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Document Version
Final published version

Publication date:
2021

License
Unspecified

Citation for published version (APA):
Zambach, S. (2021). *Citizen Produced Visualisations as Qualifying the Public Debate on the COVID-19 Pandemic*. Poster session presented at ACM Collective Intelligence Conference 2021, Frederiksberg, Denmark.

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Download date: 16. Apr. 2024



Citizen produced visualisations as qualifying the public debate on the COVID-19 pandemic

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1. INTRODUCTION

Visualisation is a convenient tool for presenting difficult information to peers and to the public. With open data and open source, high quality visualisation and statistics tools, it is possible for people who are not trained epidemiologists to participate in the discussion of the development of the pandemic, prediction of cases and deaths and in visualizing the daily data to the public [Trajkova et al. 2020].

Citizen science is normally defined as projects run as research projects or government agency initiatives in which amateurs can contribute in a systematic manner. However, a broader definition, “where public participation and knowledge production meet” from [Irwin 2015] encompass the situation where many citizens produce and co-produce knowledge through visualisations on public available data. I will refer to them as *citizen data scientists*.

Though nobody has asked the citizen data scientists to create the charts, they use their spare time on modelling and data visualization of the development of the COVID-19 pandemic [Trajkova et al. 2020]. They comment on each other’s visualizations, share data and refine them with the aim of influencing the public debate and thus directly or indirectly persuading decision makers to impose restrictions, lift them, or vaccinate faster.

This self organizing, bottom-up approach impacts both the peer citizens as suggested in [Valkanova et al. 2015] and potentially the public debate and decisions taken by various authorities [Irwin 2021].

This work focuses on the debate on the social media Twitter, where skilled amateurs have to a large extent participated with modelling and visualizing the COVID-19 pandemic. With this work, I would like to investigate how this citizen data science engagement influenced the decisions taken by the authorities including the scientific work by the experts’ modelling. Next, I would like to understand how the work has influenced the public debate.

These questions are motivated by the persuasive effect which the collective visual products have on the debate and decisions being taken during the pandemic. An example of this is a figure made by Prof Drew A. Harris (fig. 1). He is a population health analyst at Thomas Jefferson University in Philadelphia and used the chart in his lectures. He posted it on Twitter February 29th of, and after being circulated, commented and promoted among users for its clearness, the illustration ended up being in focus of many governments lockdown announcements around the world during March 2020 [Roberts 2020], (e.g. in Denmark, fig. 1¹, where the health authority persons are active Twitter users).

However, there are more, maybe less prominent examples of citizens creating, sharing and discussing each other’s graphic products. What are their drive and how do they relate to the collective knowledge production which is created? In Citizen Science projects it is often a challenge to reward the citizen scientists with feedback in an appropriate way, e.g. [Silvertown 2009].

The citizen data scientists are not being asked to create their visualizations as a part of a public project, and authorities might even face criticism for their politics mediated through these illustrations. Therefore, appreciation must come from elsewhere, such as being part of the scientific citizenship

¹One year later, we know that the chart is simplified with respect to the actual behaviour of SARS-CoV-2.

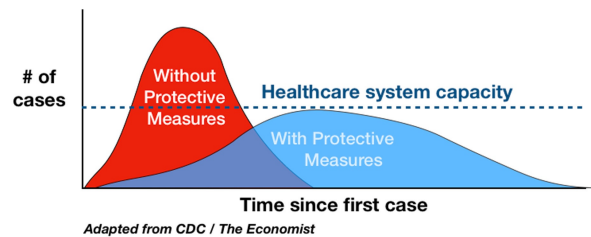
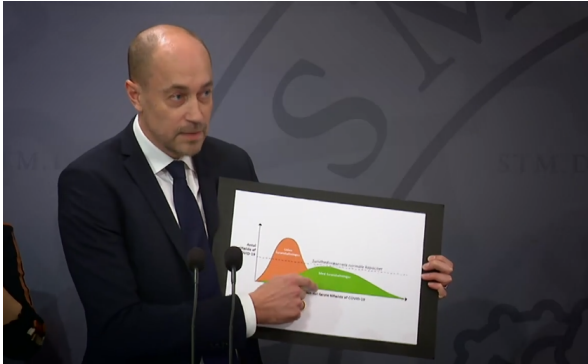


Fig. 1. An important visualization in the public debate all over the world, was created, shared and refined among different citizens, e.g. on Twitter. It was used by e.g. the Danish Health Minister. (Regeringen.dk, Drew A. Harris).

[Irwin et al. 2013]. Likewise, validation comes from peers, which can potentially lead to misinformation [Nguyen and Catalan-Matamoros 2020] due to the lack of formal peer reviewing.

2. METHOD

The paper is based on exploratory, semi-structured interviews regarding visualizations produced by citizens' of public data during the COVID-19 pandemic. Particularly, I have looked at visualizations of the spread of SARS-CoV-2 infections and of the vaccine roll-out.

Four persons were selected for the preliminary round of interviews. Two citizen data scientists, one with a background in natural science and one with a background in social science. Two experts (people working professionally with the COVID-19 crisis in Denmark), one from the expert modelling group that have provided models for the Danish authorities and one politician from the Danish parliament, who has been engaged in debates on health and data visualization.

2.1 Main questions

The questions in the interview focus on how layperson produced visualizations and modeling has influenced the debate or political decisions. I asked the citizen scientists how their efforts have been rewarded, and what has driven them into using their spare time on this work. The interview persons representing the authorities (politician and modeller) were asked how the criticism of and challenges to their work has affected them personally.

Interviews were carried out on Zoom or Teams software, one person at a time.

3. RESULTS

Both the persons representing authorities and those representing citizens agree in their interview that open data is important for the democratic debate, and that the quality of the visual products by the citizens data scientists are in general high.

3.1 Challenging science communication from atop a soapbox

The citizen scientists interviewed were both familiar with using data analysis tools in advance. Their reason for starting to produce visualizations was a feeling of indignation.

One (with natural science background) centers on the exponential nature of numbers in an epidemic and initially, he simply wanted to understand "how the pandemic was going" and challenge the general usage of R_t as a measure for this. He therefore creates daily plots of spread, hospitalizations, and now vaccines data, on the same semi-logarithm charts, and has adjusted them according to suggestions from others on Twitter. The other citizen scientist (with social science background) is more interested in challenging the authorities on the trade-off between health decisions and impact on society. He is visualizing the speed of vaccinations in Denmark, sometimes compared to other countries and to the speed of vaccine deliveries.

Although misinformation and conspiracies has grown during the pandemic [Nguyen and Catalan-Matamoros 2020], the citizen scientists themselves saw no negative impact of the public engagement of their peers in COVID-19 data. "Actually, I don't understand why some people are not influencing the debate more. I am daily discussing with people who are really smart, but don't have the same platform (# of followers) as me. We all stand on our soapboxes trying to reach out." However, one noticed that although the impact overall is positive, naive, misleading plots are produced, such as highlighting a correlation between mask usage from August and a following raise in infections (although the raise is caused by season and not by face masks). This is in line with one of the experts: "Some are misleading, for example people trying to prove through charts that restrictions do not work. However, democratic debate is like this, and so many citizens' visualizations qualifies the debate and complements the professionally created charts, that are not necessarily the best for all purposes".

3.2 Importance of open data

An essential prerequisite for qualified visualizations is open data. "It is important to have both open data and open code to support more skilled citizens in contributing to the discussion" as one expert says. The other agrees on this "the pressure from citizens for open data made us prioritise publishing data and preparing the code to be available. We worked 80 hours a week", he says, not leaving many hours for those efforts. The difficulties in getting tidy data has been challenging for the citizens, although they are now open. "I get the data in a lot of different formats such as csv, pdf files, webpages and dashboards, so now I collect it and share it on GitHub as csv files", one citizen scientist said. "But the effort is worth it, when people interact with the visualizations or tell me that they are useful".

4. DISCUSSION AND FUTURE WORK

All the persons interviewed agreed that the overall knowledge produced by fellow citizens, citizen data science, is important and positively influences the debate, and that the danger of misinformation is clearly trumped by the potential of qualifying the debate.

However, open data of decent quality seems to be the keystone for the citizen data scientists, if their visualizations should truly qualify the debate and create knowledge. The struggle with obtaining useful data in a useful format has been—and still is—hard for both citizen data scientists. This includes the area of disease development and vaccinations. However, there is a trade off for the authorities between doing the modelling and using resources on opening up their data.

Finally, how can laypeople recognize that the powerful visualizations create knowledge and not "disinformation". How do we validate the charts? Spread of misinformation is accepted as a precondition, but not considered a threat by any of those interviewed. However, the knowledge is solely validated by peer support and not by formal peer review, and different epistemologies are at work in the case of COVID-19, rather than just different levels of data quality being visualized, or different level of data science capacities.

The conclusions of this survey is preliminary and should be followed up by a more thorough survey into what has actually influenced the debate and what are the motivations of the citizen data scientists.

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