Open Scientist Handbook • OSH

Open Collaboration Networks fuel Creativity

Bruce R. Caron

Published on: Mar 10, 2021

DOI: 10.21428/8bbb7f85.34b3656b

License: [Creative Commons Attribution 4.0 International License \(CC-BY 4.0\)](https://creativecommons.org/licenses/by/4.0/)

“We need more diverse institutional forms so that researchers can find (or found) the kinds of organizations that best channel their passions into contributions that enrich us all. We need more diverse sources of financing (new foundations, better financed Kickstarters) to connect innovative ideas with the capital needed to see them implemented. Such institutional reforms will make life in the research community much more livable, creative, and dynamic. It would give researchers more options for diverse and varied career trajectories (for-profit or not-for-profit) suited to their interests and contributions”(Kansa 2014; Accessed June 23, 2019).

Build the new, refactor the old

Looking at the inventory of academy organizations, it seems clear that open science will spawn new research collaboratives in addition to refactoring existing institutional cultures. Libraries will pivot to become central info-hubs for learning across communities of interest and purpose, their collections now digital and their all-digital journal subscriptions tied to actual costs for non-profit open publishing. Ad hoc collaborations will blossom from research conversations on the open web. More focused research discussions will get backbone-staff funding to build connected

networks around grand (and not-so-grand) challenges. Open, caring programs for learning and social justice with reconnect academy institutions with their locales and regions. All of these collaborations will demand time and resources and will need new career-path support outside of the old dichotomy of “teaching” and “research” (Whitchurch 2013).

The “research” endeavor will expand significantly. Institutional, regional, national, and international repositories will grow to house an abundance of data and information resources offering novel research avenues. Scholarly commons—self-governed collectives formed to optimize shared use of common pool resources, and to secure their maintenance—will range from simple teams inside single institutions, to large, inter-organizational networks that foster a new research enterprise: “Perhaps even more exciting is the prospect that the analysis of vast data collections at scale by machines and through techniques of artificial intelligence will allow us to identify patterns and correlations not visible to human eyes alone. It has been suggested that this heralds a Fourth Paradigm of science. A profound transformation is underway, shifting the capabilities and methods of researchers. This shift is apparent across the research spectrum, from climate science, through genomics, to commercial analytics in the realm of ‘Big Data’” (Hodson et al. 2018). Bigger, cheaper, faster: the coming abundance of resources will require new types of collaboration and stewardship.

Celia Whitchurch (2015) notes that these new careers, which often blend professional skills with academic research, will need to be folded into an expanded sense of mission—and new value propositions—for their academic homes. New cadres of academic professionals will be needed to fulfill the mission of open science.

Collectives first, then communities

In corporate organizational management theories, “community” (such as a “community of practice”), is useful for management as a tool to improve worker engagement, and it also makes workers more willing to share their tacit knowledge, which can then be recorded as institutional memory. “Engagement” in the corporate sense describes a positive emotional alignment of the employee with her work and co-workers.

Engaged workers are said to be more productive (there is evidence for this), and so programs aimed at increasing their numbers have become routine. A somewhat more aggressive form of engagement is called “stakeholder alignment” which looks to build engagement for a specific project. This engagement helps projects move through implementation without hiccups. In the academy, workers at a large public university,

say, who are tasked with maintaining the facilities and grounds, feeding the students, providing administrative support, etc., need effective, supportive management the same as workers elsewhere. The same is true for the staff of professional scholarly associations and other academy organizations.

Retail merchants commonly do “community engagement.” This extends the notion of engagement beyond the workplace to customers, members, or service users, in the drive for brand loyalty (in this case it’s also known as “customer relationship management”). At a time when members have simple, powerful means to compare prices and ratings, forging a durable emotional alignment between the merchant and its customers becomes even more valuable. The same is true in the non-profit world where a new army of “community engagement managers” now works to keep donors loyal and their wallets open.

On the upside, the best community engagement programs support an open dialogue to improve the qualities of the workplace, or the product or service. There is a give, and not just a take here. On the down-side, the effort to promote engagement can entail a (seemingly) unending amount of emails or tweets or whatever, designed to remind workers, alums, or customers of why they need to be even more engaged.

What happens when your employees are already engaged in their own research path and teaching arena? This presents a different challenge for universities and academic associations. How do you engage scientists who are already fully engaged with their own research? They don’t need the offer of a group tour rate to cruise around New Zealand, nor another term life-insurance policy.

The first rule here is to offer services that help scientists optimize their current engagement without adding more cognitive load (Wilson 2019). Introduce them to the “club” they can join where their pain-points and research friction problems become conversations with peers. These clubs are “...based around the joint production and consumption of scholarly output among a scholarly community. This is an economics of team production and consumption in clubs or, as we style them, ‘knowledge clubs’” (Hartley et al 2019). Hartley’s clubs center on publication, but really, the next generation of academy organization needs to be club-ified.

“The web, for good or ill, through the way it transforms the economics and geography of both publishing and interactions more generally creates an assumption of access. Perhaps more importantly it restructures the economics of which communities, or clubs, are viable. First, it makes much more niche clubs

possible by reducing radically reducing the costs of discovering and interacting with like minded people (those who share cultural elements). But achieving these cost reductions requires some degree of openness. Otherwise there is no discoverability, and no interaction” ([Neylon](#) 2015; Accessed July 1, 2020).

It’s a (club) collective, not a yet community: Community can/will happen later

For several years, studies of online groups revealed a wide range of “stickiness,” a description for member engagement. In general, engagement could be plotted on the usual power-law curve; a handful of really engaged members on one side, and hundreds or thousands of mostly un-engaged members in the “long-tail” end of the curve.

One genre of online groups completely broke this curve. These were the most engaged groups online, and by a long ways. Their entire membership regularly contributed content. The problem—for them most of all, and for any online community manager trying to emulate their engagement on the open web—was that these groups were made of individuals who had been diagnosed with terminal or incurable chronic physical diseases.

These online groups, numbering in the hundreds, shared personal stories about symptoms and medication advice, uploaded and argued over new medical findings, and identified sources of emotional support for members and their families. They sought answers beyond the ken of their individual medical advisors, and they collectively shouldered the news when one of their members inevitably passed on.

The feeling of “community” was evident in their mutual concern, but this feeling was not central in these groups. “Belonging” was not the goal; it was their circumstance, their fate, their bad luck. Nobody was trying to get into these groups. Yes, they grew to care for and about one another. But they didn’t join for that purpose. Members joined because the circumstances of their lives brought them to this sad place: a space of collective struggle against a common and specific foe: their diagnosis.

Research collectives are valuable and different

Let’s explore the dynamics of these groups. Each online group focuses on a single disease or condition, from ADHD to Zika. Each member shows up already fully engaged in their own private struggle. What they need and find is an online collective, a place to share what would remain private in any other circumstance. A space of mutual learning. Douglas Thomas and John Seely Brown (2011) have described these

spaces in their book, *A New Culture of Learning*. “Collectives are made up of people who generally share values and beliefs about the world and their place in it, who value participation over belonging, and who engage in a set of shared practices. Thus collectives are plural and multiple. They also both form and disappear regularly around different ideas, events, or moments.” For more than a decade, the most engaged groups on the internet have been collectives, not communities. Knowledge clubs of the first order.

The global internet has two virtues: it scales pretty well up to billions of users, and it can host a hundred million independent groups. Online “communities” generally (and always when these are commercial in intent) love to grow bigger. Group size is a key metric. Belonging builds the brand. No company wants to say, “sorry, we don’t need any more customers at this point.”

On the very other hand, online collectives only need to grow to the size that optimizes the group’s collective intelligence and variety of knowledge. In fact, you know you’re in a collective when you try to join and somebody asks you what you bring to the conversation. Collectives have no long tail of non-participants. The collective may be very sensitive to an internal “signal-to-noise” ratio. The quality of participation is a feature.

To use another analogy (getting away from disease for a moment): if you joined a church congregation—note, this is a West-Coast US protestant anecdote—you’re a part of that community, even if you only attend twice a year, and toss in a bit of coin now and then. But if you also join the choir, you enter a collective, joined a club. Everyone in the choir is supposed to—you guessed it—sing. If you just stand there with your mouth shut, people will notice. If you don’t show up, someone will likely call you and ask where you are and if you are all right. There is no “long-tail” majority of choir members standing up in the choir loft not singing. The choir has zero need for a “choir engagement manager” to encourage choir members to actually sing. Singing is why members join. And if you happen to suck at it, others in the collective might encourage you to leave.

You are afflicted by science

From case notes and anecdotes collected from community managers who have attempted to engage scientists online, it is clear that science effects its “victims” (scientists) much like an incurable (intellectual) disease. Scientists commonly spend sixty or more hours a week chasing unknowns in their labs, gathering field data, or tracking down software bugs. They share a fever for knowledge and their own common foe: the specific unknown that stands between the state-of-the-science in their specialty and a better understanding of the object of their study; the peculiar intellectual challenge (disease) they have chosen as their quest and their foe.

Scientists don’t need and don’t want to join online communities to do science. If that is all your new platform or service provides, your dance floor will remain empty. What scientists need are online clubs, collectives that can amplify and accelerate their own research, and reward their contributions to new knowledge in their chosen specialty.

Six lessons so far on online science collaboration:

1. The most engaged online groups are collectives, not communities.
2. Collectives don’t follow the power-law curve.
3. Collectives form around specific issues, and common foes. They house a hunger for collective intelligence in the face of inadequate information. The driver here is a collective need to know.
4. Unlike online communities, membership growth is not a desired metric within collectives. Small can be beautiful.
5. In terms of engagement, science acts like an intellectual disease, a diagnosis of a specific lack of understanding about some object of study that drives the scientist to devote her life to discovery.
6. Scientists will already be engaged if they join an online collective, and will already be disengaged if they are asked to join an online community.

NOTE: community will show up later, because community informs and supports culture.

It's an easy first step: support clusters

“As they work together in their cells to pursue that goal, the shared commitment of the participants to have increasing impact helps them to build deep, trust-based relationships with each other. This makes it possible for each participant to ask for help from others as they each struggle to get better faster” [Hagel](#) (Accessed June 7, 2020).

Your university, online-enabled organization, or newly refactored learned society can start on the right track by allowing members to self-organize online teams, which are sometimes called “cells” or “clusters.” Give these teams the teamware they want to use to start conversations across the internet. Help them find others with specific research interests; this is a great use of your database capabilities. Then stand back and let them work. Remind them that clusters need to be active, to get something done early, and then consider un-forming. You are not building edifices that must be protected, but rather scaffolds for better conversations that need to be torn down as soon as they might.

Clusters are a model for the future of online science collectives. They have the virtues of being free, instant, active, and nimble. They can merge with one another or diverge from their original intent as desired. They have no requirements for a deliverable, except that they reward the services of the volunteer time they spend. And so they are motivated to get real work done. They can grow to whatever collective size they need. And when their work is finished they disappear, leaving their findings in a discoverable location on a wiki, a repository, and/or published in science journals.

In a pre-internet world, funding several thousand physical workshops a year helped fill some of the need for science collectives. In the future, internet-enabled science could be based on scientist-led online-organizations that each spawn hundreds of active online collectives as these are needed.

Six more lessons learned

1. Cluster-like groups can become an important mode of online collective work across the sciences, with huge savings in time, money, and effort.
2. When funders support travel to community-run meetings that grow a culture of sharing and trust, they enable these communities to host their own online collectives. Funders will save hundreds of millions of dollars by NOT directly funding workshops.

3. Each additional cluster can be started with a zero marginal cost (based on existing support for backbone community organizational tools and services).
4. Funders and community staff coordinate among these clusters to amplify the impacts of their results.
5. Funders encourage cross-community online clusters for trans-disciplinary science.
6. Funders can target some travel and other support to improve diversity at the community level. Staff work to nudge diversity at the cluster level.

Platforms and Norms: There's a commons in your science future

Science is broken: Who's got the duct tape and WD40?

Let's review a bit: Scientists are individually infected with their own science quest. Science is really social too. Why else would scientists take a hundred-thousand airline flights a year to gather in workshops and solve problems together (well, apart from the miles)?

The next bit needs to be about culture and technology. But not so much about the content of culture and the features of technology. Rather, about the doing of culture and the uses of technology.

Yes, the sciences are broken. Some part of this rupture was built-in (Merton, who outlined scientific norms in the 1940s, also outlined the integral tensions that disrupted these—i.e., the Matthew effect). But much of the damage has come from the displacement of the academy within society that has warped the culture of science.

Yochai Benker generally describes the tensions of this warping as “three dimensions of power”. These power dimensions (hierarchy, intellectual property, and the neoliberal need to always show more returns) work against science as a mode of peer production that self-commits to shared norms. Science needs to find alternative means to fight hierarchy, share its goods, and own its own returns.

The sciences are stuck and fractured, in need of both WD40 and duct tape—culture change and technological support. Scientists need to operationalize open sharing and collective learning. For this, they must discard the institutions that enable the above dimensions of power in favor of new communities and clubs that can house cultures of commoning, and activate global peer production.

The Power of Demand Pulling: a review

The book, *The Power of Pull*, (Hagel, *et al* 2012) announced that the internet had changed the knowledge-world of smart businesses; effectively flipping this from a knowledge pushing activity, where companies used internal knowledge resources to create innovation, to a knowledge pulling activity, where companies harvested knowledge from a broader network of sources and assembled this in novel ways to create innovation. This book was co-written by JS Brown, who had been the head of Xerox PARC, one of the largest knowledge-pushing sites around. This knowledge flip notion seconded what the Cluetrain Manifesto <<http://cluetrain.com/>> folks had announced in 1999: customers were getting smarter than companies.

In the academy, however, it was business-as-usual, or as usual as might be describable for an early enlightenment project housed in late medieval organizations (universities). In a 2010 blog post for the Society for Scholarly Publishing, [Why Hasn't Scientific Publishing Been Disrupted Already?](#), Michael Clarke wrote, “When [Tim Berners-Lee](#) created the Web in 1991, it was with the aim of better facilitating scientific communication and the dissemination of scientific research. Put another way, the Web was **designed to disrupt scientific publishing**. It was not designed to disrupt bookstores, telecommunications, matchmaking services, newspapers, pornography, stock trading, music distribution, or a great many other industries.... And yet it has [emphasis in the original].”

Clarke's point is that scientific communication should have been the very first arena for radical change fostered by the new opportunities afforded by the Internet; and certainly not the last. His conclusion on why scientific communication had not (in 2010) changed at its core—despite the efforts of the open-access publishing (and open-science and open-data) movements—was that publishing had become embedded into career advancement based on the older model (dating back originally to 1680); nobody cared to be the first martyr to a new system, while the old system, however inefficient and expensive it might be, still got one tenure. In short, the reputation of the scholar was carried on the shoulders of the reputations of the journals that publish her works. Journals had become the standards—heraldic gonfalons—that tenure-seeking authors could fly for their deans. But no longer. As these words are being written, open science publishing efforts have pushed back against both the for-profit publishing (more precisely, for-profit “privatizing”) model and against the role of journal reputation for advancement.

As an open scientist, you've already moved past relying on seventeenth century publishing logics and onto open access and open review for your work. This means

that your research is open to the power of demand sharing/pulling: you have realized the opportunity for others with very similar research interests to discover your work, critique and make suggestions about this, offer questions and new ideas, and push your research into an innovative matrix of collective intelligence. Those colleagues from across the planet who stepped up to respond to your work can become an ad hoc cell shaping the contours of learning toward the goals of exploiting serendipity and increasing research impact.

These small collectives are exactly what your research needs to accelerate into new discoveries; realizing the power of pull, as you activate demand sharing. At any one time you will probably find yourself a member of several internet-enabled cells, each probably numbering fewer than twelve members, and each working to solve some immediate problem. Once their problem is solved, the cell can publish the solution and simply disband. All that remains are the affective ties of trust and gratitude that its members retain, each one building their own network of collegial acquaintances, “weak ties” that will grow and mature over time.

Amassing a social network of “weak ties” is one of the most important and valuable practices that any scientist can do, not just for science, but for their own careers. “If information is to move from one group to another that is far away, either socially or physically, then the only way is through *bridges*—links between two different people, two different worlds, links that, by definition, are weak rather than strong. As Granovetter (has 1977) wrote in his original paper, ‘this means that whatever is to be diffused can reach a larger number of people, and traverse greater social distance, when passed through weak ties rather than strong’. If weak links are removed—the bridges, as it were, are blown up—then this would harm the spread of information more than if strong links were dissolved. If the bridges did not exist, new ideas would be stunted or spread slowly, science would be handicapped, and social divisions would be perpetuated” (Koch and Lockwood 2011).

Let’s turn now to these new “weak link” open collaboration networks, and to internal reorganizations that academy institutions face as they grow into open science hubs.

“[N]ow that science is becoming a network, knowledge is not something that gets pumped out of the system as its product. The hyperlinking of science not only links knowledge back to its sources. It also links knowledge into the human contexts and processes that produced it and that use it, debate it, and make sense of it. The final product of networked science is not knowledge embodied in self-standing publications. Indeed, the final product of science is now neither final nor a product. It is the network itself—the seamless connection of scientists, data, methodologies, hypotheses, theories, facts, speculations, instruments, readings, ambitions, controversies, schools of thought, textbooks, faculties, collaborations, and disagreements that used to struggle to print a relative handful of articles in a relative handful of journals” (Weinberger 2011).

Open Collaboration Networks are the future of science, not just open science

One thing that is new and not at all new about open science is the reliance on “online organizations.” Learned societies bring together widely dispersed scholars, and have been doing so since the 17th Century, when the advent of postal systems fostered widespread mail correspondence across the universities of Europe. *Internet-enabled* science organizations are, by definition, no older than 30 years.

Platform coops and gig economy firms are sometimes called “virtual organizations:” companies expanding their workforce without adding more employees, through outsourcing. As the current pandemic (this is 2020) has taught us, any organization can become “virtual” today, with all of its members separated in space and

communicating across the web. So the Handbook will use “open collaboration networks” (OCN) to corral the capacity to include geographically distant colleagues into a working collaboratory that can harness collective intelligence. As we learned in Science happens elsewhere, no single college, university, laboratory, or agency has the means to assemble all the scientists doing work in even the tiniest sub-discipline. The dozens of scholarly commons that will emerge in the coming decades will all use OCNs to guide their work.

What can you do when your research team looks around and realizes, “This problem is way too complex?” The first impulse—over the past half century or so—would be to apply to a funding agency to run a workshop. Large agencies spend billions of dollars on these; they create an ocean of white papers that lurk, mainly unread, on institutional websites. Elsewhere we discuss how most—but certainly not all—workshops are obsolete today. There are nimbler methods to get the same outcome. Let’s explore.

Ashby’s Law

When your government agency or university laboratory looks to innovate in a world where multiple/large data inputs are coming on line, how can you stay ahead of the inherent complexity of the systems you are creating/interrogating? One way to look at this problem is through Ashby’s principle/law of requisite variety. A principle of cybernetic management, requisite variety notes that unless the control system has at least the variety of the environment it controls, it will fail. Which actually means that some part of the environment will be controlled elsewhere.

Elsewhere is also where innovation happens; because unless you can corral the inherent variety of the problem you face, it will seem too complex for your team to innovate a response. You can either go out and hire a bigger team, or you can borrow enough requisite variety just long enough to bring your own team up to speed. This is one form of an open collaboration network.

The network you build to tackle a tough problem needs to have enough of a portfolio of knowledge and skills to address all parts of the problem. Not only that, but they need to communicate their skills and knowledge to one another so that each team member shares in this collective intelligence. Andrew Van de Ven put it this way, “Requisite variety is more nearly achieved by making environmental scanning a responsibility of all unit members, and by recruiting personnel within the innovation unit who

understand and have access to each of the key environmental stakeholder groups or issues that affect the innovation's development." (Van de Ven 1986).

Open collaboration networks include online communities of practice, research collaboratories, open source software programmer collectives, and other groups in a great variety of arenas and professions. What they offer is an open network of common interest and complementary talents. When your university, foundation, or agency is looking to innovate in a world where data are more plentiful than insights (Abbott 2009) then it makes great sense, in terms of time and effort, to fund and build an OCN and gain enough requisite variety to conquer complexity and kickstart some innovation.

So, you want to, or need to start a new open collaboration network, or build one inside the mission of your department, or laboratory. Perhaps you have been awarded some funds to do so. If so, congratulations. If you do this right, it will govern itself into a productive, happy (smiles are a good thing) academic community.

Here are Seven Key Suggestions

1: Read Jono Bacon's 2009 *The Art of Community*. Bacon has more good advice than you will find in a hundred blogs. Governance is not the same thing as management: "Don't fall into the trap of assuming that governance is merely about decision-making. There is no reason why you can't constrict it in this way, but you will be missing out on a wealth of opportunities to excite and energize your community." What Bacon will also tell you, and it's very important, is that you need to build your community and its governance first thing. This is not a "phase 2" activity in any plan.

2: Connect with the community on the issue of membership. Who gets it, what levels there are, who gets to vote, who gets to lead, and how to manage conflicts: getting some early conversations done with the community, and particularly those who will be asked to volunteer, will help to draft that part of the initial governing documents. Remember that you are setting up the initial conditions for your member-led organization. Double-loop governance means that your members will be able to rethink membership rules and roles.

3: No matter how much you want to implement a plan with your team, and no matter how you have researched effective governance, you will only be creating a temporary framework for your membership to use as a first go-around for a governance system. Because you are giving your members the ability to make changes in the documents you have drafted, you have to understand this: they will make changes, probably right away before even an initial vote is taken. And then remember: this is a good thing. So,

put the texts up on a wiki and let them have a go at it. The sooner they come to own the text, the sooner they will start to celebrate its vision.

4: Put some budget into play if you have this, but never pay volunteers for their time (See below about staff and volunteers and who does what). What can you pay for? Help support communication platforms, pay for students to do some background research for a draft business plan (the “how” of your organization), bring in some key community members for a workshop, but open this up through video conferencing, and included others who express an interest to also be present.

5: Always work toward a rough consensus, and never erase “minority reports.” Let conflicts rise to the surface and deal with them quickly. Leave their content open for others to see. Show your members that their time, their skills, and their opinions are honored, even if they are overruled. Jono Bacon has great advice for conflict resolution.

6: Ignite some preliminary teamwork by having the initial community vote on two or three small, “low hanging fruit” efforts and then support ad hoc teams (clusters) to address these. By this you begin to show an initial innovation ROI the online organization will build upon.

7: Hold a few face-to-face meetings, but keep them from being PPT centric. Plan for small-group discussions and multiple breakouts, and hold the meetings in convivial neighborhoods, not airport hotels. Gather as many members as are there and read over the founding governance documents paragraph by paragraph (but only once, and then set up a process to edit the text online until the document goes up for a final vote), and let the group speak their concerns. Open up the entire budget for the membership to give their suggestions. If possible, let the membership vote on the budget after suggestions have been taken and changes made (a real vote).

These suggestions are just a starting point for boot-strapping a double-loop governed virtual organization. Once the hard work of building in double-loop governance into the culture of the organization is over, the rewarding work of seeing how this accelerates volunteer engagement can begin, and the creative work of husbanding this engagement into your organization’s business and strategic goals can be fully supported through the culture and the values, and the celebrated vision you own as a community.

Walking the walk is only hard when you haven't tried it

For many commercial organizations, the rush to market and the lure of some short-term exit strategy might make all this focus on congruence and culture and values and vision seem superfluous. And if your goal is to start-up and sell your business in the next 24 months, you would be wise to stick to a single-loop management plan (with a hefty stock option, because you will not have much love or glory). Similarly, when you have funding for three years, building a governance structure that takes at least three years to find its feet might seem unattractive. The Primary Investigator in you—and certainly the Program Manager you send reports to—wants/needs to show progress in months, not years. So you punt on the governance and push for “results.” This is the pathway to innumerable white papers that nobody ever reads.

The main reason why so very many funded-project-led open collaborative networks fail as soon as the funding is over is this: their PI and the agency/foundation PM failed to enable the network community to build their own collaboration infrastructures inside a self-governing process. They have no self-governed collaborative capacity to move ahead when funding stops.

If you are tasked to build an online organization that can stand on its community-based resources, you should seriously consider building in double-loop governance from day one. What you are offering your membership (or your employees, or your customers) is a congruent experience: whatever your brand (or your vision) will become, it will emerge directly from your culture.

Your OCN deserves all the Democracy it can Handle

“What motivates social behavior is a sense of ownership, to be able to say that the commons or a shared good is ‘mine’ or ‘ours.’ The more intensely ownership is experienced, the greater the sacrifices people are willing to make” (Klamer 2017).

As an open scientist you may be been tasked—perhaps through a grant, or by occupying a management position in your university—to build or lead an open collaboration network (OCN). Up front, you will face questions about the cost/benefit issues of democratic governance, as opposed to central management. If you stepped into an existing supervisory role, this question is yours to bring to the table as you get a handle on the exiting culture and everyday practices, and begin the process of making these practices more reflexive and transparent.

Given the usual shortage of funding and time, you will have real concerns about the effort required to build a community-based governance system. These concerns are usually layered on top of the more general concern that the community (or rather, certain activists within the community) may use the governance system to push the organization's goals toward their own interests. Managers who desire to manage have little good to say about adding democracy to their process.

Ownership is the cornerstone of community

While demand-sharing cultural norms call for removing the barriers of private ownership of the academy's scientific intellectual property in favor of commons-based resource governance, organizational governance is based member-ownership of the budgets, processes, and decisions made within the organization. Members own their organizations, and the organizations share their assets among members, and with other academy organizations.

But democracy is expensive in time and resources...

Certainly, democratic governance increases the overhead (in terms of time and effort) spent on governance. Top-down decision making can be quite efficient up to the point where it tends to fail rather abruptly. Democratic governance is also more prone to being gamed by people with time and interest to do so. This is where the community comes in to play. When you build in enough democracy to give the community the opportunity to really govern, it will tend to resist the efforts of certain individuals to subvert this opportunity. This is one of the goods that democracy delivers to your OCN.

What are other goods that democracy provides for your OCN? What does democracy do that you cannot do without committing to this type of governance? There are two types of goods (positive, valuable results) that democracy creates within an OCN. The first type are community building goods. Democracy is central to your ability to build a community for your OCN. The second type are decision support goods. These help align your decision making effort with the goals and vision of the community, and improve buy-in by the community.

The main community-building good you achieve by promoting democratic governance is inclusiveness. The divide between the funded OCN team and its larger collection of stakeholders disappears. Governance provides the means for a wide variety of voices to be recognized. This encourages more participation (and more participants) building the size and the depth of community for your OCN.

The next community-building good is that of bottom-up control. Bottom-up control over your OCN establishes the means for the community to have a say not only as an afterthought (e.g., a survey), but on matters as central as budgets and goals. The community is given real ownership over the OCN's efforts. This is the hallmark of any authentically “community-based” or “community-led” organization. Until your OCN has achieved this level of community governance, your efforts to build a community will be met by a wall of indifference. Developing the means for community-based control of your OCN breaks down this wall and builds the foundation for real community growth.

Decision support goods can also be expected from your democratic governance efforts. Once the community is fully involved, you receive the benefits of their considered judgements. The whole point of your OCN is to engage with larger numbers of people with expertise. Why not put this expertise to good use?

Give intelligent people—your colleagues—the reason and means to reach a considered judgement on an issue of importance to your OCN and they will work diligently in this effort. The second decision support good your OCN gets is new leadership. Those in the community who have expertise, time, and interest will step up to take positions of authority/responsibility for the work that the community is contributing to the goals of the OCN. Find the means to reward these leaders (give them resources to manage and build their reputations within the community) and they will become the levers to take your OCN to the next level.

Of course, not all democratic governance efforts are equal. Your OCN will need to work to maintain transparency in the governance activities, in part by making the staff fully accountable to the community. Your OCN's governance system will need mechanisms to be modified so that it can learn to be more efficient over time.

Using democratic governance to build community is probably the best solution for crafting a virtual organization that can survive its initial funding. There are no half-way democratic forms that will deliver the same goods. And if you decide to forego democracy, or delay democracy while you build your technology, there will likely be a day when the funds run out and you will turn to the “community” and ask them for their support. Good luck with that.

Why do democratic governance when you are already paying staff?

Getting the right mix of staff and members for an OCN is a crucial task for sustainability. The key is to take limited resources (if you have unlimited resources, call me) and invest these in directions that bring the best return for all. Member volunteers

are the heart of an OCN . Keeping this vital organ alive and well is job one for staff. Members bring skills, vision, energy, and passion to the organization. They tend to do so in short-term increments. They need to know their efforts are valuable. This knowledge prompts them to stay engaged. Through the serial engagement of many members, certain activities are maintained: governance, oversight, incremental work on infrastructure, a supply of new ideas, and, yes, occasional sidetracks. Nobody can sell your OCN to funders and new partners better than members. And nobody can grow your organization over time and on budget like members.

What is your staff good for? Staff are the backbone of any OCN. They keep it on track and guide its fortunes. They have responsibility for those tasks that members should not be asked to perform (more about this soon). They also have responsibility to keep members engaged. They do the thank-less work and get paid for this. But that doesn't mean the organization doesn't owe them a heap of thanks. Still, they are professionals, and need to step up and take charge when the need arises.

Generically, the work of staff falls into two buckets: everyday necessary tasks and putting out fires. members should not be asked to perform these types of work. Staff run the events on the community's calendar; they manage the web-presence, the accounting, the teleconferences, and a hundred day-to-day activities. They facilitate volunteer efforts. And, when the website is hacked, or the projector bulb burns out, they fix it.

Members get called in to plan and direct new activities and articulate new goals. Ideally, they are given a say (not just a voice) in the OCN's operational budget. Because they do the planning and determine the budget, it's only fair that they do some of the work. They can be tasked to scope out any new work required by a new goal and to build new capabilities to meet this. Then they either do the work, or determine that the job is too big for them to accomplish.

When the members are done with their efforts, the outcomes are passed back to staff to incorporate into the organization's operational inventory. Sometimes the outcomes are not fully ready to use (having been built by members). Staff might need to hire an outside expert to polish the work. Note: this person should be fully "outside" and not a community member. Never hire a community member as a consultant to fix another community member's volunteered contribution.

When the job is too big, members might ask for some support (more often they just stop answering emails). There are many ways to support members. Paying them is the

least valuable, as this transforms them into non-members. There are several descriptions of the negative impacts of paying members. Basically you are pissing in your own soup. Other means of support are always better: find them assistants (pay for interns), pay their travel, pay for hardware and software when required, and, if nothing else works, add staff to help. Sometimes, this might mean making a skilled volunteer a “fellow” for a short period of time. This move should include a community vote, including an open call for the fellow position within the community. The community is tasked to help staff fill a temporary (less than a year) need from within their ranks. By this, the “fellow” can be paid for a time and then return to the ranks of the volunteer community.

Remember that members need to know their efforts are valuable. The organization needs to build and maintain recognition systems for members. These include online and in-person awards. The three motivations for engagement are money, love, and glory. When it comes to members, if you are stingy with the glory, don’t expect any love. And when you let the community add to their own glory, then you can stand back and watch new leaders emerge and know your open collaborative network is healthy and growing.

Self-Governed OCNs are a Win-Win-Win for funders too: let them in on this important fact.

Science agencies and science-focused foundations fund science. It’s their job. Usually this is done directly through the competitive funding of research projects, equipment, and centers. All of these competitions *can* include instructions for the proposers to describe how their work supports open science. You can make it clear in the request for proposals that the outcomes of the project, including software, data, and results, are openly shared, reproducible, and reusable. You can do much more than that, for a very small investment—say, one percent of your research budget. With that investment, you can help shape the culture changes needed to move your funded research into an open science future.

Funding open networks

As an open scientist in a funding agency (government or foundation) or a scientist proposing a new research network, there is something to always remember: some important science-related activities that cannot, indeed *must* not be *directly* funded in order for them to succeed. Sometimes innovation needs to go where cash doesn’t count.

If you are guiding a science funding agency or foundation, then the notion that you can achieve certain high-value science goals only by *not directly funding them* may be news to you. It should be welcome news. In fact there are enormous innovation potentials you can only realize when you can refrain from adding money to the mix. There is a caveat here. While you cannot fund these activities and processes, you also cannot manage them. Instead, they must govern themselves.

As the abundance of openly shared research objects grows, self-governed commons need to step up and steward these resources for an optimal return on investment. The time is ripe for new varieties of science/data virtual organizations/networks. Drawing their members from a broad swath of experts, led by the community they build themselves (through a governance they own), and powered by volunteers, these commons offer funding agencies and the academy new forums for scientific discussion, knowledge management, and collective intelligence.

To be really clear; These organizations still need support. All of them require sponsors to pay their staff and expenses. They manage websites, teleconferences, shared research capabilities, and stage face-to-face meetings to build community sense, and expand the “room” of their conversations. But these activities: the occasions for trust building, the growing sense of community, and the actual work: these are ultimately accomplished by the volunteers for themselves and without being paid (apart from some logistic support).

Distributing activities across an engaged volunteer network of peers can use a very limited budget—say five percent of the total research budget—to accomplish the socio-cultural side of the program, given time and proper attention to governance. Money is not the driving force here; trading money for time is not an option. Agencies that fund science research can easily afford to support governance through project research budgets; more to the point, they cannot afford to *not* support this if they want to accomplish what *only a community can do*.

At the same time, efforts to support “community” are often pursued without actually building community-based governance. Project budgets may include large amounts of “participant support” for annual “community meetings” that could help build engagement. But without the governance structure that puts the community in a position to determine key aspects of the core activities, these meetings are really only very expensive alternatives to an email list. The attendees may learn something, and will forge their own interpersonal connections, but the work of building community through governance is left undone.

The amount of real governance required to support activities also depends on what types of activities need to be supported. If communication is the goal, then a relatively weak governance system will suffice. If real collaborations are to be supported through an open collaboration network, then a robust governance system may be needed. Clay Shirky (2008) examines three levels of social interaction: communication, coordination, and collaboration. Each of these levels needs its own level of governance to be sustained across years.

Funders gain value for their research outcome when they invest in community. But it's the members, the scientists and their teams in these collaborative networks that realize a massive return by their involvement. In fact, each and every scientist should get more than they give. This math is driven by a host of network effects. You, the agency manager, can finally get something for almost nothing; and that something is a thing that no amount of additional budget would achieve!

Seven science outcomes that your agency can only fund by funding self-governance

Here are *Seven Outcomes* your science agency can now get only by not funding them directly. Rather, you can achieve these through supporting a community-led virtual organization of scientists/technologists:

1. Your agency gets to query and mine a durable, expandable level of collective intelligence;
2. Your agency can depend on an increased level of adoption to standards and shared practices;
3. It will gain an ability to use the community network to create new teams capable of tackling important issues (also=better proposals);
4. Your agency can use the community to evaluate high-level decisions before these are implemented (=higher quality feedback than simple RFIs);
5. Social media becomes even more social inside the community, with lateral linkages across the entire internet. This can amplify your agency's social media impact;
6. Your diverse stakeholders will be able to self-manage a broad array of goals and strategies tuned to a central vision and mission; and,
7. You will be able to identify emergent leadership and potential new employees.

Bottom Line: Sponsoring a community-led, volunteer-run science organization offers a great ROI. There are whole arenas of valuable work to be done, but only if nobody funds this directly.

ESIP: a real-life example of a wildly successful OCN

The oldest and perhaps the best example of a self-governing, online science OCN in the US is Earth Science Information Partners (ESIP), sponsored by NASA, NOAA, and the USGS (esipfed.org). Why is ESIP a good example of these new science organizations? A good deal of the buzz at any ESIP meeting is generated by the appreciation for the “ESIP way” of getting things done. ESIP champions open science at all levels, and this openness extends to everything ESIP does internally. ESIP builds and celebrates a strong culture for the pursuit of open science in the geosciences, and remains a model for other volunteer-run open collaborative networks (OCN) across science domains. There are lessons learned here that can be applied to any arena of science.

Governance NOT Management

One important lesson learned at ESIP is this: governance must never be reduced to management. Funded projects and centers are managed. OCNs are self-governed. Volunteer-run science organizations are intrinsically un-manageable as a whole (for reasons we shall see soon), and at their best: it’s a feature, however inconvenient for agency program managers. An OCN can certainly house dozens or hundreds of small, self-directed teams where real work can be “managed”: teamwork is central to their mission. ESIP “clusters” are good example. These teams can produce valuable and timely deliverables for science and for the sponsors.

The style of governance is also very important here. Attempts to shift governance away from the membership and into top-down executive- or oversight committees are always counterproductive. They give the membership a clear alibi to not care about the organization. Academics have enough alibis to not volunteer without adding this one. The members need to own the mission, vision, and strategies. Successful activities will emerge from initiatives that have been started independently, and with some immediate urgency, by small groups; and which grow into major efforts with broadly valued deliverables. Bottom-up governance will outperform top-down management over the long term.

Science culture shifting

Probably the largest recognized impact that science OCNs can make here—and perhaps only these can accomplish this—is to model a new, intentional cultural mode of producing science. This new cultural model will be centered on sharing (sharing is also one of the oldest cultural traits of science, only recently neglected). Sharing ideas. Sharing software, tools, techniques, data, metadata, workflows, algorithms, methodologies, null data, and then sharing results. Reuse needs to become a key metric of science knowledge (Cameron Neylon noted this at the original *Beyond the PDF* conference).

Transforming science means changing the culture of science. Science OCNs must perform a lot of culture-building work here. This is often a challenge for their sponsors. The key learning moments and opportunities, and perhaps the highest ROI for sponsoring a science OCN is when this community teaches its sponsor to also change their organizational culture.

Three critical governance conditions any agency/foundation sponsor needs to heed

There are three necessary conditions for an agency-sponsored, community-led organization.

1. The sponsoring agency needs to allow the community to build its own governance. Governance documents and practices are not subject to approval or even review by the sponsoring agency, apart from needing to follow standard fiduciary rules. The sponsoring agency can offer input the same way other individuals and groups do, but the community decides its own practices. The metrics for the governance are the growth of volunteer participation, and spread of community involvement, the perceived transparency and fairness of decisions, and the community's estimation for the value of the work being done.
2. The sponsoring agency has no right to review or in any way interfere with elections. All organization members have the right to run for office and to be elected. If the governance process allows, volunteer leaders might be selected through a lottery, which helps bring in leaders from the margins.
3. The agency's sponsorship is designed to help the organization grow into its potential as a volunteer-run, community-led scientific organization. The returns on investment for the agency are multiple, but do *not* include tasking the organization to perform

specific duties, other than to improve their governance (and their member satisfaction) over time.

As an open scientist, and an open-science culture-change agent, you will want to be able to demonstrate that a small amount of your science funding budget is best spent on building *self-governing organizations*, instead of direct investments in funded projects. The real test for a science OCN is to develop fully within the scope and logic of its organizational type. The concomitant test for the sponsors is to understand that sponsoring a new and different type of organization will require some new expectations and an incubation period (a few years) of growth and experimentation to allow the organization to find its own strength and limits.

Bibliography: Open Scientist Handbook References