AALBORG UNIVERSITY
DENMARK

Digital methods contributions to citizen hearings

A techno-anthropological approach to Twitter and technology assessment

Birkbak, Andreas; Madsen, Anders Koed; Munk, Anders Kristian

Published in:
Techno-Anthropological Contributions to Technology Assessment

Publication date:
2021

Document Version
Accepted author manuscript, peer reviewed version

Citation for published version (APA):
Birkbak, A., Madsen, A. K., & Munk, A. K. (Accepted/In press). Digital methods contributions to citizen hearings: A techno-anthropological approach to Twitter and technology assessment. In L. Botin, & T. Børsen (Eds.), *Techno-Anthropological Contributions to Technology Assessment* Aalborg Universitetsforlag.

Digital Methods Contributions to Citizen Hearings: A Techno-Anthropological Approach to Twitter and Technology Assessment

Andreas Birkbak, Anders Koed Madsen, Anders Kristian Munk (all TANTlab, Department of Culture and Learning, Aalborg University Copenhagen)

Introduction: Supplementing TA with digital methods

Over the past 40 years, technology assessment (TA) has developed into an institutionalised practice for decision-makers faced with the complexity of implementing new technologies in society (Grunwald, 2010). In a European context, the Office for Science and Technology Options Assessment (STOA) represents a network of institutions, such as the Danish Board of Technology Foundation (DBT), that have been pioneering a particular brand of participatory TA, where emphasis is on citizen consultations with a representative sample of the population, following established principles of rational dialogue (Jensen, 2005; Horst & Irwin, 2010).

Within the fields of digital methods and Science & Technology Studies (STS), from which we draw our techno-anthropological inspiration, another set of practices have emerged under headings such as issue mapping and controversy mapping. These efforts involve the use of digital methods to understand and represent public concerns (Marres, 2015). These methods are characterised by being both post-demographic (Rogers, 2013), i.e. not representative, and by following the actors of a debate in the wild, i.e. not in a controlled environment. As such, there is a potential conflict between the practices found in institutions such as the DBT and the practices we refer to as digital methods.

Nevertheless, this chapter explores how digital methods, although seemingly incongruent with established practices for TA, became pertinent in a concrete TA project in collaboration with the DBT. We analyse a specific event where we, as members of the Techno-Anthropological Laboratory (TANTlab) at Aalborg University, collaborated with the DBT to investigate whether and how analyses of Twitter data could provide viable inputs to a citizen hearing the board was facilitating on the topic of epidemics and pandemics. The collaboration revolved around a so-called data sprint (Munk et al., 2017) at the TANTlab in the early spring of 2016, where several data sets from Twitter were explored in order to understand public responses to the threats of epidemics and pandemics.

The chapter proceeds in the following steps. First, we account for the existing practices at the DBT in line with the techno-anthropological idea of building rapport with the domain-specific expertise (Botin &

Børsen, 2013). We thus identify three central steps that underpin most TA practices as they are institutionalised within the EU, and we explicate the values of and assumptions about the public underpinning these. We suggest that the practices of DBT should be understood as a specific set of techniques for eliciting public assessment of emerging technologies. This view is informed by the basic techno-anthropological (and STS) idea that in practice, social and technological elements combine in the construction of knowledge, including knowledge about publics (Lezaun & Soneryd, 2007; Laurent, 2011).

Second, we introduce digital methods (Rogers, 2013; Munk, 2013; Birkbak & Munk, 2017; Madsen 2015; 2017), arguing that Twitter is best understood not as a source of 'big data' but as a field of activity that should be studied with a reflexive techno-anthropological attitude in order to take its media-related cultural and technical specificities into account. Also, we explicate the specific socio-technical infrastructures that influence the kind of publics that can be represented with digital methods. For instance, digital traces are weak when it comes to demographic metadata (information on e.g. gender or age are generally not available through digital platforms in any reliable fashion), thus digital methods feed on patterns in decentralised and unmoderated discussions 'in the wild'.

Third, we discuss how to make a techno-anthropological contribution that spans the different practices of DBT and of STS-inspired digital methods. Through fieldwork among TA practitioners, we identify potentially productive interfaces between existing TA practices and our own digital methods practices. Also, we note that some of our own preferred practices are too incoherent with core values in the established practice. The result being that we organise a data sprint around a quite specific challenge: how can a large set of Twitter data be repurposed to source relevant dilemmas about epidemics and vaccines? More specifically, dilemmas that can be used to frame discussions at a pan-European citizen summit?

Finally, the data sprint is described and analysed, including the specific steps taken during data collection and data analysis to develop a meaningful 'interface' between Twitter as a data source and the DBT as an interested party with specific ideas about what counts as public deliberation. This involved an iterative process, drawing on both what is characteristic about the DBT approach to technology assessment, how Twitter could be repurposed to contribute to this approach, and how the DBT approach itself could potentially be developed in view of the affordances of Twitter as a platform and arena of digital public inquiry.

Citizen engagement as Technology Assessment - the Danish tradition[1]

During the 1990s, The Danish Board of Technology was a key contributor to methods that combined practices of citizen engagement with inputs to what is commonly known as Parliamentary Technology

---

[1] This section is written on the basis of information on the website of the Danish Board of Technology (tekno.dk) and the website of Engage2020 (http://engage2020.eu), which DBT was in charge of, as well as several conversations and meetings with project leaders at the board.

Assessment (see for instance http://www.eptanetwork.org/). Born out of an interest in deliberative democracy and public engagement with science in the mid-1980s, the board made itself a consistent partner for Danish politicians in need of assessments of the promises and perils of emerging technologies such as drones or genetically modified foods. From 1995 to 2012, the board was funded as part of the Danish state budget and it was during this period the DBT established itself as an internationally renowned developer of procedures and methods for public engagement in the context of TA (see e.g. Jensen, 2005; Horst & Irwin, 2010).

Examples of methods that characterise DBT's approach to TA is the consensus conference, the citizen jury, and the citizen summit. Each of these methods contains detailed instructions of how to prepare public deliberation on complicated technological issues, how to moderate and facilitate such deliberation processes, and how to communicate the results of such deliberations to politicians and decision-makers. A central trait of the DBT is accordingly to combine a theoretical and methodological interest in the public and its concerns about technologies with an insistence on translating these concerns in ways that make them have an impact on politics. Even though the methods of DBT are many and have their differences, most of them follow a workflow that revolves around the following three steps (see e.g. Danish Board of Technology, 2017; Engage2020, 2015).

The *first step* is to identify dilemmas that can stimulate a productive discussion when the public meets to deliberate. Not all dilemmas are good dilemmas, and a central aspect of this preparatory work is to consult what the DBT would refer to as relevant experts and stakeholders in relation to the technology in question. An engagement exercise about robot technology could, for instance, be grounded in dilemmas sourced from interviews with researchers and engineers, who have reliable knowledge about the state and progress of technological development, as well as experts on the sociology of work, who have reliable knowledge about the impact of technology and automatization on working conditions in different sectors. This ensures that the dialogue takes place on an informed basis.

This way of preparing an engagement exercise suggests that two important assumptions guide the DBT approach to TA. One is that the role of citizens is to debate *pre-defined* dilemmas - not to formulate them. Another is that dilemmas must be selected and formulated in dialogue with people who are *officially credited* with having knowledge about the technology in question. The views of these experts will ultimately be presented in a *fair and balanced* information material that will be circulated among citizens as preparatory reading in advance of the engagement exercise. Since this material will often be written by a journalist, it is the typical journalistic criteria of impartiality that will guide the presentation of dilemmas. Accordingly, the material presents two - often antagonistic - takes on the right political priorities in relation to a given dilemma.

The *second step* is when the citizens enter the equation. The aim in this phase is to facilitate a rational dialogue about the chosen dilemmas among a selected group of citizens. Again, not all selections are good selections. Most of the DBT methods get their legitimacy by presenting the concerns of a

representative sample of the population. This reflects another central assumption underpinning the approach to citizen engagement and TA that has been developed by the board. The public that is deemed competent to engage in debates about technologies must be comprised of citizens with no vested interests in the given technology. The best selection of citizens is a group of people spanning a diversity of demographic categories and who are more or less blank slates when it comes to the specific technology being debated. This will ensure that the deliberation takes place with reference to the balanced portrayal of dilemmas in the information material rather than being polluted by dedicated interest groups with no interest in putting their preconceived framing of the issue at risk.

Besides these guidelines for selecting participants, this second phase is also characterised by clear guidelines as to how the actual deliberation takes place. Five to eight citizens are placed around a table with a moderator who ensures that everyone gets their say and that the discussion stays on track in relation to the information material and the questions the citizens are supposed to form an opinion about. For instance, if the prepared material about robot technology includes a dilemma between prioritising efficiency or human interaction in the workplace, it is the job of the moderator to ensure that the citizens at his or her table take a stance on this specific dilemma. In other words - the different tables are supposed to deliberate under the same headline.

The *third step* is to condense the results of the involvement process into actionable recommendation for decision-makers. Success in this phase depends on the moderation taking place during the second step. In order to have an impact, the report must be clear and concise in its communication of the visions and priorities of the citizens. Sticking to predefined dilemmas in the process increases the chance of achieving this in at least two ways. First, it ensures that the reported concerns are 'realistic'. They are rooted in expert evaluations about potential consequences and possibilities of a given technology - not in the free-running imagination of a lay person. Second, organising deliberation across tables around cross-cutting dilemmas eases the communication of 'public opinion'. Because the citizens are discussing comparable issues, they appear as a uniform public that - despite disagreeing on solutions - share each other's framings of the problems.

In sum, the DBT approach to TA stages citizen involvement as a moderated endeavour that sits between expert-driven problem formulations and the output of findings to pass on to decision-makers. With this attempt to outline an archetypical workflow of a DBT engagement process, it becomes possible to understand the specific practice of TA that we aimed to contribute to with our digital methods. Even though our data-sprint was conducted as part of a specific project - *Action plan on Science in Society-related issues in Epidemics and Total pandemics* (ASSET) - it was a prerequisite for the relevance of our contribution that we succeeded in creating a workable interface between our digital methods and the values and assumptions that pertained to the field. For instance: the value of reliable foundations for dilemmas, representations of the public, and actionable recommendations. Before turning to our analysis of the actual construction of such an interface in the ASSET data-sprint, the next section will introduce digital methods as a specific method of making public debates visible.

Digital methods and public engagement

With the rise of new digital media, most notably social media and the web, an increasing amount of digital traces are retrievable and can be repurposed for social analysis (Rogers, 2013). The field of digital methods is guided by pragmatist principles (Marres, 2017; Birkbak & Munk, 2017), including the idea that publics form in response to specific issues and through specific means of conducting and circulating inquiry into these issues (Dewey, 1927; Birkbak, 2013; Marres, 2015). As a result, digital methods pay close empirical attention to how digital media shape social phenomena such as publics and carefully investigate methodological questions related to new digital opportunities for data collection within the social sciences and the humanities (Rogers, 2013). A social media platform such as Twitter comes with specific formats and affordances such as hashtags and retweeting (Borra & Rieder, 2013; Madsen, 2015). There are also highly sophisticated and diverse cultures of media use connected with digital media. The Twitter platform and its trending algorithm, for instance, are less concerned with the representations of existing social networks (compared to e.g. Facebook) and more focussed on new connections between disparate groupings (see e.g. Birkbak & Carlsen, 2016).

Such media specificities are not necessarily 'biases' to be neutralised or filtered out when using digital methods (Birkbak et al., 2015; Madsen, 2015; Birkbak & Munk, 2017). Taking a techno-anthropological approach, they can be included in the analysis based on the insight that any kind of mediation involves a transformation (Latour, 1987). That does not mean, however, that there cannot be better or worse transformations. Research within digital methods has focused on finding the best ways to 'reapppropriate' (Rogers, 2013) or 'interface' with (Marres & Gerlitz, 2016) the existing formats and technologies on the web for social research purposes.

Reappropriations have not least been guided by an attention to public engagement in digital methods. Public controversies, especially, have been argued to lend themselves to exploration through digital techniques that try to make the most of how an increasing number of actors voice their hopes and concerns on the web (Venturini, 2012). Projects such as MACOSPOL and EMAPS rely on data visualisation techniques to produce controversy 'maps' aiming to represent the various positions in a given controversy, including how the positions relate to each other (or not) and how popular they are at different points in time (see e.g. Venturini et al., 2014; Munk & Ellern, 2015).

Digital controversy mapping comes out of a long-standing interest in scientific and technological controversies within science and technology studies and related fields. Controversies are prized for their ability to render the uncertainties of scientific knowledge and technological solutions visible for analysis by social researchers. This interest in controversies thus comes with a problematisation of any simple reference to expert knowledge, especially in the case of public issues and controversies, something which is potentially at odds with division between the framing of good dilemmas (by experts)

and the deliberation of these dilemmas (by lay people) in the DBT citizen hearing method described above.

In short, digital methods come with specific sensitivities (e.g. to media specificity) and a specific conceptualisation of publics (as not falling clearly on any one side of a lay vs. expert divide). This also means that a particular take on participation has been cultivated in relation to digital methods (Marres, 2017). These developments owe not least to how the wider relevance of controversy mappings has been shown to depend on participatory processes involving those engaged in the controversies being mapped. We will briefly mention two such approaches, to which we have contributed.

The first concerns the question of how to design 'with' rather than 'for' publics when designing interactive digital visualisations of data related to specific issues (Birkbak et al., 2018). The thrust of such projects often follows the idea that public engagement can be generated by 'making things public' in relevant and well-designed ways (DiSalvo, 2009, drawing on Latour & Weibel, 2005). Such ambitions, however, also risk reintroducing an instrumental approach to publics, which comes close to the instrumental approach to 'users' that the participatory design tradition has long sought to overthrow (Simonsen & Robertson, 2012). The remedy proposed by Birkbak and Petersen (2017) is to explore the concerns of target publics as concerns that do not necessarily align with the agenda of the designers. Designing 'with' publics means working at this interface.

A second approach referred to as participatory data design specifies how such work with publics and users may take place by arguing that the qualification of specific digital traces as relevant data is a process that can benefit from being understood as an opportunity for participation (e.g. Jensen et al., 2017; Jensen et al., 2020). Participatory data design involves an understanding of participation as something that can unfold at (at least) three different points in a process of using digital methods. The first opportunity presents itself at the point of 'datafication' (Flyverbom & Madsen, 2015), which is the process of assembling and curating (i.e. filtering, organising, selecting, tagging, cleaning, as exemplified in the case description below) a relevant data set from the throngs of digital data available online and in organisational databases. The second opportunity comes with the harnessing of these data sets for the production of maps and visualizations that can guide actors in the given field or controversy being investigated. Data sprints are an example of how the production of data visualisations can be opened for participation of a broader range of actors (Munk et al., 2017). The third opportunity belongs to the situations in which the data visualisations are used. At this point, interactive maps and data exploration tools can allow for a more participatory and open-ended interpretation of the results.

The data sprint method has been developed as part of efforts to facilitate the involvement of area-specific experts in the digital mapping of a given issue (Munk et al., 2017). In short, a data sprint starts with input from invited issue experts as to what questions are most relevant to explore with digital methods. The sprint format means short-term, high-intensity work, which again makes it feasible for these issue experts to stay close and contribute to the framing of the data collection and the data

analysis. The results of data sprints are (ideally) based on several iterations between expert questions and digital methods techniques, which increase the chance of the final maps and visualisations being relevant to practitioners and publics beyond the data sprint participants.

Creating a viable interface for digital methods contributions to TA

From what has been written above, it is evident that our preferred ways of representing public controversies with digital methods differ in important ways from the preferred ways of showing public concerns in more institutionalised practices of TA, as exemplified by the DBT approach discussed above. Whereas we have been accustomed to working with a theoretical conception of issue-publics in the plural, it is a consistent element in DBT's method that their legitimacy is ensured by presenting a singular and representative 'public opinion' on the given topic. Similarly, digital methods are characterised by a trust in the relevance of patterns in more or less unmoderated discussions on the web, whereas part of the craft of DBT is their expertise in facilitating and moderating rational dialogues.

Accordingly, and in order to contribute to the institutionalised version of TA, we must create a viable interface between two quite different approaches to a similar task - namely, to make public concerns about emerging technologies visible to decision-makers. As argued in Børsen et al. (2013), this challenge is not surprising from a techno-anthropological perspective. In fact, all successful contributions to technology development have as a prerequisite to understand the culture and practices they are embedded in. In our case, this meant that we could not organise a data sprint without engaging with existing practices in the field of participatory TA on their own terms. In order to meet this demand, we relied on ethnographic encounters with current TA.

Specifically, we participated in two method development seminars - one internal in the DBT and the other organised by ASSET as part of their commitment to do methodological innovation in the field of TA. Furthermore, we participated as speakers at the European Engage2020 conference in Brussels, where the leading organisations in European TA shared methodological experiences. During these events, we were able to engage with central persons in the field to which we were trying to make a contribution. Finally, we conducted participant observation at one of the citizen hearings organised in relation to the ASSET project.

The main question guiding these efforts was to identify ways in which digital methods could make a contribution to the existing DBT TA processes. Would the point of digital intervention be at step one, focussing on selecting and formulating information material and dilemmas, at step two concerning moderated citizen involvement, or at step three, focussing on clear dissemination of results? Addressing such questions via anthropological methods is part of what techno-anthropology has to offer to technology assessment. Without acquainting ourselves with existing practices and norms, it becomes difficult to pinpoint the value of an emerging and non-stabilised toolkit such as digital methods.

In this build up to the sprint, it became clear that especially the values and assumptions underpinning step two were too central to the established institution of TA to be challenged. The idea that a proper TA process is built around a representative group of citizens that have engaged in a rational and moderated dialogue with each other was something that was mentioned every time we brought up digital methods. Some of the fundamental characteristics of digital data stood in stark opposition to the guiding assumptions about proper data. Most importantly, digital traces leave no possibility to check the demographic characteristics of the public and thereby leaves no possibility for ensuring statistical representativity. Also, discussions on Twitter are not properly moderated, and for many it comes across as a space full of rumours and unsubstantiated fears and claims. The socio-technical configuration of Twitter thus made it difficult to produce an account of 'the public' in the sense found at DBT, which cares for the representativity of those traced vis-a-vis the general population. It became clear that DBT strongly preferred a 'citizen hearing public' to a 'Twitter public'.

It became clear that if step two of DBT's take on TA was to move to the web, it would be in a dedicated space designed and moderated by TA experts. In fact, the DBT is currently developing such a space under the heading Global Say. This does not have to be understood as an opposition between a 'real public' and a 'fake (digital) public', but it nevertheless means that DBT prefers the transformations involved in representing the public through the means of a citizen hearing over the means of social media activity on i.e. Twitter. Accordingly, the challenge for us was to develop a methodological protocol for using digital methods to represent publics that was explicated well enough for DBT to trust it, or at least be able to interpret the results through it (Madsen & Munk, 2019).

What emerged during these discussions was a realisation that the best fit for digital methods in the already established space for TA would be to make a contribution to step one. This conclusion was, for instance, the outcome of a talk with the co-director of DBT on the plane back from Brussels. The possibility to use Twitter as a kind of 'hive-brain' to source the relevant dilemmas to be presented in the information material could be a way to improve the usual procedure which would be to call on pre-defined experts. Twitter might provide an indication of other themes and concerns that could serve as relevant background to the physical meeting. Or perhaps Twitter could give new inspiration in relation to the list of experts to call upon when writing up the information material. These were the challenges posed to the participants in the data sprint, which took place in the early spring of 2016.

Case: Data sprint on epidemics

A central element in the ASSET project was the organisation of citizen summits across eight European countries. This specific method reflects the more generic values and assumptions outlined as foundational for TA processes in DBT above. It aims at identifying citizens' attitudes towards political priorities on an informed basis and its purposed outcome is to provide "[...] a clear indication about citizens' attitudes, which implies some degree of commitment by the policy-makers" (Engage2020, 2015). To meet this goal, ASSET involved carrying out simultaneous citizen meetings in different

European countries where participants would be asked to discuss and respond to the same set of questions and read the same information material in advance.

The information material for these meetings contained a combination of fact boxes and case stories that presented dilemmas and raised questions for the participants to consider. Conventionally, the case stories are selected by the same experts who provide the factual information for the material. This carries an obvious risk given that the experts will frame the problem in accordance with the questions they are able to address within their field expertise. As mentioned in the previous section, it was therefore decided to attempt to draw on digital methods to source case stories from social media talk about epidemics. This would introduce a more bottom-up approach to the information material in which factual information from experts would be presented alongside topical case stories told and seen by a concerned public on Twitter.

The objective for the data sprint at TANTlab thus became to source stories from Twitter that would both address the issue of epidemics and qualify as interesting and legitimate in the context of a citizen meeting and its information material, where they would serve a specific purpose. The challenges involved in achieving this objective fall broadly in two specific categories, namely those related to Twitter as a platform and those related to the citizen meeting as a means for consulting the public. Eventually, the challenges turned out to be overlapping.

The first challenge is to build a good data set with Twitter. The Twitter Application Programming Interface (API) allows continuous and tailored harvest of tweets, but not retrospective harvest (although retrospective data sets can be purchased). It is therefore necessary, for most practical purposes, to build data sets in advance of a sprint or at least start collecting data in advance. The data collection can be delimited in several ways, including specific hashtags or keywords or by specific user profiles. In our case, we worked with data sets defined by the presence of the hashtag *#zika*, since we decided to work with a month of Twitter talk on the Zika epidemic. The data set was harvested using the Twitter Capture and Analysis Toolset (TCAT, see Borra & Rieder, 2014), between February 8th and March 8th, 2016. It contained 400,000 tweets from which we extracted 2,600 co-occurring hashtags to help us identify thematic clusters that could eventually be used to delimit and select stories about Zika through visual network analysis. The extraction process required several subsequent filtering operations that we will go through below. Our digital methods-inspired ambition of moving back and forth between data collection and data analysis in an interactive manner was toned down due to the time frame of data collection on Twitter, which meant that the filtering of the data became the crucial element instead.

The basic question we had to address was how to recognise a potentially useful story, or epidemic-related dilemma, on Twitter. It is a question that cannot be understood in isolation from the context of the citizen meeting and the information material of which these stories would eventually become part. Seen from the perspective of the project partners in ASSET, a story could not be told by a single user

but would have to be circulated in a group of users in order to qualify, and it would have to underpin a good dilemma for the citizens to engage with.

There were several ways of operationalising these quality criteria for a story in the data set from Twitter. The most obvious one was to count the number of individual users sharing it. Another would be to measure the diversity of hashtags in use around a story. A single hashtag is, in a sense, already a thematic delimiter that could be used to find and select a story in a set of tweets. It would thus be reasonable to assume that tweets hashtagged *#Rio2016* (the official tag for the 2016 Olympic Games) in a set of Zika-related tweets from within the same period of time would contain a specific storyline. If *#Rio2016* had high user diversity, this could then be taken as an indicator of a relevant story.

The problem with only counting unique users around single hashtags is that it risks uncritically following media-specific phenomena like bot activity, and that it gives priority to stories that are shared without modification by the users, which suggests a low level of social activity around a story. There is also a third risk that some hashtags are implicated in several stories (about the Rio Olympics, for instance). By focussing the analysis on hashtag diversity as well, these problems can be somewhat circumscribed.

In order to engage with not only user diversity but also hashtag diversity, we first filtered the data set to tweets containing at least two hashtags, a necessary consequence of the decision to look at co-occurring hashtags. This reduced the number of tweets from 400,000 to 19,100. We then applied a criterion of minimum three distinct users per hashtag in order to support the idea that stories should be shared, removing 12,600 hashtags from the set. Realising that some hashtag clusters were driven primarily by many users retweeting the same combination of hashtags once, we decided to filter out hashtags where all users had been active exactly once. This removed a further 3,200 hashtags. We then removed co-occurrence connections between two hashtags if they had been generated by one tweet only. We also removed the top 10 most connected hashtags, interpreting them as the most generic, thus proliferate across the dataset, and as a result not useful for detecting stories. Finally, we deleted hashtags that had been left with no connection to other hashtags (no co-occurrences in the same tweets) by the above filtering operations. The result was a network of 2,600 hashtags connected to each other if they co-occurred in the same tweet at least twice.

The network was imported to the visual network analysis software Gephi and subjected to a force vector layout based on the ForceAtlas2 algorithm (Jacomy et al., 2014). Community detection was carried out by calculating the modularity of the network and assigning a modularity class to each cluster of co-occurring tags.
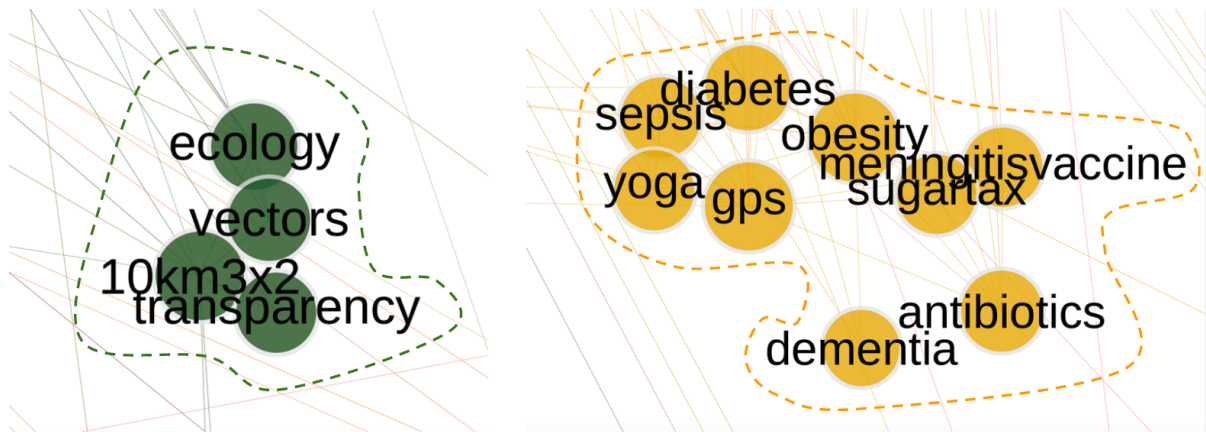
Figure 1: *Two examples of thematically specific hashtag clusters from the filtered and spatialized network.*

A combination of force vector spatialization and community detection made it possible to delimit clusters of co-occurring hashtags. Some of these were relatively non-specific, containing hashtags like #WHO, #emergency, #global and #medicine that one could expect to find in almost any storyline about Zika, while others, such as the ones shown in Figure 1, seemed to be thematically more specific. The first task for the visual network analysis was therefore to identify the most promising hashtag clusters (i.e. those most likely to contain thematically specific stories) for further analysis.

From this preliminary selection of clusters, we exported 12 tweet compilations for each of the clusters we had identified as interesting for further analysis. To be included in the compilation, a tweet would have to contain at least two of the hashtags in the cluster, thus contributing to producing at least one of the edges in the cluster. The tweet compilations were then scored by the issue experts from the ASSET project in order to determine which of the stories would be most interesting for inclusion in the information material.
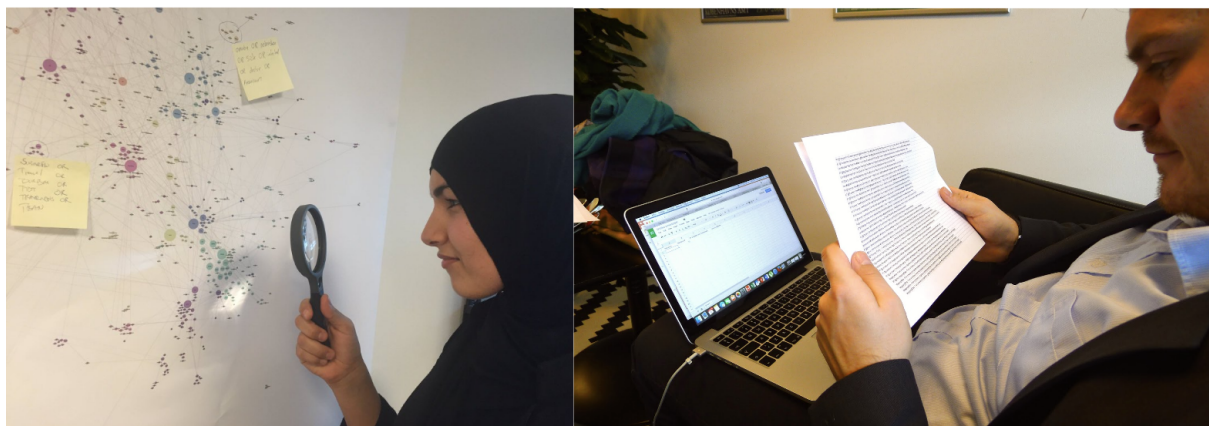

Figure 2: *Key moments in the data sprint. Left: Researchers conduct visual network analysis to select Zika-stories for further evaluation by issue experts. Right: TA experts score stories on their controversiality, source diversity, and relevance to the topic of pandemics by qualitatively evaluating tweet compilations.*

In the printed information material handed out to the ASSET citizen summits across Europe, a total of four 'Twitter stories' about Zika appeared, as illustrated below.

HISTORIE FRA TWITTER

De Olympiske Lege i Rio i 2016 er et godt eksempel på denne type debat på internettet. Efter udbrud-det af zikavirus i 2015-2016 er det lykkedes forskellige forskergrupper, almindelige borgere og medier at gøre verden opmærksom på virussen. I maj 2016 gik en gruppe forskere således sammen for at opfordre WHO (FN's verdenssundhedsorganisation, der varetager international sundhed) og den Internationale Olympiske Komité til at flytte eller udskyde legene. Eksperter hævdede, at nye konsta-teringer af zikavirus betød, at det ville være uetisk at gennemføre legene. Debatten bredte sig hurtigt på Twitter, og folk kommenterede på historien ved at bruge hashtags som #MoveOlympics og #Zika.

Lige siden de mere end 100 sundhedseksperter fra hele verden opfordrede WHO til at presse Den

HISTORIE FRA TWITTER 1: Et tweet fra en gruppe sundhedseksperter, som opfordrede til, at De Olympiske Lege i Rio i 2016 enten blev flyttet eller udskudt, opnåede stor opmærk-somhed på Twitter.

Figure 3: An excerpt from the Danish info material handed out to participants at the ASSET citizen summit the 24th September 2016 in Copenhagen. The story is about whether the Zika virus threat should result in the 2016 Olympic Games in Brazil being postponed or moved, and how this discussion appeared on Twitter.

Conclusion

The aim of the chapter has been to describe how digital methods may supplement participatory technology assessment in the tradition that the Danish Board of Technology belongs to. We have argued that this tradition is characterised by a three-step model, where a set of pertinent dilemmas in relation to a given technology are initially framed by domain experts. Then citizens are involved in systematic efforts to deliberate these dilemmas in an environment where opinions are informed, and the population as a whole is as well-represented as possible. Finally, the deliberation is summed up as results that are short and focussed enough to feed into the various policy-making institutions that legislate about the new technologies in question. Digital methods to some extent break with this three-step model by problematising the lay/expert divide and by being less interested in conventional representativeness. In digital methods research inspired by techno-anthropology, publics are rather

understood as plural, highly contingent, and emerging in relation to specific issues. This leaves us with the question of how digital methods may still find a place within the DBT process. In this chapter, we have provided one answer to that question by presenting the collaboration between the TANTlab and DBT on using digital methods to feed into the information material in advance of citizen hearings for the ASSET project. As discussed, several steps were taken both in the data collection and data analysis to ensure compatibility with the principles of DBT, including diversity of participants and sources, and the fit with pre-established topics. In the end, a set of *data-driven* Twitter stories about the Zika emergency were included in the information material by the DBT. The case described in this chapter thus points to a concrete way in which digital methods and citizen hearings can be combined despite their different assumptions about publics. When setting up such combinations, techno-anthropological approaches can be usefully drawn upon in order to situate digital methods in relation to existing norms and ongoing practices at the sites of intervention, in this case participatory TA across Europe.

To sum up, two techno-anthropological contributions to TA have been proposed. First, digital methods offer new ways of tracing and representing publics and their engagement in topical affairs for participatory TA. Second, and as just indicated, an ethnographic exploration of the empirical ground in which TA methods are situated can facilitate a more robust integration of digital methods approaches within existing practices.

References

Birkbak, A. (2013). *From networked publics to issue publics: Reconsidering the public/private distinction in web science*. Proceedings of WebScience '13, Paris, France.

Birkbak, A., Petersen, M. K., & Jørgensen, T. B. (2018). Designing with publics that are already busy. *Design Issues, 34*(4), 8-20.

Birkbak, A., Petersen, M. K., & Elgaard Jensen, T. (2015). Critical Proximity as a Methodological Move in Techno-Anthropology. *Techné: Research in Philosophy and Technology*, *19*(2), 266-290.

Birkbak, A., & Carlsen, H. A. B. (2016). The public and its algorithms: Comparing and experimenting with calculated publics. In: L. Amoore & V. Piotukh (eds.), *Algorithmic Life*. London: Routledge, 21-34.

Birkbak, A., & Munk, A. K. (2017). *Digitale metoder i samfunds- og humanvidenskaberne*. Copenhagen: Hans Reitzels Forlag.

Borra, E., & Rieder, B. (2014). Programmed method: developing a toolset for capturing and analyzing tweets. *Aslib Journal of Information Management*, *66*(3), 262-278.

Børsen, T., & Botin, L. (2013). *What is Techno-anthropology?* (pp. 7-34). Aalborg: Aalborg Universitetsforlag.

Danish Board of Technology (2017). Borgertopmøde, available at: http://www.tekno.dk/services/borgertopmoede/. Accessed 7 December 2017.

Dewey, J. (1927). *The Public and its Problems*. New York, NY: Henry Holt and Company.

DiSalvo, C. (2009). Design and the Construction of Publics. *Design Issues*, vol. 25, no. 1, 48–63.

Engage 2020 (2015). Action Catalogue - Citizen Summit, available at: http://actioncatalogue.eu/method/7403. Accessed 30th November 2020.

Flyverbom, M., & Madsen, A. K. (2015). Sorting data out – unpacking big data value chains and algorithmic knowledge production. In F. Süssenguth (ed.), *Die Gesellschaft der Daten: Über die digitale Transformation der sozialen Ordnung* (1 ed., pp. 123-144). Bielefeld: Transcript Verlag.

Grunwald, A. (2010). *Technikfolgenabschätzung: Eine Einführung* (vol. 1). Berlin: edition sigma.

Horst, M., & Irwin, A. (2010). Nations at ease with radical knowledge on consensus, consensusing and false consensusness. *Social studies of science*, *40*(1), 105-126.

Jacomy, M., Venturini, T., Heymann, S., & Bastian, M. (2014). ForceAtlas2, a Continuous Graph Layout Algorithm for Handy Network Visualization Designed for the Gephi Software. PLOS ONE, 9(6).

Jensen, C. B. (2005). Citizen Projects and Consensus-Building at the Danish Board of Technology: On Experiments in Democracy. *Acta Sociologica*, *48*(3), 221–235.

Jensen, T. E., Birkbak, A., Madsen, A. K., & Munk, A. K. (2021). Participatory Data Design: Acting in a Digital World. In G. Downey & T. Zuiderent-Jerak (eds.), *Making and Doing STS.* Cambridge, MA: MIT Press.

Jensen, T. E., Madsen, A. K., Misfeldt, M., Munk, A. K., & Tamborg, A. L. (2017). Participatorisk Data Design: En ressource for Capacity Building. In: Krogstrup, H. K. (ed.), *Samskabelse og Capacity Building i den Offentlige Sektor* (pp. 171-195). København: Hans Reitzel.

Latour, B. (1987). *Science in action: How to follow scientists and engineers through society*. Cambridge, MA: Harvard University Press.

Latour, B., & Weibel, P. (eds.) (2005). *Making Things Public: Atmospheres of Democracy*. Cambridge, MA: MIT Press.

Laurent, B. (2011). Technologies of democracy: Experiments and demonstrations. *Science and Engineering Ethics*, *17*(4), 649–666.

Lezaun, J., & Soneryd, L. (2007). Consulting citizens: Technologies of elicitation and the mobility of publics. *Public Understanding of Science*, *16*(3), 279–297.

Madsen, A. K. (2015). Tracing Data – Paying Attention - Interpreting digital methods through valuation studies and Gibson's theory of perception. In: *Making Things Valuable* (eds. Kornberger et al), Oxford University Press: 257-277.

Madsen, A. K. (2017). Mellem algoritmisk automatik og faglig intuition – en case-analyse af digitale metoder som participatorisk datadesign. In: *Digitale Metoder.* Frederiksberg: Forlaget Samfundslitteratur.

Madsen, A. K., & Munk, A. K. (2019). Experiments with a data-public: Moving digital methods into critical proximity with political practice. *Big Data & Society*, *6*(1).

Marres, N. (2017). *Digital Sociology: The Reinvention of Social Research*. Hoboken, NJ: John Wiley & Sons.

Marres, N. (2015). Why map issues? On controversy analysis as a digital method. *Science, Technology, & Human Values*, *40*(5), 655-686.

Marres, N., & Gerlitz, C. (2016). Interface methods: renegotiating relations between digital social research, STS and sociology. *The Sociological Review*, *64*(1), 21-46.

Munk, A. K. (2013). Techno-Anthropology and the Digital Natives. In: T. Børsen & L. Botin (eds.), *What is Techno-Anthropology?* (pp. 287-310). Aalborg: Aalborg Universitetsforlag.

Munk, A. K., Tommaso, V., & Meunier, A. (2019). Data Sprints: A Collaborative Format in Digital Controversy Mapping. In Vertesi, J. & Ribes, D. (eds.), *Digital STS: A Field Guide for Science & Technology Studies*. Princeton, New Jersey, USA: Princeton University Press.

Munk, A. K., & Ellern, A. B. (2015). Mapping the New Nordic Issuescape: How to Navigate a Diffuse Controversy with Digital Methods. In Jóhannesson, G. T., Ren, C. & van der Duim, R. (eds.). *Tourism Encounters and Controversies: Ontological Politics of Tourism Development*. London: Routledge, p. 73-95.

Rogers, R. (2013). *Digital Methods*. Cambridge, MA: MIT Press.

Simonsen, J., & Robertson, T. (eds.) (2012). *Routledge International Handbook of Participatory Design*. London: Routledge.

Venturini, T. (2012). Building on faults: how to represent controversies with digital methods. *Public understanding of science*, *21*(7), 796-812.

Venturini, T., Meunier, A., Munk, A., Rogers, R., Borra, E., Rieder, B., ... & Azzi, M. (2014). *Climaps by EMAPS in 2 pages (a summary for policy makers and busy people)*. Social Science Research Network.