Fostering organizational learning through responsible crowdsourcing in prospective cohort studies

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Abstract

Purpose: We propose a methodology for responsible crowdsourcing and explore how such methodology can be used to foster organizational learning.

Approach: In the JoinUs4Health project, we created an online platform that connects consultive mechanisms that are typical in crowdsourcing with deeper co-creation processes in smaller groups to enable different scales of collaboration. This platform will allow our crowdsourcing methodology to be integrated into learning in research-performing institutions. For this purpose, we establish three living labs within the cohort institutions and aim to leverage the strengths of each institution and the difference between the three institutions to understand how context can shape the implementation of our methodology.

Expected findings: We expect that the JoinUs4Health platform can inform activities at research-performing and educational institutions such as adaptations of curricula and enhanced application of Responsible Research and Innovation methods and approaches. This platform will act as a boundary object that connects different stakeholder communities under a shared purpose and allows coordination of action without necessarily striving for consensus among those groups and consequently overlooking the perspectives of specific actors.

Originality: We use crowdsourcing as a method to operationalize RRI. With the aim to foster the deliberative processes that are characteristic of RRI, while still making use of the advantages of crowdsourcing as a knowledge production method, we devised a methodology that allows involving large communities of non-professional scientists not only in data collection but also in all steps of the scientific process, including protocol validation and the formulation of research questions.

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49 **Introduction**

50 Science has gained an increasingly central role in society. All human societies are knowledge
51 societies, but especially since Vannevar Bush, director of the U.S. Office of Scientific Research
52 and Development, published his influential report “Science: the endless frontier” in 1945, the
53 crucial role of scientific research for social, economic and cultural development has been
54 explicitly emphasized. All aspects of our knowledge societies have been affected by scientific
55 discoveries, and science itself is changing rapidly at present, which is reflected in funding
56 strategies (European Commission, 2021) and publication of national (e.g. FactoryWisskomm,
57 2021) and international guidelines for open, engaged and responsible science (e.g. OECD,
58 2020). Societal and scientific actors become increasingly aware and even demand such
59 transitions towards more societally relevant research, especially in amidst the ongoing COVID
60 pandemic and emerging effects of climate change. Despite these transitions, strategies and
61 needs, the scientific process remains largely closed to the general public, particularly in health
62 research. Often, societal actors are still seen as data sources rather than potential stakeholders.

63 Responsible Research and Innovation (RRI) provides a framework to open up the scientific
64 process to the public, and to renegotiate the role of science in society. It fosters knowledge
65 production processes that are responsive to societal challenges, through four main
66 interconnected aspects. First, RRI promotes the democratization of knowledge-making, which
67 translates to active participation of the public in science where stakeholders, including
68 researchers, interact to set research agendas, produce knowledge and apply findings in local
69 contexts (Reber, 2018). Second, RRI allows for iterative knowledge production, since it is in
70 the interface of science, policy, and practice, allowing for greater potential for societal impact
71 in a shorter time frame when compared to traditional scientific research (von Schomberg,
72 2019). Third, by involving societal actors, RRI increases the legitimacy of the knowledge
73 making process as well as relevance and external validity of its results compared to

conventional research, and thus can be a powerful tool to address the ongoing confidence crisis in science (Sutcliffe, 2011). Lastly, fostering a partnership between participants and scientists can increase participation in health research (Jagosh et al., 2012) and promote “scientific citizenship” not only among participants but also within local communities in cohort study regions, thus creating a more tangible local impact of cohort research.

RRI is an inherently deliberative methodological framework. This means that it relies on dialogue between different stakeholders for collective reasoning. While RRI has been operationalized in many different ways (Zwart et al., 2014), the co-creation process within RRI is often done in small groups of stakeholders, where deliberation can happen more effectively (this may involve innovative and imaginative setting, e.g. future labs, social labs, co-constructive design labs, science theatre, citizen panels, etc. (Zwart et al., 2017)). Additionally, from a citizen’s perspective, crowdsourced projects are easy to join and do not often require much preparation, while comprehensive skills, advanced tools, and materials are not prerequisites for participation (Frigerio et al., 2021). With the advent of Web 2.0 technologies, the co-creation envisioned in RRI can be distributed, and a large number of people from diverse backgrounds can be involved in knowledge-making through crowdsourcing. By involving a larger number of people in the research process, crowdsourcing allows for addressing a wider range of research problems as well as increasing the speed in which challenges can be addressed (Franzoni & Sauermann, 2014). Moreover, it increases the potential for diversity of perspectives among the actors involved in co-creation and thus can allow for producing more socially robust knowledge (Nowotny, 2003).

To enable such distributed co-creation, the JoinUs4Health project aim to develop a crowdsourcing methodology to operationalize RRI in health research and incorporate this methodology into three large, prospective, population-based cohort studies, which have created

in-depth databases. Therefore, these cohort studies provide a particular potential to create living laboratories in the local cohort study regions and thus to develop and test our crowdsourcing methodology. More specifically, we will investigate if and how embedding responsible crowdsourcing mechanisms into research-performing organizations connected to cohort studies promotes organizational learning and consequently institutional changes towards more responsible research.

In this paper, we focus on how organisational learning could be fostered through responsible crowdsourcing. It is structured in five parts: In part one, we outline the development of a responsible crowdsourcing methodology. Part two explores how crowdsourcing could enable organisational learning and how it can be integrated into traditional organisational learning pathways. In part three, we link RRI with organizational learning. It is in part four, where we explain how ongoing population-based cohort studies can serve as living laboratories for responsible crowdsourcing. Lastly, in part five, we contextualise such living laboratories in the JoinUs4Health project and elaborate on expected results when testing our developed methodology in such a project.

Developing a Responsible Crowdsourcing Methodology

Crowdsourcing has been defined as “using an online, distributed problem-solving and production model to leverage the collective intelligence of online communities to serve specific organizational goals” (Brabham 2013). Crowdsourcing applications have been grouped in various ways, e.g. human computation, crowd competitions, and peer collaboration (Hansson, Ludwig, and Aitamurto 2019) or microtasking, information pooling, broadcast search, and open collaboration (Blohm et al. 2017).

In its variety of applications, crowdsourcing has been evolving in recent years in the political, academic and business area with increasing strives to become inclusive and interactive. In (bio)medical and health research, research-performing institutions have increasingly engaged citizens in searching for solutions to empirical problems (Wiggins & Wilbanks, 2019). Challenge contests or hackathons have also been used to collect ideas and possible solutions to issues related to health as well as promote mass engagement in specific health topics (Pan et al., 2017). Likewise, crowdsourcing has been used to increase data collection and analysis potential, where citizens are tasked with contributing data to answer a specific question (Franzoni et al., 2021). A shortcoming of such low-level engagement is the missed opportunity for more advanced and in-depth involvement in scientific processes – engagement often ends with the data observation, recording, and transfer to platforms or the scientific community (Frigerio et al., 2021).

Research as a whole is becoming more responsive to societal needs and the same applies to crowdsourcing projects. Crowdsourcing projects have moved towards involving citizens and stakeholders as more than data sources, collaborating with non-professional scientists in all stages of the research process (Peters & Besley, 2019). It is precisely here, we argue, that RRI can provide a useful framework in which crowdsourcing can be applied in a more responsible and inclusive manner.

RRI and crowdsourcing both opt for a systemic holistic perspective and combine retrospective perspectives (learning from experience) with prospective ones (exploring scenarios). Crowdsourcing reflects the urgent need to transform our methodologies on the basis of “collective thinking” (Schauer, 2018), while RRI implies that societal actors work together during the whole process in order to better align its outcomes with the values, needs, concerns and expectations of society (von Schomberg, 2013). Since the applied crowdsourcing methodology allows involving non-professional scientists not only in data collection but also

in all steps of the scientific process, including protocol validation and the formulation of research questions, it can be considered as a radical and intense form of citizen science (Haklay, 2013).

One of the challenges in operationalising RRI through crowdsourcing is that deliberative practices are central to RRI (Pellé, 2016) and these practices need to have sufficient quality to produce usable knowledge. RRI methodologies often rely on close interactions among epistemic actors to ensure that co-creation is achieved through deliberation (Deserti et al., 2022). Actors are expected to contribute to co-creation from their position as situated knowers, where their previous experiences, identity, and background have an important effect on the knowledge that they contribute to the research process. However, such close interactions are not possible within a large community of people. Crowdsourced interactions are by nature depersonalised, where deliberation focuses on viewpoints rather than actors (Aitamurto, 2016). Arguments can be proposed by specific actors and taken up by others, and anonymity in the crowdsourcing process blurs the understanding of how positionality influences the arguments proposed.

On the other hand, crowdsourcing allows for gathering input from a large number of people. Even though the publics involved in crowdsourcing processes are often not representative of the stakeholders in a given issue, the diversity of opinions expressed in such processes tend to represent the opinions expressed by these larger publics (Aitamurto & Landemore, 2016). Moreover, since crowdsourcing is facilitated using Web 2.0 technologies, it enables asynchronous and displaced interactions, where people from any location and background can contribute as much or as little as they choose, at any time that suits their availability.

With the aim to foster these deliberative processes while still making use of the advantages of crowdsourcing as a knowledge production method, we devised a methodology that connects

consultive mechanisms that are typical in crowdsourcing with deeper co-creation processes in smaller groups to enable different scales of collaboration between members of the community. Traditionally, crowdsourcing includes four elements (Brabham 2013): 1) an individual or an organization has a task (questioner); 2) a community addresses the task (crowd); 3) a platform enables the task to be addressed and crowd members to interact; 4) a benefit arises for both the questioner and the crowd. We postulate a set of key features of a responsible crowdsourcing approach suitable to promote RRI and mutual learning. Figure 1 outlines the basics of the underlying concept. Features of this approach were first proposed to bridge the gap between science and public health (Schauer, 2018), but are in principle applicable to any research field.

Fig.1 - Core steps of the JoinUs4Health Platform to facilitate responsible crowdsourcing.

In our methodology, any member of the community can act as the crowdsourcer (suggesting questions / tasks) or crowd member (vote; contribute time, knowledge or even money).

Questions may for example comprise proposed research questions to be investigated or questions relating to existing knowledge or real-life experiences. Tasks refer to specific actions, for which input is sought. Examples of tasks are invitation to other stakeholder groups to review manuscripts prior to submission (questioner: scientist), requests for a literature review (e.g. business representative) or translation of published research into citizen-friendly language (e.g. citizen).

Submitted suggestions (questions / tasks) are screened by community members and categorized before being collated in a search database to facilitate ease of navigation, manage metadata to allow tagging, cluster similar suggestions together and optimize data quality. Community members can screen suggestions via search and filtering functions, promote suggestions by submitting their support (vote) or comments (reviewed by community members before being made public) and express willingness to contribute time or money to help addressing a given question or task. Such activities (submissions, screening, voting, indicating willingness to contribute) are termed “community-level interactions” as at that stage no direct exchange takes place between community members (no forum dialogue). Volunteer reviewers or assigned “Facilitators” can provide relevant background materials (e.g. available research, further information), revise and summarize comments by community members.

Since it is not possible to address all proposed questions, a transparent process needs to be applied to select questions via community-level interactions described above. For instance, community support (votes, resembling “Microtasking” as described by Blohm et al. (2017)), the number, skills and diversity of volunteering individuals and the availability of a “Facilitator” may be taken into account. In future applications, voluntary input could be enhanced by paid input via the option of crowdfunding.

209 The process requires first a volunteer to create a topic based on the suggestion to be promoted.
210 Any community member can turn a suggestion into a topic but needs to agree with a set of
211 guidelines and outline a plan, which is opened for community feedback for two weeks to collate
212 comments and start recruiting volunteers. If no objections are raised, a team may be formed
213 from the group of volunteers given that a primary “Facilitator” takes care of the team and a
214 “Moderator” has been assigned to act as main contact point and oversee the process.

215 Once a working team has formed, team members may interact directly (team-level
216 interactions). The assigned primary “Facilitator” is responsible for coordinating the team and
217 ensuring standard reporting of plans, progress, and outputs. Teams may apply various
218 approaches to their projects.

219 For instance, at an exploratory stage, focus group discussions or Delphi questionnaire
220 methodology can be used to explore key points related to the question of interest and develop
221 a research proposal specifying tasks and roles. Tasks are subsequently addressed via direct
222 exchanges (virtual meetings, discussions with stakeholders, review etc) ideally breaking down
223 larger tasks into smaller activities so to offer a circumscribed time of commitment. Such team-
224 level interactions match the crowdsourcing types “Broadcast Search” and “Open
225 Collaboration” (Blohm et al. 2017). Working teams will frequently require information to be
226 reviewed. Tasks like this can be outsourced to the community if the working team itself does
227 not include sufficient volunteers or expertise (resembles “Microtasking” as described by Blohm
228 et al. (2017)).

229 In summary, in our methodology we follow the principles of RRI that advocate for horizontal
230 mutual learning processes. Therefore, we envision that crowdsourcing can be initiated by both
231 organisations and individuals. We do not exclude actors that are not affiliated with
232 organisations or interest groups from proposing tasks for the JoinUs4Health community to

address, but rather welcome these contributions. Nonetheless, since the focus of this paper is on how organisational learning could be affected by responsible crowdsourcing, we will assume that the crowdsourcing process is initiated and led by a (research-performing) organisation. More specifically, we will explore how crowdsourcing could enable organisational learning in the crowdsourcing organisations and how crowdsourcing can be integrated into traditional organisational learning pathways.

Crowdsourcing and organisational learning

In this section, we explore how crowdsourcing could enable organisational learning and how it can be integrated into traditional organisational learning pathways. Organisational learning theories provide a framework for explaining how organisations optimise their actions through learning, incorporating a behavioural and evolutionary perspective (Argote & Miron-Spektor, 2011). Organisational learning is not solely dependent on individual- or group-level learning but rather is embedded into systems and structures within an organisation (Crossan et al., 1999).

In this paper, we will use Crossan et al.'s (1999) model for organisational learning. The authors outline the processes that underlie the learning transitions from individual- to group- and organisational-level learning, where learning flows bi-directionally from one level to another. Besides defining the levels in which learning takes place in an organisation, Crossan and colleagues outline four learning processes that take place during organisational learning: Intuiting, interpreting, integrating and institutionalising. Intuiting is a creative process that occurs at the individual level where ideas are generated when actors connect concepts and areas of knowledge that were not previously connected. This process is encompassed in steps 1 ("Suggest") and 2 ("Vote") of our proposed methodology (Figure 1). Interpreting follows intuiting and involves explaining and refining ideas through discussion with other actors.

Therefore, interpreting is an inherently collective process that occurs at the group-level. In our proposed methodology interpreting occurs in steps 3 (“Promote/Recruit”) and 4 (“Working teams”). Subsequently, integrating happens simultaneously at group- and organisational level where ideas are put into practice through collective action, which is reflected in both Steps 4 (“Working teams”) and Step 5 (“Disseminate”). Finally, institutionalising occurs at the organisational level when these practices that were integrated are incorporated into organisational routines and systems, which is the envisaged impact of the outlined methodology.

Crowdsourcing has been shown to stimulate organisational learning at individual-, group- and organisational levels. Schlagwein and Bjorn-Andersen (2014) describe how LEGO, a toy manufacturer, used crowdsourcing for generating ideas and integrating these ideas into their processes of conceptualisation, evaluation, production and commercialisation of products through organisational learning. Alternatively, Lenart-Gansiniec (2021) evaluates how crowdsourcing affects organisational learning in local governments and conclude that most types of crowdsourcing, with exception of crowdfunding, have a positive effect on organisational learning at all levels outlined in Crossan et al.’s (1999) framework.

It is important to note that organisational learning happens in two spheres for crowdsourcing organisations: substantive and procedural. More specifically, they gain an understanding of the problem and the solution space, understanding the processes behind the proposed solutions as well as the previously attempted solutions to such problem (substantive); they also learn about the process of working with external and unknown individuals and organisations (procedural) (Feller et al., 2012).

Even though Crossan et al.’s (1999) framework offers a useful lens through which we can understand organisational learning relating to crowdsourcing, it has important limitations

regarding the scope of learning that it anticipates. Schlagwein and Bjorn-Andersen (2014) point out that such conceptualisation of organisational learning assumes that only individuals within an organisation are able to act on the knowledge developed within the learning process. This contrasts with core concepts of crowdsourcing, where the actors, that are external to the organisation, tackling the tasks delineated by the crowdsourcer, are directly acting on issues that will influence organisational learning. Schlagwein and Bjorn-Andersen (2014) proposed a model to understand organisational learning when related to crowdsourcing, where the organisational learning fuelled by external, crowdsourced contributions are complementary to the already established processes of learning within an organisation. In the following section of this paper, we link RRI with organizational learning.

RRI and organisational learning

We ascribe to the definition of RRI as proposed by Stilgoe, Owen, and Macnaghten (2013), which defines RRI as “taking care of the future through collective stewardship of science and innovation in the present” (p. 1570). The authors define four process dimensions of RRI: Anticipation, Reflexivity, Inclusion and Responsiveness. Anticipation encourages researchers and organisations to think systematically about the consequences of their research. Reflexivity refers to institutional reflexivity rather than only individual reflexivity, where value systems and theories that shape how research is conducted are critically examined. Inclusion refers to including voices of stakeholders and the wider public into a deliberative process where voices that are not normally included in the knowledge making process can be heard. Responsiveness is about “adjusting courses of action while recognising the insufficiency of knowledge and control” (Stilgoe, Owen, and Macnaghten 2013, p. 1572).

Due to its systemic focus and its involvement of a wide range of relevant stakeholders, RRI provides the ideal framework for optimal organisational learning (Egeland et al., 2019), and organisational learning has been identified as a pre-requisite for adoption of responsible practices by organisations (Porcari et al., 2020). In fact, RRI practices share many similarities with activities performed in learning organizations as conceptualized by Senge (1994), and it can be argued that organizational learning not only facilitates RRI practices but often consists of RRI practices themselves (Hansen et al., 2020).

For example, RRI allows for multiple perspectives to be integrated when tackling a specific problem. This means that all people involved with the challenge addressed are part of designing a solution, which is more robust and can be quickly implemented and revised due to shared ownership among stakeholders (Hansen et al., 2020). Similarly, organizational learning requires an iterative knowledge-making process, where knowledge production and transfer are accompanied by behaviour change within the institution, and such behaviour change is informed by the knowledge acquired and simultaneously informs ongoing and future knowledge production (Garvin, 1993). Moreover, organisational learning happens not only internally in an organization, but also within the context in which the organization is immersed, encompassing the way the organization interacts with local communities for example (Argote & Miron-Spektor, 2011). This close relationship with community, where mutual learning happens through co-creation of knowledge between actors inside and outside an organisation, is reflected also in RRI and its dimensions of responsiveness and inclusion. Following this reasoning, we explore in the next section of this paper how ongoing population-based cohort studies can serve as living laboratories for responsible crowdsourcing.

Population-based cohort Studies as living laboratories for Responsible Crowdsourcing

A prospective, population-based cohort study is an observational study, that recruits community-dwelling individuals to collect baseline data on characteristics, health outcomes and potential exposures. This ‘cohort’ of participants is subsequently re-examined at several points over time to determine disease events and its risk factors. Hence, this study type allows assessing incidence of disease, disease risks associated with the measured exposures as well as long-term consequences of disease (Ikram et al., 2020; Volzke et al., 2011). Since cohort research generates large amounts of population-based data regarding a wide range of diseases and potentially modifiable risk factors associated with such diseases, the results from cohort studies are often used to guide public health policies and to inform clinical practice (Giroux, 2011)

Indeed, findings produced by cohort studies are likely to have an impact at the local and global level. The cohort institutions are part of local, national and international networks with scientific, policy and business partners. By design, cohort research additionally requires substantial funding and infrastructure due to its complexity and extended timeframe (Toledano et al., 2015). Moreover, cohort studies produce very large amounts of data over time, and given their volume cannot possibly be used to their full potential to answer all possible (relevant) research questions. Traditionally, population-based cohort research largely focused on diseases or disabilities that posed the largest burdens on population health. However, these topics do not necessarily reflect (contemporary) questions that answer pressing needs from the local community in which these studies are immersed. Therefore, it remains necessary to reflect on the implications that cohort results can have for contemporary human health, as well as ensure that the resources allocated to these studies are used in a manner that is also responsive to the needs of local communities and wider society. RRI provides an ideal framework to guide these reflections and to facilitate a pathway for implementing responsibility and mutual responsiveness between local communities and cohort governance.

At the same time, cohort studies act as living laboratories - providing a promising environment for implementing, monitoring, and evaluating RRI at an institutional level. These studies also offer particular advantages for facilitating organisational learning due to their long-term implementation in local communities, existing infrastructure, extensive research outputs and, most importantly, large population-based databases covering in-person examinations and follow-up of risk factors and health outcomes. Their extended research outputs can be used to address a multitude of questions in an expedited manner according to societal needs. In a longer timeframe, their adaptive study design can provide opportunities for fine-tuning new data collection protocols in direct connection with local communities to collect data in accordance with what is necessary to address specific societal challenges.

RRI provides an opportunity to increase the societal relevance of cohort research and improve engagement from (potential) participants. Declining response of randomly selected persons for population-based studies worldwide, i.e. citizens' preparedness to participate in research, are of concern for research validity leading to risk of selection bias and lower generalizability of findings. In line with global trends, two of the three cohort institutions contributing to this paper experienced a decrease in baseline response from 68.8% (1997-2001) to 50.1% (2008-2012) in the Study of Health in Pomerania (SHIP), Germany (Volzke et al., 2011), and from 78.1% (1989-1993) to 46.0% (2017-2020) in the Rotterdam Study (RS) (Licher, Terzikhan, Splinter, Velek, Rooij, et al., 2021), the Netherlands. Notably, response in these established cohort studies is still higher than in more recently initiated population-based studies or biobanks. The third participating cohort Bialystok Polish Longitudinal University Study (PLUS), which has not been established long enough to evaluate how participation in cohort studies changed over time, had a response during its first two years of implementation of 39% (2019-2021). In comparison, baseline response was 18% in the German National Cohort (NAKO) (start 2014; n = 205,000) (German National Cohort (GNC) Consortium, 2014) and 5.5% in the UK biobank

project (start 2007; n = 502,655) (Batty et al., 2020). We hope that encouraging the development of a shared sense of responsibility for the knowledge produced within cohort studies can promote not only increased engagement but also increased participation in cohort research, greater confidence in research findings and better uptake of such findings by practitioners and other societal stakeholders (Asveld et al., 2015).

What differentiates cohort research from other types of health research to which RRI has been implemented is that cohort research does not necessarily focus on specific illnesses but rather assesses a population-based sample of the general population, which means that entire local communities are stakeholders in such studies. Findings produced can also be relevant for general human health and can often be extrapolated or compared to knowledge produced in different cohort regions (Stieb et al., 2021; Wyss et al., 2018), meaning that communities that are not directly assessed in these cohort studies can also be considered stakeholders in such research. Additionally, the study participants themselves are important stakeholders. Cohort studies often evaluate thousands of people and these people should have a voice in how the study is planned, conducted, and how its findings are analysed and disseminated.

Therefore, a method that allows for co-creation with a large number of stakeholders is necessary to implement RRI in cohort research. Crowdsourcing can enable such interactions and enable the embedding of such participatory practices in the governance processes of the cohort studies. Therefore, cohort studies can be great living laboratories for testing a methodology for responsible crowdsourcing. With this aim, we have established the JoinUs4Health consortium to develop a responsible crowdsourcing methodology to enable co-creation between large groups of people and implement this methodology in the context of cohort research.

Responsible Crowdsourcing in the JoinUs4Health project: Context and Expected Outcomes

In the JoinUs4Health project (<https://joinus4health.eu/>) we establish three living labs within the cohort institutions, with the aim to leverage the strengths of each institution and the difference between the three institutions to understand how context can shape the implementation of our methodology. The close collaboration between three large, population-based cohorts act as cornerstone to facilitate organisational learning within and between these cohort institutions, but also in other consortium partners and organizations across the three culturally rather distinct Member States (Germany, the Netherlands, and Poland).

The three cohort institutions have long-standing experience in population-based cohort research with in total 58 years of data, from over 28,000 participants: SHIP in Germany since 1997 (n = 8,728; Volzke *et al.* (2011)), Rotterdam Study in the Netherlands since 1990 (n = 18,924; (Ikram *et al.*, 2020; Licher, Terzikhan *et al.*, 2021), and PLUS in Poland since 2019 (n $\approx$ 1000 as of December 2021). Until 12/2023 approximately 5,000 additional participants will be enrolled as part of SHIP (n $\approx$ 3,000) and PLUS (n $\approx$ 2,000). This coordinated approach between the three cohort partners offers specific advantages regarding organizational learning with public involvement, since all cohorts are prospective and repeatedly examine study participants approximately every five years. This creates a strong bond with many participants who therefore are more likely to engage in research and contribute to change than citizens without any link to an ongoing study.

To implement the responsible crowdsourcing methodology described in the sections above, we will establish an online platform linked with tools for virtual meetings, questionnaire implementation, joint editing of documents and educational courses. We expect that this platform can inform activities at other educational institutions such as adaptations of curricula

and enhanced application of RRI methods and approaches. This platform will act as a boundary object that connects different stakeholder communities under a shared purpose and allows coordination of action without necessarily striving for consensus among those groups and consequently overlooking the perspectives of specific actors (Benn et al., 2013). Moreover, the platform will strive for including sectors of society that are often underrepresented in the research process. Since it focuses on individual participation rather than participation through interest groups, the online platform can mitigate power imbalances in the knowledge co-creation process. This is particularly relevant for organizational learning, since perceived power and legitimacy can determine how influential stakeholders are when enacting change in organizational learning (Desai, 2010).

One of the unique features of JoinUs4Health platform is the possibility of teams of community members to apply for access to results from the cohort studies to investigate specific questions. Exchanges target health-related topics ideally connected to areas investigated within the cohort studies. But even interactions that do not have a direct link to cohort research can generate knowledge that can then be incorporated into the organisational structure of the cohort, influencing data collection procedures, ways of working and the creation of new lines of investigation by professional scientists. Therefore, activities within the platform are expected to directly stimulate organisational learning within the cohort studies.

We expect to observe organisational learning at all levels (individual, group and organisational levels) described by Crossan et al. (1999) in the participating institutions within our project. We envision that intuiting will take place through interactions between the members of the JoinUs4Health platform, where individual members will post ideas and suggestions and vote on other members' contributions. Interpreting will be achieved through moderated discussion between members at the platform, as well as through the initial stages of teamwork. Knowledge will be integrated in later stages of teamwork, where the teams will plan and execute a research

project that possibly connects them to the cohort studies and its organisational structure. Finally, we expect that institutionalising will occur as questions and findings obtained through both community- and team level interactions will be incorporated into the data collection and analysis procedures performed as part of the cohort studies. It is important to note that we hope to transcend the framework of organisational learning proposed by Crossan and colleagues (1999) by postulating that learning will happen not only within the organisation but also within local communities. We expect that collaboration between stakeholders will not be confined to the platform and projects will extend into collaborations among members of the local communities and academic and non-academic stakeholders, where organisational change will happen also in institutions outside the cohort organisations. We expect that the content-focused learning that is stimulated through our crowdsourcing methodology adds more community-relevance to the topics to be investigated in the cohorts, which is highlighted by members of the platform. Practices that stem from the collaboration between members of the platform (including cohort scientists) and cohort organisations can then be integrated into everyday research and education practices in such organisations in a structured and targeted manner.

Summary

In this paper, we propose a methodology for converging RRI and crowdsourcing. We outline the rationale for using cohort studies to test such methodology and present the JoinUs4Health project as the context in which such methodology will be tested.

Crowdsourcing methods allow for accessing the collective intelligence of the crowd and have been increasingly used in research and innovation. By employing crowdsourcing methods under an RRI framework, research can be made more societally responsive and inclusive

through co-creation between large and diverse communities of people. Both crowdsourcing and RRI have been shown to stimulate organisational learning. We propose that each stage of our responsible crowdsourcing methodology translates into organisational learning at the individual, group, or institutional level.

Moreover, we postulate that organisational learning will be promoted not only in the cohort institutions but also among the actors that engage in the crowdsourcing process as well as the communities in which they are embedded. For this reason, among others stated above, cohort studies provide a promising context for developing and testing such responsible crowdsourcing methodology. Cohort studies have deep ties with local communities as well as networks of policy makers, medical professionals and industry, which allows for organisational learning to happen not only within cohort institutions but also within the communities and networks associated with them.

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