



Open Collaboration for Social Problem Solving: Converging or Diverging Norms of Governance Authority?

Colaboração aberta para a solução de problemas sociais: normas de autoridade de governança convergentes ou divergentes?

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RESUMO

Este trabalho examina o potencial para colaboração entre profissionais da ciência formal e grupos frouxamente conectados *online* que empregam *crowdsourcing* para gerar recursos de informação digital. Quais são as diferenças entre os modos preferidos de governar a criação do conhecimento de cientistas e de outros grupos *online*? Faz-se uma distinção entre modos de governança constituídos e adaptativos, e as similaridades e diferenças entre o entendimento dos dois grupos a respeito da curadoria, verificação e abertura da informação são consideradas. Sugere-se que a ciência aberta precisará tornar-se mais flexível, se for para construir colaborações com grupos frouxamente conectados em termos equitativos, respeitando seus respectivos valores e de modos que maximizem suas contribuições para a solução de problemas sociais.

Palavras-chave: Ciência Aberta; *Crowdsourcing*; Informação Digital; *Big Data*. Governança; Autoridade; Curadoria.

ABSTRACT

This paper examines the potential for collaboration between formal science professionals and loosely connected online groups that employ crowdsourcing to generate digital information resources. What are the differences between scientists' and other online groups' preferred modes of governing knowledge creation? A distinction is drawn between constituted and adaptive modes of governance and similarities and differences between the two groups' understandings of information curation and verification and openness are considered. It is suggested that open science will need to become more flexible if it is to build collaborations with loosely connected groups on equitable terms that respect their respective values and in ways that maximise the contributions of these groups to social problem solving.

Keywords: Open Science; Crowdsourcing; Digital Information; Big Data; Governance; Authority; Curation.

INTRODUCTION

The formal institutions of science are responding to the challenges of knowledge generation in an open digital information environment in ways that differ from those privileged by many loosely connected online groups that are engaging in crowdsourcing information. The digital information generated by both groups

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contributes to knowledge creation in the sense of knowing ‘what’ and ‘how’ (MOKYR, 2002). This knowledge serves as a resource that can be applied in actions aimed at social problem solving. These differences are important in an era when digital networks are enabling new forms of collaboration.

I make a distinction in this paper between ‘constituted’ and ‘adaptive’ authority as contrasting modes of governance that are the principal means through which professional science and loosely connected online groups organize their information generation activities. Formal science frequently aims to achieve curated stocks of digital information that respect the formally constituted norms of verification. In contrast, many loosely connected groups are mobilizing to respond in a timely way to crises. They generate information that is not easily verified according to the norms of formal or professional science. These groups engage in more flexible or adaptive modes of governance. This distinction can lead to tensions between the two groups over what information constitutes reliable evidence which should inform social action.

Despite increasing subscription by both formal science professionals and loosely connected groups to the principles of openness, issues relating to governance authority need to be addressed if collaboration between these groups is to be fostered. The first main section considers how formal science treats the issue of authority. The next section discusses the relationship between different approaches to authoritative governance in the knowledge creation process in the big data era. This is followed by a consideration specifically of approaches to governance with respect to digital information curation, and a reflection on how different governance norms play out in the context of crowdsourcing information. The conclusion considers what may be necessary to maximise the potential for collaboration between these groups in the interests of social problem solving.

AUTHORITATIVE GOVERNANCE AND KNOWLEDGE CREATION

With a proliferation of digital tools and online platforms that are available to formal science professionals and to loosely connected online groups, strong claims are being made about the potential for collaborative knowledge creation. The use of wireless technologies, the convergence of telecommunications, computing, and multimedia, and the use of internet tools is resulting in an explosion of digital information. Message boards, photo sharing, podcasts, video sharing, wikis, blogs, social networking sites, and mapping and geo-tagging location services are available to both groups. Despite their uneven global distribution, these tools and platforms support faster and cheaper data. However, differences in authoritative norms for governance between formal science and loosely connected groups often create barriers to realising mutual benefit from their respective information contributions that are generated through the use of these tools.

It is helpful to think of a continuum of authority for governing digital information creation with ‘constituted’ and ‘adaptive’ authority marking the end points of this continuum, with hybrid forms in between (MANSELL, 2013). The principal governance approach of formal science is constituted authority. This form of authority embraces the arrangements, practices and norms of the institution of formal science that enable information to be purposefully shared. The presumption is that ‘formal credit is assigned according to priority, that its propositions are tested by consensuality ... , and that it tries to minimize the tacit component by elaborating its materials, methods, assumptions, and techniques’ (Mokyr, 2002: 5). Dasgupta and David (1994)

emphasize that the dynamic of science-technology innovation creates challenges to traditional norms. This is especially so when innovation gives rise to increasing openness of the technical practices of science and to the need for responses to public demand for greater transparency and accountability.

The UK's Royal Society report on science as an open enterprise offers a response to these challenges. It states that:

open inquiry is at the heart of the scientific enterprise. Publication of scientific theories – and of the experimental and observational data on which they are based – permits others to identify errors, to support, reject or refine theories and to reuse data for further understanding and knowledge. Science's powerful capacity for self-correction comes from this openness to scrutiny and challenge. (ROYAL SOCIETY, 2012, p.7).

The same report, however, contains the following proviso -- 'opening up scientific data is *not an unqualified good* ... There are legitimate boundaries of openness which must be maintained in order to protect commercial value, privacy, safety and security' (ROYAL SOCIETY, 2012, p. 9, emphasis added). The dissonance between fully 'open inquiry' and 'legitimate boundaries' is addressed by the argument that information related-activities should be organised to meet 'the requirements of accessibility, intelligibility, assessability and usability' (ROYAL SOCIETY, 2012, p. 39). This leaves open a potential area of conflict between commercial value and accessibility and, indeed, between assessability and the trio of privacy, safety and security. As a form of constituted authority, the suggestion is that 'intelligent openness' is needed to ensure that information is accessible and can be readily located.

The report also states that data should be '...intelligible to those who wish to scrutinize them; data must be assessable so that judgements can be made about their reliability and the competence of those who created them; and they must be usable by others' (ROYAL SOCIETY, 2012, p. 7). Implicit in these statements is the resolution of a conflict between openness for 'those who wish to scrutinize them' and openness that is 'usable by others'. This resolution is reached, however, by avoiding the question of who 'others' wishing to access and use the data actually are permitted to be. If properly vetted and funded, the issue is resolved by implicit reference to a qualified observer who is admitted by the institution of formal science, thereby maintaining the privileged role of formal scientific authority. Even in open science projects, access may be granted only to those explicitly deemed to be able to advance the aims of a project (DAVID et al., 2010). Issues around access to digital information resources are mainly presented by formal science as being technical ones concerning the effective use of digital platforms, changing cost structures of research, and problems of expanding access to data to both professionals and amateurs (DUTTON ; JEFFREYS, 2010).

GOVERNING IN A BIG DATA ERA

In open formal science the norms of authority increasingly must be sufficiently flexible to accommodate a 'data deluge' in the big data era where 'vast volumes of scientific data are captured and generated by large scientific facilities, new sensors and instruments, interconnected networks, e-commerce, and computer models' (CODATA, 2012). Science, engineering, medical research, and the social sciences and

the humanities, as well as education, are becoming increasingly data-intensive. As a result, science is partially embracing more flexible governance norms but not without qualms about losing control, not only of access, but also of information verification and curation and of who might be qualified to offer a view on the meaning of the data collected. This is occurring in the wake of efforts to foster 'citizen science' or 'science by the people' (SILVERTOWN, 2009). These manifestations of open science are associated with forms of voluntary citizen activity that Haklay argues, 'can only exist in a world in which science is socially constructed as the preserve of professional scientists in academic institutions and industry' (HAKLAY, 2011, emphasis added) and where scientists serve as overseers of knowledge creation (WIGGINS ; CROWSTON, 2012).

Despite its affinity to openness, citizen science is located mainly in the realm of constituted authority, differentiating it from what is sometimes called community science. In the burgeoning literature on e-science or web science, attention is being given to new forms of constituted authority for the conduct of Web 3.0 forms of formal science (and social science/humanities) (DUTTON; JEFFREYS, 2010). The idea of a scientific 'peer' may be blurring, but citizen activities are still often regarded as creating pressures and problems in areas such as peer review and data validation (STODDEN, 2010). Citizens who contribute are designated as *amateurs*, not as scientific researchers. Research councils are adopting the discourse of openness, but they are adhering closely to constituted authority as the principal means of governing professional science.

These developments are quite distinct from 'research in wild' which considers 'concerned groups as (potentially) *genuine researchers*, capable of working cooperatively with professional scientists' (CALLON; RABEHARISOA, 2003, p. 195, emphasis added), that is, as people contributing to social problem solving without the need for the norms of constituted authority provided by formal science. Here, the norms of adaptive authority are privileged. These forms of governance involve bottom-up, often informal, norms that are characteristic of the information activities of many loosely connected groups that are taking advantage of the increasing scale, speed and reach of digital networks. Adaptive authority as a means of governing information production aligns with Benkler's (2004, p. 1110) view that information is open or commons-based 'when no one uses exclusive rights to organize effort or capture its value, and when cooperation is achieved through social mechanisms other than price signals or managerial directions'.

Collaboration in the production and sharing of information is said to have the potential to enable universally distributed collective intelligence (LÉVY, 1997, p. 13). It is associated with open participatory cultures characterised by empowerment of citizens and flexible modes of organisation (JENKINS, 2006). These forms of collaboration favouring non-hierarchical norms of adaptive authority do not exclude power struggles over values, status and the roles of participants. Formality is not completely absent even when norms are based on altruism and reciprocity (as in the case of open source software development communities) (MATEOS GARCIA; STEINMUELLER, 2008). It may be, therefore, that the preferred means of governing online information activities by loosely connected groups differ from the constituted authority of formal science only in the extent to which hierarchy is acknowledged explicitly.

Adaptive authority, nevertheless, typifies the governance of digital information generated by the activities of loosely connected groups whether purposefully or not. This is happening as a participatory culture gives rise to a 'cognitive surplus, newly

forged from previously disconnected islands of time and talent' (SHIRKY, 2010, p. 29). In the knowledge creation process and in response to socio-technical controversies, 'faced with the exceptional' (CALLON, 2003, p. 40), explanations are being sought by people who do not know each other and may have no pre-existing consensus about the culture of scientific knowledge creation. With the spread of online interaction, the 'overflowings' of groups historically excluded from the production of knowledge are likely to become increasingly more difficult to accommodate within the constituted authority approach of formal science.

DIFFERING KNOWLEDGE CREATION NORMS

Open information activities are involving participants from formal science and loosely connected groups. A key difference between them is their respective governance norms for the curation of digital information. In formal science, digital curation has a special meaning referring to 'maintaining, preserving, and adding value to digital research data throughout its lifecycle ... in trusted digital repositories [which] may be shared' (DIGITAL CURATION CENTRE, 2012). It includes conceptualizing, creating, validating, accessing and using, preserving, storing, reusing and transforming digital information. Research funders invest in digital curation with a view to the long-term accumulation of knowledge. In contrast, in loosely connected groups, more attention is given to what is referred to as *content curation*, that is, aggregating, distilling, sifting and selecting information, usually for more immediate purposes (BRUNS, 2010). Fewer efforts are made to validate, preserve, organize and store information for reuse as understood by formal science professionals. The information generated by these loosely connected groups may be highly valued by a community – and, potentially, by formal science, but it does not accumulate as a knowledge resource because it is not 'curated' in a lasting way according to the norms of professional science. This difference creates problems for collaboration and key areas of conflict are over what information can be accessed and the nature of efforts to curate or validate information.

In addition, both formal science and loosely connected groups are engaging in big data activities. This is presenting new opportunities for the curation of information in the interests of social problem solving. Productive discussion between these groups is difficult because constituted authority is about 'top down', hierarchical (exploitative) power, while adaptive authority involves 'bottom up' horizontal collaboration and consensual power. As a result, formally constituted open science finds itself in conflict with loosely connected groups, diminishing potentially useful contributions to knowledge. Formal science, with its attachment to constituted authority as a source of privilege and power, treats its movement towards openness as a form of resistance to the enclosure of information in the proprietary domain (BOYLE, 2008), rather than as an opportunity to engage on equal terms with concerned groups.

CROWDSOURCING AND KNOWLEDGE CREATION

Different perspectives on digital information curation and the norms governing information generation are particularly evident in instances of crowdsourcing. Crowdsourcing refers to voluntary activities engaged in by participants in large-scale planned and spontaneous online interaction (HOWE, 2008; SUROWIECKI, 2004). Such activities are not always associated with open information since many are captured

for commercial purposes. Other activities, however, are directed at scientific or public social problem solving. Participants are often anonymous, but are not always strangers and the use of wireless technologies and internet tools is resulting in an explosion of crowdsourced digital information.

Crowdsourcing initiatives may favour constituted or adaptive authority and there are many empirical questions about the extent of the overlap between the initiatives of formal science and loosely connected groups. Constituted authority comes into conflict with adaptive authority over the issues of what information should be retained and how it should be organised. When it does, collaboration often suffers. The result is a loss to both formal science and to loosely connected groups because of controversies about how to retain or to systematically access 'know what' and 'know how' information. This reduces the social benefits that might otherwise be possible through new forms of online collaborative learning, social action and problem solving in the digital era.

In some cases there is a clear boundary or delineation between the roles of formal science and loosely connected groups that contribute via crowdsourcing activities. Volunteers may, for instance, offer the unused capacity of their personal computers to enable data simulations or to analyse satellite imagery. Such projects are governed typically by constituted authority in formal science. They aim to achieve curated information that is verified according to received scientific norms. The mobilizers are mainly the formal scientific institutions that support open science and target a pool of dispersed participants. Participants may be motivated by games, prizes, or recognition, but the norms of formal science ultimately take priority and participants are treated as amateurs. Sometimes formal science sponsors citizen science, but the conventions of formal science are likely to be privileged (HAKLAY, 2011).

In other cases, the boundary between formal science and loosely connected groups in terms of reliance on constituted or adaptive authority is blurred. This is so when initiatives are mobilised by individuals with a preference for the norms of adaptive authority with reasonably flexible self-governance, but with a simultaneous preference for scientifically curated information. In yet other cases, where crowdsourcing is used to mobilise responses, for example, to environmental problems and crises, the governance norms are predominantly aligned with adaptive authority. In contrast to formal science, these kinds of initiatives often are mobilized in conflict situations and involve local groups that are seeking to develop an evidence base and social action plans. These initiatives often generate large amounts of information that is not curated according to the norms of professional science. The information resources may dissipate when a social problem becomes less pressing. This makes it difficult for such groups to ensure that their data are transformed from unmoderated information into information that is curated in a way that is deemed to be valuable to formal science professionals.

When multiple digital information sources derived from call logs, mobile banking transactions, user-generated content (blog posts and Tweets), online searches, and satellite imagery, for instance, are combined via crowdsourcing of data, there are likely to be conflicts associated with privacy and ethical issues around data collection and issues of information access and sharing. The verification or curation standards of formal science often do not accord with action-oriented crowdsourcing initiatives and priorities even when the aim is to strengthen the basis for coordinated action. While many crisis and emergency response international agencies are taking advantage of crowdsourced information using Twitter, Facebook and other open digital platforms, they tend to do so within an overarching framework that privileges

constituted authority. This often conflicts with the values of loosely connected groups engaged in bottom-up knowledge creation, but who are often using the same tools to generate information

CONCLUSION

It might be suggested that the only solution to ensure that the verification of information for knowledge creation and sharing purposes is acceptable to both formal science and loosely connected groups is a move by the latter towards the governance norms of the former, that is, towards constituted authority. This might be achieved by invoking laws of copyright to secure rights of access to use information and by creating incentives for its verification and long term curation. However, the spread of crowdsourcing as a means of generating information resources is changing this singular view of the best way to generate knowledge. Attention needs to be given to building bridges between adherents to these disparate norms of authority. Creating opportunities to curate large amounts of data is likely to require a governance framework that is matched to local needs and conditions, involves opportunities for participation in setting the rules, and encourages respect for the norms of disparate groups (OSTROM, 1990).

It also needs to be acknowledged that as Hess and Ostrom (2007, p. 13) observe, a collaborative commons can result in outcomes that 'can be positive or negative or somewhere in between'. Little is known about the actual and potential overlap between constituted and adaptive authority in initiatives characterized as open online collaborations or indeed about their outcomes. When bridges between formal science and loosely connected groups are either ineffective or absent, opportunities to reap the benefits of the application of digital technologies in efforts to find solutions to human problems are diminished. Nevertheless, instances are proliferating of experimentation addressing social challenges and these are leading to intersections between these modes of authority. As this happens, formal science may seek to limit access to information by proponents of adaptive authority by bypassing those who do not conform to their norms for validating digital information.

Since the big data phenomenon is presenting challenges to both groups, it is essential to examine who is included and excluded from constituted authority-led information initiatives (BOYD; CRAWFORD, 2012). The spread of open online collaboration means that formal science must become more attuned to the dynamics of producing large quantities of information, to the exigencies of immediacy and real time social problem solving, and to adaptive authority modes of governing knowledge creation. Proponents of adaptive authority are often regarded as presenting threats to formal science when they compete for the resources required to curate or validate their respective information resources.

Claims that adaptive and constituted authority are necessarily in conflict are reminiscent of the incommensurability of conflicting paradigms. In a static view, the competing paradigms for knowledge creation are entrenched. While the language of openness may suggest a convergence in approaches to governance, the framing of issues and modes of governing adhered to by different groups remain contested. This is not surprising since the potential for a blending of governance modes is often resisted in the normal development of knowledge (KUHN, 1962). It is worth hypothesising, however, that in the face of very rapid technological change and contestations over the framing of social problems (KUHN, 2000), a new governance

paradigm, blending elements of disparate norms and practices will emerge. This is a more hopeful prospect than is a vision of persistent conflict.

Effective policy to underpin social problem solving in an open collaborative digital environment requires a better understanding of hybrid forms of governance. The increasing granularity and modularity of information activities facilitates openness but this requires a new accommodation between formal science professionals and loosely connected groups. Only in this way will the potential societal benefits from greater synergies through collaboration be maximised. It is insufficient to argue that all that is required is to liberate information on open digital platforms. There is a need to better understand whether there are signs of an 'in between' mode of governing knowledge creation leading to applications of knowledge in diverse social settings. The alternative is that formal science, even when described as open, will continue to conflict with the information activities of loosely connected groups, diminishing the potential contributions to useful knowledge in the longer term.

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