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Abstract

The last years, citizen science, or crowd science, has increased tremendously, both in number of projects, and number of participants. Most literature on crowd science focuses on its advantages, for both scientists, and the participating citizens. The challenges of crowd science come mainly from limited organizational capacity of some of these projects. As a result of this line of reasoning, the main issue becomes, how we can facilitate citizen science, and help it expand to more projects, and involve more (types of) participants. My aim in this discussion note is to make two points: first, that, most recent work on citizen science fails to elaborate on the new types of relationships, practices and interactions that are facilitated by information and communication technologies, when compared to traditional volunteer science. The second point is that there are pronounced disciplinary differences among citizen science projects, something that, again, is generally being missed in much recent work. Missing these points can lead us to imagine that it's only a matter of time (and of course funding) before all sciences catch up with citizen science. Such a line of thought can result in investing resources (money, time, effort) in projects and infrastructures that are doomed to fail, because of their topic. I conclude by offering some thoughts on a research agenda.

Introduction

"…[C]rowd science can make significant contributions to science and deserves the attention of funding agencies and policy makers", note Franzoni and Sauermann in their recent article (Franzoni and Sauermann, 2014), and this phrase summarizes nicely most publications on crowd science, or citizen science or volunteer science[1] the last 4-5 years. The main argument of such literature can be summarized as follows: citizen science has many advantages, not only for scientists, and the science that is produced, but also for the participating citizens. The challenges come mainly from limited organizational capacity of some of these projects; for instance good leadership and sustaining the involvement of the citizens are challenges. As a result of this line of reasoning, the main issue becomes, how we can facilitate citizen science, and help it expand to more projects, and involve more (types of) participants. So has crowd science become our new holy grail?

My aim in this discussion note is to address the article by making two points: first, that, like much recent work on citizen science, the authors fail to elaborate on the new types of relationships, practices and interactions that are facilitated by information and communication technologies. The phenomenon is not new, as the authors note: but the use of information and communication technologies (ICTs) to conduct such projects is new, and that is precisely where novel practices and problems lie, something that is generally missed. The second point is related to the first: that there are pronounced disciplinary differences among citizen science projects, something that, again, is generally being missed in much recent work. Franzoni and Sauermann hint at this, but do not explore the implications further, as I will show below.

This can lead us to imagine that it's only a matter of time (and of course funding) before all sciences catch up with citizen science. Such a line of thought can result in investing resources (money, time, effort) in projects and infrastructures that are doomed to fail, because of their topic. I conclude by offering some thoughts on a research agenda.

1. Crowd science as ICT phenomenon

Amateurs were always a constitutive part of sciences, but they have been marginalized with

[1] I use the term *citizen science* throughout the note, mainly because this is a more widely used term for the practice than *crowd science*.

its growing institutionalization. Recent advances in information and communication technologies, among other reasons (Silvertown, 2009), have boosted citizen science, but they have also changed its character dramatically. Whereas until now citizens would, in isolation, contribute data to a central database for instance the bird counting and water pollution projects in the USA in the 70s and 80s (Pfeffer and Wagenet, 2007), they now form *online communities* which collect and share data, or code existing content (Rotman et al., 2012). The use of social media, such as Facebook, blogs and interactive maps, has led to fundamentally new opportunities for visibility and communication among citizens and scientists. In addition, communication technologies enable *interconnectivity* of online citizen science databases with other databases containing information on land cover, topography, census data (Dickinson et al., 2010). Moreover, new sensor technologies (mobile and stationary) have *automated collection* of some environmental data, facilitating citizen science practices. Following Fukushima, networks of Japanese citizens used mobile devices to collect radiation data, challenging what scientists and policymakers declared about safety areas (Varughese, 2012).

These changes, namely 1) the emergence of citizen science communities; 2) interconnectivity of citizen science databases with other databases and 3) automated collection of data, remain largely unexplored. For instance, previously, when data collection involved getting out in the nature, observing and counting birds, participants tended to be, among other things, pensioners, with a lot of free time (Pfeffer and Wagenet, 2007). With automated collection of data, e.g. through one's mobile phone, this changes. Franzoni and Sauermann note en passé that participants may enjoy social benefits resulting from social interaction in these projects, but this is not further explored. For instance, under which circumstances would online communities of citizen scientists challenge the authority and role of scientists (Ottinger, 2010)?

In 2008, we suggested with Gaston Heimeriks that the emergence and use of ICTs conditions certain changes in the sciences, distinguishing among three different levels in which these changes can be identified: researching, scientizing and politicking (Heimeriks and Vasileiadou, 2008). At the researching level, we noted, "the use of ICTs… allows for a heterogeneity of the types of output produced, a variety in the methods, tools and concepts to be developed, a different type of relationship between the scientist and the subject matter, and different socialization and identity-construction mechanisms for scientists." Conceptualizing crowd science as part of these developments, we can understand how it may result in new

type of methods, as most research questions become *pattern recognition exercises*, using suitable statistical methods. At the same time, the novel socialization and identity construction mechanism that citizen science implies relates to scientists positioning themselves not exclusively in relation to their peers in their field, but also in relation to interested citizens, as well as scientists from other fields, since most of these projects also involve computer scientists, and other related fields. Thus trans- and inter- disciplinarity may be particularly favored as modes of doing science through crowd science (Dickinson et al., 2010).

At the scientizing level, we noted how "the use of ICTs …enables new ways of collective coordination of scientific communities, leading to different possible identity-formation mechanisms, and diversifies the types of rewards available for individual scientists, thus impacting on their career-path strategies and the resource management of their local contexts, even as it allows for accumulation of knowledge on the basis of different mechanisms than the print-based journal system" (Heimeriks and Vasileiadou, 2008; 19). It is still an open question to what extent organizing a crowd science project can give additional or complementary rewards to participating scientists, and what these rewards are: for instance public visibility. A differentiated career strategy for such scientists could thus be using their public (online) visibility to attract grants or other resources such as students, and not necessarily going for the traditional career strategy of publishing high quality articles to influential journals, in order to attract peer recognition. Such a career-path could imply that public recognition precedes (or becomes a precondition of) peer recognition.

My point here is that we should not take for granted the fact that citizen science is using ICTs, but to understand and problematize the "new features" that ICTs bring to citizen science. Otherwise we run the risk of falling in with the hype, as earlier cases of promissory science (Wouters et al., 2012).

1. Disciplinary differences of crowd science

There is a big difference between collecting particulate matter data with your smart phone (i-Spex project), to coding types of galaxies based on digital photos. This difference, Franzoni and Sauermann would claim, relates to one of the skill required for the citizens activities. But this is not the main issue, I would think. The main issue is, from a policy perspective, one of

stakes: I have higher stakes, and thus higher motivation, to map, model (and be able to improve) the air quality in my surrounding area, than to understand what type of galaxies there are. The same high stakes hold for citizen science in health, something that the authors acknowledge.

Sociology of science has shown that there are systematic differences among different scientific fields, and we would expect that in some fields it is more likely that crowd science develops, than in other fields (Silvertown, 2009). From an organizational point of view, for instance, Whitley claims that there are two distinctive variables on the basis of which we can distinguish the work organization of scientific fields: their degree of mutual dependence and their degree of task uncertainty. 'Mutual dependence' refers to the degree to which scientists in a field depend on their colleagues for reputation and access to resources, as well as on their results, ideas and procedures as contributions to collective intellectual goals. When mutual dependence in a field is high, there tends to be a high degree of collective identity, competition among researchers is also higher, and the degree of local and individual autonomy from collective goals and standards is low. We can imagine that in such a field of high mutual dependence, citizen science data can become a key resource over which scientists can compete, for instance in astronomy, the Galaxy Zoo project is one of the most famous and successful examples.

'Task uncertainty' refers to the degree of uncertainty in terms of work techniques, intellectual priorities, and research topics in different scientific fields, and it results from the innovative character that scientific outcomes need to have. When task uncertainty in a field is high, research strategies and procedures are less standardized, and the results are less easily compared and coordinated. In those fields of high task uncertainty, centralized control over research strategies and performance standards is less feasible, and the overall coordination and integration of research is reduced. We can imagine that in such fields, citizen science projects would be less likely to succeed, because of the limited standardization of tasks.

While Franzoni and Sauermann use task complexity to distinguish among different types of projects, they do not elaborate on the disciplinary basis of such differences, nor do they explore whether citizen science is simply not suitable to specific types of problems and fields.

Conclusion

Back in 2000, Kling and McKim suggested that it is not just a matter of time the extent to which different fields will embrace electronic communications, and especially e-journals and pre-print archives, at the time relevant ICTs (Kling and McKim, 2000). For instance, they suggest that in fields where industrial collaborations are the norm, especially those that may readily result in income from patents and trade secrets, there is no tradition of sharing data. In those fields, means of electronic communication are far less likely to succeed.

My argument is similar here: We cannot take at face value the increase of citizen science projects, nor can we view them simply as practices through which we (as scientists) only stand to gain. A more nuanced understanding would conceptualize citizen science as part of broader changes in science related to the use of ICTs; these changes are articulated in different ways across different fields. By ignoring such dynamics we stand to lose: as decision makers, we stand to lose resources spent into projects that fail; as scientists we stand to lose time and effort in such projects. But as societies we also stand to lose insights into the changing dynamics of authority and expertise that citizen science entails. If knowledge is power, welcoming new participants in knowledge production will inevitably challenge existing power hierarchies. A research agenda on how citizen science is altering a) research practices, b) scientific knowledge and c) the role of science in society can investigate such developments.

References

Dickinson, J.L., Zuckerberg, B., and Bonter, D.N., 2010. Citizen Science as an Ecological Research Tool: Challenges and Benefits. Annual Review of Ecology, Evolution, and Systematics, 41, 149–72.

Franzoni, C., Sauermann, H., 2014. Crowd science: The organization of scientific research in open collaborative projects. Research Policy, 43, 1-20.

Heimeriks, G., Vasileiadou, E., 2008. Changes or Transition? Analysing the use of ICTs in sciences. Social Science Information 47, 5-29.

Kling, R. and McKim, G., 2000. Not just a matter of time: Field differences and the shaping of electronic media in supporting scientific communication. Journal of the American Society for Information Science 51, 1306–1320.

Ottinger, G., 2010. Buckets of resistance: Standards and the effectiveness of citizen science. Science, technology & human values 35, 244-270.

Pfeffer, M. J., Wagenet, L.P. (2007). Volunteer Environmental Monitoring, Knowledge Creation and Citizen-Scientist Interaction, in: Pretty, J., A. Ball, T. Benton, J. Guivant, D. Lee, D. Orr, M. Pfeffer and H. Ward (Eds), Sage Handbook on Environment and Society. Sage Publications. London, pp. 235-249.

Rotman, D., Procita, K., Hansen, D., Sims Parr, C., & Preece, J., 2012. Supporting content curation communities: The case of the Encyclopedia of Life. Journal of the American Society for Information Science and Technology 63, 1092-1107.

Silvertown, J., 2009. A new dawn for citizen science. Trends in Ecology and Evolution 24, 467–471.

Varughese, S.S., 2012. Where are the Missing Masses? The Quasi-Publics and Non-Publics of Technoscience. Minerva 50, 239-254.

Whitley R., 2000. The Intellectual and Social Organization of the Sciences. Oxford University Press, Oxford (2nd edition).

Wouters, P., Beaulieu, A., Scharnhorst, A., & Wyatt, S. (Eds.), 2012. Virtual Knowledge: Experimenting in the Humanities and the Social Sciences. MIT Press, Cambridge.