, all of them are expressed in German language, the English translation is provided for convenience.

Topics	English translation	Topics	English translation
Betreuungsgeld	Care Benefit	Nichtraucherschutz	Non Smoking Protection
Bildungspolitik	Education Policy	NPD-Verbot	NPD Ban
Bürgerrechte	Civil Rights	Open Government	Open Government
Castorbehälter	Castor Containers	Parteispenden	Political Donations
Datenschutz	Privacy Policy	Praxisgebühr	Practice Fee
Energiepolitik	Energy Policy	Rauchverbot	Smoking Ban
Europapolitik	European Policy	Rechtsextremismus	Right-wing
Finanzpolitik	Fiscal Policy	Schuldenbremse	Debt Brake
Fracking	Fracking	Schulreform G8	School Reform G8
Frauenquote	Women's Quota	Solidarpakt West	Solidarity Pact West
Generationengerechtigkeit	Intergenerational Equity	Sozialpolitik	Social Policy
Gentechnik	Genetic Engineering	Sozialticket	Social Ticket
Gleichstellung	Equality	Studiengebühren	Tuition
Harz4	Fourth law to reform the rendition of services on the job market	Tempolimit	Speed Limit
		Verbraucherpolitik	Consumer Policy
		Verkehrspolitik	Transport Policy
Innenpolitik	Domestic Policy	Verteidigungspolitik	Defence Policy
Kohlekraftwerk Datteln	Coal Power Plant Dates	Umweltpolitik	Environmental Policy
Kommunale Grundversorgung	Municipal Primary Care	Urheberrecht	Copyright
Linksextremismus	Left-wing Extremism	Volksbegehren	Referendum
Migranten	Migrants	europäische	European
Mindestlohn	Minimum Wage		
Netzpolitik	Network Policy		

Table 1: Filtered topics and their corresponding English translation

3.1 Obtaining policy related tweets

To investigate the characteristics of users discussing policy topics in social media we monitored a sample of the Twitter population. We collected users and posts via the Twitter search API (https://dev.twitter.com/docs/api/1/get/search) using as queries the topics described in Table 1. We restricted the collection to German language to avoid gathering noisy information. The sample was collected during a week, starting on 4th of January 2014 and finishing on 12th of January 2014. The collected dataset consists of 17,790 posts originated from 8,296 different users. For both, users and posts, we extracted the set of features provided by Twitter and computed an additional set of features to conduct the analyses presented in this paper. The complete set of features is listed below:

User features

To analyse the characteristics of each particular user and his role in the conversations around policy topics we extracted the following features:

- *Number of posts*: number of posts that the user *u* has written since his/her registration on Twitter
- *Post rate*: Number of post per day created by the user *u* since her registration on Twitter
- *Number of policy posts*: number of posts generated by the user *u* in our sample dataset
- *Initiations*: number of conversations that the user *u* has initiated in our sample dataset
- *Contributions*: number of conversations in which the user *u* has participated (reply) in our sample dataset

- *Followers*: number of users who follow the user *u* (a high number of followers indicates high popularity)
- *Friends*: number of users that the user *u* follows (a high number of friends indicates high engagement)
- *Location*: location that the user *u* specifies in his Twitter profile
- *Description*: description that the user *u* specifies about himself in his Twitter profile

Note that demographic information such as age, or gender is not available via the Twitter API.

Content features

To analyse the characteristics of Twitter content around policy topics we extracted the following features:

- *Sentiment*: sentiment polarity and strength of the post *p* computed using the SentiWordNet German lexicon (http://www.ulliwaltinger.de/sentiment).
- *Mentions*: the users that are mentioned within the tweets (mentions are identified by the symbol @)
- *Hash tags*: the topics that are explicitly mentioned within the tweets (hash tags are identified by the symbol #)

4. Data Analysis

The following section presents the analyses performed over the collected data. The first analysis studies the characteristics of Twitter users discussing policy related topics. The second analysis investigates the dynamics of debates around policy topics including topic popularity and users' sentiment in relation to these topics.

4.1 Users Demographic and Behavioural Characteristics

The purpose of this analysis is to characterise those users discussing policy topics in Twitter. Figure 1 shows the distribution of users per number of posts, which presents a long-tail pattern. According to this distribution only a small proportion of the users generates a high number of posts (head) while the majority of the population contributes with less than 6 posts (long-tail). Users appearing in the head section of this distribution are responsible of 36% of the generated content of our data sample. We will refer from now on to this part of the population as "top contributors" for the rest of our analysis.

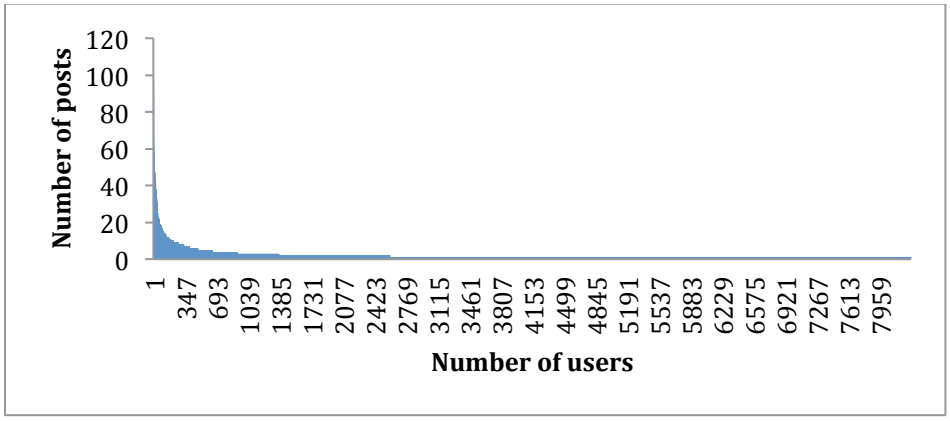


Figure 1: Distribution of users per number of posts

The average top contributor has 4,279 followers, 1,028 friends and has posted 33,134 times during his life in Twitter. Figure 2 displays the tag cloud of the top contributors' names. Among these top contributors we identify multiple organisations and news agencies such as Demokratie Report, Anonymous Germany, DTN Germany, Svejk News, Netz4ktivisten, TimesDailyNews, Voice Dialogue and others. We have manually assessed the user accounts that belong to the group of top-contributors and 73.4% of them do not represent individual citizens but news agencies and other organisations. We can therefore conclude that *policy discussions are led by a small subset of active Twitter users that do not represent individual citizens but news agencies and other organisations*.

Figure 2:Names of the top contributors

The long-tail of the distribution (the remaining 94% of users) presents an average of 1,365 followers, 630 friends and 9,578 posts during their Twitter life. These numbers are still higher than the ones reported for the average Twitter user (Beevolve 2012), which follows 102 users, is followed by 50 users and posts 307 times during her Twitter life. These results provide an indication that *the users contributing to policy topics are more active, popular and engaged than the average Twitter user*.

In addition to this analysis we have also investigated how users are geographically distributed. For this purpose we extracted the locations specified within the profiles of the collected Twitter users and geocoded them (extracted the latitude and longitude coordinates) by making use of the Google Maps API (https://developers.google.com/maps/). Figure 3(b) displays the geographic distribution of users: in yellow those locations with less than 10 users, in pink those locations with 10 to 50 users, and in red, those locations with more than 50 users. As expected, the higher concentration of users occurs in constituencies of high population density such as Berlin, Hamburg, Munich and Koln in Germany, Vienna in Austria, and Zurich in Switzerland. To investigate whether these locations are similar to the ones from which citizens engage in eParticipation platforms we compared this map with the distribution of eParticipation projects in Germany (https://www.politik.de), Figure 3(a). Since we could not find concrete statistics about the geographical distribution of users engaged in eParticipation platforms in Germany, we made the assumption that the regions with higher number of eParticipation initiatives are also those ones where more users are engaged. Note that, while user statistics of eParticipation are available for Germany at country level (E-Gov Survey, 2012; http://www.bertelsmann-stiftung.de/cps/rde/xbcr/bst/xcms_bst_dms_31401__2.pdf) we haven't found any document reporting similar statistics at regional level. To map the locations of Twitter users within the 16 regions specified by https://www.politik.de (Babaria, North Rhine Westphalia, Baden-Wurttemberg, etc.) we have made use of the region bounds provided by the Google API. The Pearson correlation coefficient between the number of Twitter users and the number of eParticipation projects in each region is 0.817. This indicates that *users engaged in social media conversations around policy topics tend to be geographically concentrated in the same regions than users engaged in eParticipation platforms.*

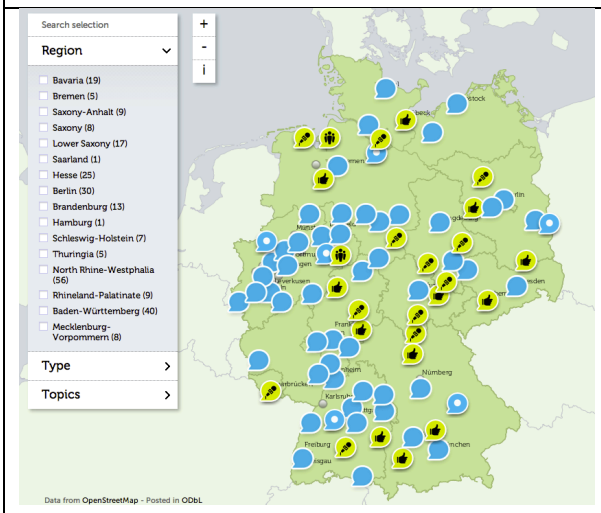
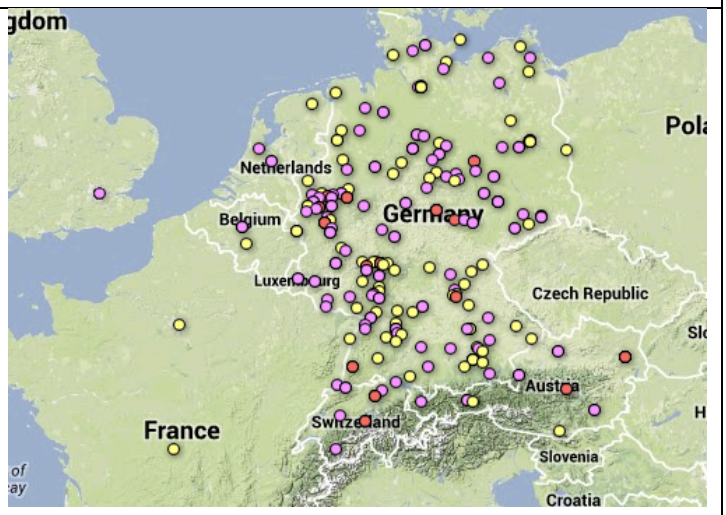
(a) Distribution of eParticipation projects	(b) Distribution of Twitter users
	

Figure 3: (a) Distribution of eParticipation projects in Germany (http://www.politik.de/politik-de/projekte_entdecken/beteiligungskarte) (b) Distribution of Twiter users: yellow are locations with less than 10 users, pink are locations with 10 to 50 users, red are locations with more than 50 users

4.2 Dynamics of policy debates

The purpose of this particular analysis is to understand how are policy topics represented in the policy discussions happening in social media and what is the overall sentiment about these topics. To extract the representativeness of policy topics (in terms of quantity of posts and users involved in the discussions) we first obtain the subsets of posts collected for each of the 42 topics and then identify the creators of these posts. To obtain the representativeness of positive and negative sentiment for each particular topic we compute the sentiment for each individual post associated to the topic and then extract the authors of those posts. This can give us an overview of how the opinions in favour and against policy topics are represented in the discussions. To compute the sentiment of the posts we use the SentiWordNet German lexicon (http://www.ulliwaltinger.de/sentiment). To extract the terms from the posts and map them to this lexicon we use the Lucene (http://lucene.apache.org) text processing tools for German Language, in particular the German stopwords removal and tokenizer. The results of this analysis are shown in Table 2.

Topic	Posts	Users	+Posts	+Users	-Post	-Users	NPost	NUsers
privacy	3439	2130	491	404	404	361	2544	1629
network policy	3250	1615	515	392	323	262	2412	1271
minimum wage	2598	1558	683	578	285	240	1630	979
copyright	1297	954	221	183	68	62	1008	788
fracking	1079	688	236	191	194	174	649	431
domestic policy	910	478	175	146	108	79	627	323
genetic Engineering	808	454	72	57	**82**	51	654	410
Harz4	632	351	100	78	34	30	498	281
migrants	601	494	139	130	**143**	127	319	270
equality	536	421	164	145	33	30	339	280
female ratio	416	370	217	203	23	22	176	156
right wing	306	221	85	84	28	24	193	127
referendum	300	223	30	26	**108**	98	162	129
left wing extremism	245	199	50	49	26	25	169	142
education and training policy	235	213	94	88	39	38	102	98
energy policy	185	146	35	30	33	28	117	98
european policy	139	128	22	22	**25**	24	92	84
party donate	110	100	4	4	**7**	7	99	92
social policy	107	77	25	21	13	11	69	50

speed limit	75	66	5	5	**13**	10	57	52
financial policy	74	68	20	20	4	3	50	47
no smoking	70	66	16	16	4	4	50	48
care money	66	61	10	10	1	1	55	50
transport policy	61	54	15	15	3	3	43	37
generational justice	55	54	13	13	2	2	40	40
debt brake	51	45	6	6	6	6	39	34
environmental policy	43	39	8	8	3	3	32	30
npd ban	36	24	3	3	**19**	7	14	14
non smoking shelter	35	35	4	4	**7**	7	24	24
socially ticket	28	21	1	1	**4**	4	23	16

Table 2: Representativeness of topics. For each topic the table includes: (1) its English translation, (2) the total number of posts about the topic, (3) the total number of users contributing to the topic, (4) the number of positive posts about the topic, (5) the number users contributing positively to the topic, (6) the number of negative posts about the topic, (7) the number of users contributing negatively to the topic, (8) the number of neutral posts about the topic and (9) the number of users contributing neutrally to the topic.

Our analysis shows that 30 out of the 42 collected topics were discussed during the monitored week. The posts distribution per topic is displayed in Figure 4. As we can see in this figure, *few topics are extensively discussed* during the analysed period, such as privacy, network policy, minimum wage, or copyright, *while the majority of topics are underrepresented*.

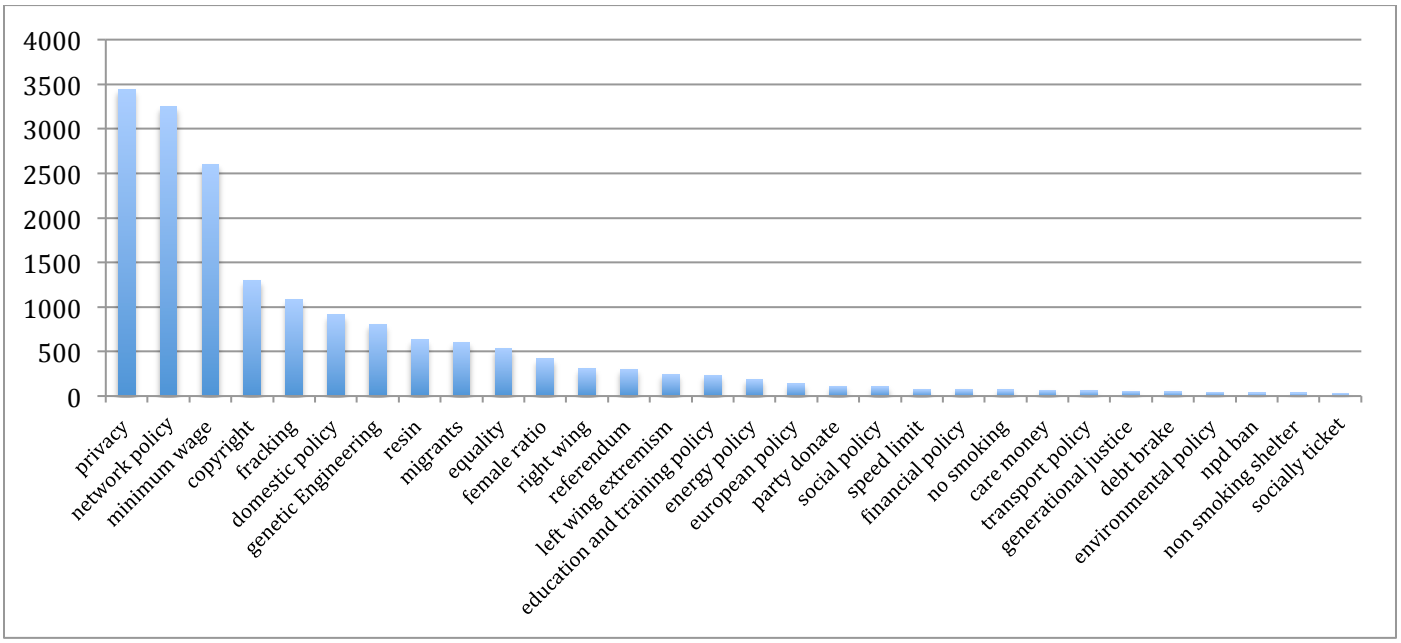


Figure 4: Post distribution per topic

This topic distribution is also reflected in the hashtags used within the Twitter conversations. Hashtags are metadata tags that Twitter users include in their posts to explicitly indicate the topics under discussion. As we can see in Figure 5 the most popular hashtags of our dataset include privacy, minimum wage, copyright, fracking or genetic engineering, which are among the most popular topics in terms of frequency of associated posts.

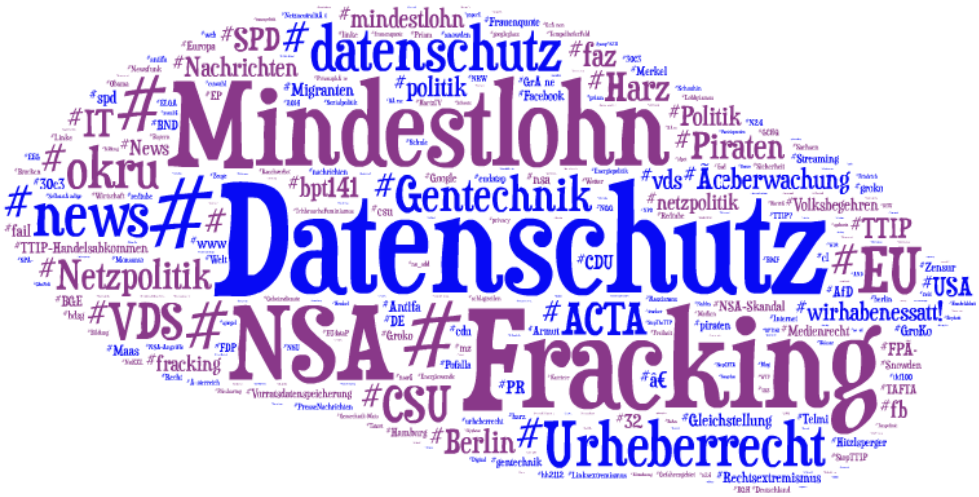


Figure 5: Hashtags extracted from the collected dataset

Regarding the sentiment around the collected topics, we have highlighted in red (Table 2) those topics for which the number of negative contributions is higher than the number of positive contributions. Among these topics we find genetic engineering, immigration, the possibility of a referendum, donations to political parties or the speed limit. The rest of the monitored topics present a slightly higher number of positive than negative tweets. Note that there is a high percentage of neutral posts for each topic. These posts are those for which the sentiment lexicon could not assign any polarity (positive or negative) because the vocabulary of the posts was not covered by the vocabulary of the lexicon. As future work we plan to apply other German-based sentiment analysis tools that can help us to increase the level of coverage. It is also important to highlight that some topics present a high volume of posts around positive and negative opinions, i.e., they are notably controversial. Among these topics we can highlight privacy, fracking, or domestic policy.

As a measure of user engagement in conversations around policy topics we have analysed the reply chain of the collected conversations. 45% of the collected posts in our dataset are replies to previously initiated discussions. Contrasting this result with earlier studies based on different collected Twitter datasets (http://www.sysomos.com/insidetwitter/engagement/), where a maximum of 23% of posts where replies, this percentage of engagements in discussions is comparatively high, i.e., *users that engage in policy discussions in Twitter more actively than in other topics.*

5 Conclusions

Understanding who are the users discussing policy in social media and how policy topics are debated could help PMs assessing how their views and opinions should be weighted and considered to inform policy making. This paper aims to provide a step forward in this direction by analysing 8,296 Twitter users discussing policy topics in social media. These discussions (17,790 Twitter posts) were collected by monitoring, for one week, 42 different topics selected by sixteen PMs from different political institutions in Germany.

We analysed the different types of user groups discussing policy topics as well as their geographical distribution. Our results show that a small percentage of users (top contributors) are responsible for most of the generated discussions (around 6% of users are responsible of 36% of the conversations). 73.4% of the top contributors are not individual citizens but news agencies and other organisations. Our results also show that the Twitter user discussing policy topics is more active, popular and engaged than the average Twitter user. Regarding the geographical distribution of these users we have observed that: (i) they tend to be concentrated in locations with high population density and, (ii) they tend to be concentrated in the same regions than users engaged in eParticipation platforms.

We have also analysed the popularity and sentiment of the different conversations around policy topics. Our results indicate that a small subset of topics is extensively discussed (privacy, network policy, minimum wage, copyright, etc.) while the volume of conversations is relatively low for the rest of the topics. Regarding the analysed sentiment, the topics accumulating a higher percentage of negative comments include: genetic engineering, immigrants or the possibility of a referendum. While most of the analysed topics present a higher

number of positive than negative comments, some of these topics are particularly controversial. It is also important to notice that the sentiment lexicon used in this study did not provide sufficient coverage and a large percentage of tweets were not assigned any sentiment. As future work we plan to investigate other German-based sentiment analysis tools that can provide higher coverage.

While we are aware that this is confined study and that the obtained conclusions may seem of little surprise we have, by analysing real data, observed who are those users discussing policy in social media. The top conclusions of our study include: (i) a high volume of conversations around policy topics does not come from citizens, but from news agency and other organisations and, (ii) users discussing policy topics in Twitter are more active, popular and engaged than the average twitter user. As future work we aim to extend the data collection to a longer time period and to study the temporal evolution of discussions around policy topics. As additional contribution of this work we have released the dataset collected for this study (ECSMDataset 2014)

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