



Crowdsourcing as a method of transdisciplinary research—Tapping the full potential of participants



Dietmar Wechsler*

Wuppertal Institute for Climate, Environment and Energy, Döppersberg 19, D-42103 Wuppertal, Germany

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ABSTRACT

Within the scope of citizen science projects, crowdsourcing has already expanded into scientific application areas. In this, its scientific potential is only partly exhausted, however.

It will be shown that transdisciplinary research is made up in content and structural aspects in such a way that crowdsourcing can fully unfold as a research method through varied participation possibilities, reflective processes and use of contemporary technical possibilities. Furthermore, mutual learning, understanding and the dissemination of knowledge strongly profits from effects that even result automatically in this context.

The scientific application of crowdsourcing represented here makes high demands on project management, but it is expected to turn out as an effective research method precisely in the area of transdisciplinary research.

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1. Introduction

Numerous uses are subsumed meanwhile under the concept of crowdsourcing characterised by Howe [1], meaning the assignment of certain tasks and problem formulations to a larger volume of people that is mostly not closely defined. In general this is realised by the use of modern web-based technologies.

In this, the participants make available certain resources and abilities (time, knowledge, computing capacity, data, pattern recognition, etc.), work together on the development of free solutions and offers (open source and open information activities like Linux, openstreetmap, wikipedia, etc.) or take part in open innovation activities (innovation and idea competitions, product tests and developments).

Their feasibility and conveyance via internet-based technologies and offers has contributed to the popularity and successful implementation of many crowdsourcing activities [2,3]. The technological possibilities of smartphones in combination with special apps do their part to expand the potential of crowdsourcing, as well as to shape it in a more mobile and more adaptable manner.

In the literature, as well as on the Internet, overviews and typologies can be found on the numerous activities which further illustrate the variety of application areas and application possibilities [4–8].

Though crowdsourcing could not establish itself yet as a common research method of (first) choice in the area of science, it can, however, already show respectable scientific achievements in the form of citizen science projects, in which by

* Tel.: +49 2022492178.

E-mail address: dwechsler@web.de

definition also non-scientists get involved in the research projects [3,4]. The question is still posed here how the scientific significance and use of crowdsourcing and the associated, much-touted “wisdom of crowds” [9] can be determined in more detail and where its use results in the biggest scientific added value.

Answers to this complex set of questions can possibly be found, in particular, in the area of transdisciplinary research. It essentially defines itself through the exploration of life-world problems with aspects of crossing and integration of disciplinary paradigms [10,11]. It therefore might provide, according to its comprehensive and community-oriented approach, good reference points for the scientific integration of crowdsourcing. What relations can be identified in this, and how crowdsourcing can be used as a method of transdisciplinary research, is something that is meant to be examined in this article.

The next chapter prepares this analysis by initially putting the three areas crowdsourcing, citizen science and transdisciplinary research in relation to each other. Starting with the fundamental scientific features of these areas, existing points of contact, differences and common characteristics are identified. In Table 1 the similarities and differences between the three fields are summarised.

Following that it will be analysed to what extent crowdsourcing can be used as a transdisciplinary method and what added values for transdisciplinary research thereby result. A concluding view sheds light on further scientific potentials, as well as on methodical improvements and testing of crowdsourcing that are still necessary.

2. Crowdsourcing, citizen science and transdisciplinary research

In numerous citizen science projects, volunteers gather scientific data, but also execute research, above all in the areas of organismal and environmental monitoring (butterfly monitoring, weather observation, investigation of the water quality etc., cf. [4]). Also other science areas, like astronomy and biochemistry, profit from the commitment of the community [3], e.g. the Foldit project conceived as an on-line game, in which the users design protein folding structures with respect to an optimum chemical stability.

Citizen science is found in different stages of scientific research [12]. Readiness to learn and tasks like image analysis and pattern recognition are being demanded from the participants in this context. Mostly the participation is limited, however, to the gathering of scientific data, while the evaluation, scientific classification, conclusions and publication are carried out by the scientists who have initiated the project.

This brief characterisation of citizen science implies that it is to be understood as a scientifically oriented form of crowdsourcing. Crowdsourcing itself encompasses many other aspects, like social and economic activities, that are not associated, or only to a low extent, with research projects and research objectives: offers oriented to knowledge and to information (e.g. Yahoo! answers, wikipedia, metadatagames), open collections of images, videos, music, texts, etc., assessments and decisions through questioning the crowd, industrial and/or social innovation projects and competitions, etc. (cf. [7]).

However, there are also crowdsourcing activities that, in spite of addressing a broad target group, are orientated primarily, on experts and scientists. Thus many Internet platforms within the scope of ideas and innovation competitions often address precisely those participants that have expert knowledge and special abilities, in order to solve industrial development problems, but also academically significant questions. This cannot be declared as citizen science since the tasks assigned to the participant group (“community”) require expert knowledge and are, therefore, mostly not to be tackled by interested laymen.

The same applies to many open source projects (e.g. wordpress, a content management system, or openfoam, a software package for computational fluid dynamics), provided that here, for example, special programming skills or other scientific expertise, is indispensable. However, one also finds in the specialist literature the position that open source activities

Table 1
Comparison of crowdsourcing, citizen science and transdisciplinary research.

Characteristics	Crowdsourcing	Citizen science	Transdisciplinary research
Non-scientific projects are also realised	+	/	/
Scientific activities without life-worldly reference	+	+	–
Scientific activities with life-worldly reference	+	+	+
Scientific activities beyond disciplinary borders	○	○	+
Scientific projects restricted to one discipline	+	+	/
Framing by general scientific guidelines	–	–	+
Hierarchical and closed scientific structures	○	+	○
Open and codetermining structures	+	–	+
Participation is open to everybody	+	+	○
External experts are needed	○	–	○
Participants are integrated to perform scientific work	+	+	–
Practice partners are integrated to consider life-worldly knowledge	○	–	+
Contributions are assignable and are shown explicitly and promptly	+	–	○
Utilisation of modern web-based technologies	+	+	–

+, in many cases; ○, in some cases; –, in rare cases; /, in no cases.

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