The odd couple:

Contrasting openness in innovation and science

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Abstract

Over the last two decades, two domains have undergone seemingly similar transformations: Closed innovation turned into open innovation, closed science into open science. Open science replaced closed science. In this essay we engage critically with recent calls for a close coupling of the two domains based on their apparent commonality: openness. Comparing the historically-specific ways in which openness has been mobilized and defined, we find substantial differences between open innovation and open science. While openness in innovation was developed as an analytic concept and redefined quite flexibly over time, openness in science was created as a prognostic concept and defined rather rigidly. Contrasting openness in innovation and science helps anticipating some of the unintended consequences that a close coupling of these domains might yield. In particular, a close coupling might slow down the transformation of scientific practices towards new societal problems, marginalize science-practice collaborations with objectives other than innovation, and support new but unethical business practices. Reflecting upon these unintended consequences can help research and policy-making to better address societal challenges.

Keywords: Open innovation; open science; science policy; innovation policy

Introduction

Openness has become a 'master category' (Tkacz, 2012, p. 387) in many descriptions of work and organizing. Two domains which are frequently described as being in a state of transformation towards greater openness are innovation and science. Building on such descriptions of an 'open revolution' (Pollock, 2018), policy-makers, research funders, and think tanks increasingly call for a closer coupling of open innovation and open science (Blümel et al., 2019; European Commission, 2016; Fingerle, 2019). From such a coupling, they expect beneficial effects for firms, research institutions, and as a consequence thereof society at large. For example, a few years back the European Commission presented open innovation and open science as two main pillars of their research agenda (European Commission, 2016). In a similar vein but more explicitly, the German think tank Stifterverband proposed that by linking innovation and science through a political framework of 'strategic openness', firms would be able to increase their innovation outputs and the public's trust in science could be bolstered (Blümel et al., 2019; Fingerle, 2019). Some firms and research institutions have already begun to follow up on such calls, by setting up internal exploratory projects or by piloting new forms of collaboration between innovation and science (Owens, 2016). For example, the Austrian Ludwig Boltzmann Society created the Open Innovation in Science Center with the ambition to 'tailor' and 'adapt' open innovation practices from business to science (Missbach, 2019).

These calls for a closer coupling of open innovation and open science have attracted scholars in our field, who started to explore the conditions for and outcomes of such an endeavor. To date, these scholars have informed this debate in mainly two ways: First, they empirically studied successful collaboration between open innovation projects and advocates of open science (Perkmann & Schildt, 2015; Susha et al., 2019). For example, Perkmann and Schildt (2015) studied

how the Structural Genomics Consortium served as a boundary organization, which allowed for unprecedented open data partnerships between private firms and academic scientists. Second, scholars developed conceptual frameworks to demonstrate the possibility and potential benefits of coupling open innovation and open science (Beck et al., 2019; Friesike et al., 2015; Smart et al., 2019). For example, Smart and colleagues (2019, p. 279) argued that open innovation and open science already exist in a relationship of 'co-evolution, co-existence, and co-production', which allows for a 'generative coupling' of the two. Linked through openness, the authors suggested, innovation and science can jointly stop the drifting apart of experts and non-expert audiences in 'an age of post-truth populism' (p. 279).

Both forms of inquiry focus on the generative effects of linking open innovation and open science. In this essay we propose a third line of inquiry, which sheds light on the unintended consequences that such a close coupling may have. Rather than taking for granted openness as a common denominator of the two spheres, we 'complexify' (Tsoukas, 2017) openness by tracing historically-specific ways in which the concept has been mobilized and defined in innovation and science. We find that open innovation started as an *analytic concept* used by innovation researchers to describe various changes in the way R&D departments of technology firms handle intellectual property rights and ideas. Continuously redefining the concept of openness in flexible ways helped this research community to grow and to demonstrate its relevance towards firms and research funders. By contrast, open science was initially developed as a *prognostic concept* by activist academics, which allowed them to gather peers around the shared goal of transforming scientific practices. Only carefully updating their definition and strongly policing how their terminology is used by others, helped this academic movement to maintain momentum and to prevent co-optation.

Despite the semantic congruence, communities in innovation and science have historically used and defined the concept of openness quite differently and as a means for different ends. Contrasting these different versions of openness hence enables us to anticipate some of the unintended consequences that may arise from current efforts to closely couple these two domains. *First*, a close coupling with open innovation might drive out some of the core members of the open science movement and diminish the community's potential to transform scientific practices to better address societal challenges such as post-truth populism. *Second*, a close coupling with open innovation might suppress generative couplings between science and practice that are not directed at innovation, such as practices of maintenance and care. *Third*, a close coupling between open science and open innovation can lead to new but unethical business practices such as predatory publishing.

Our assessment of these unintended consequences suggests implications for policy-making and future research. Policy-makers should allocate resources to open science projects aimed at innovation as well as maintenance. Also, they should reassess, whether certain forms of scientific research are already too closely coupled to industry. Future research should examine the full array of collaborations between science and non-science stakeholders. Further, by studying different forms of openness in action rather than conceptually integrating them, the open innovation community can take new trajectories towards relevant and surprising research findings.

Openness in innovation: Analytic and flexible

The concept of open innovation was coined by business school professor and innovation scholar Henry Chesbrough in 2003. Chesbrough (2003) argued that new technologies and a changing labour market push technology firms from a model of closed innovation towards a 'paradigm' of

open innovation in which ‘valuable ideas can come from inside or outside the company and can go to market from inside or outside the company as well’ (2003, p. 43). He supported his new concept with case studies on large firms such as IBM, Intel, and Lucent, each providing insights on different and very specific innovation practices. Chesbrough introduced open innovation as a concept that allowed him to capture and collectively refer to these emerging innovation practices of technology firms. Chesbrough did not provide a clear-cut definition of what exactly rendered an innovation activity either open or closed. He described openness as a more general trend, which appears in all kinds of firms but which can be traced back to the same root causes.

As an analytical concept, openness helped its creators (mainly Henry Chesbrough and his students/collaborators) to build a new academic community within the larger field of business research – a process which Mehrpouya and Willmott describe as ‘knowledge branding’ (2018, p. 729). Through publications, workshops, conferences, and a considerable amount of special issues, this group of ‘academic entrepreneurs’ (2018, p. 729) has over the last two decades managed to attract an ever-expanding cohort of scholars willing to frame their research through the concept of open innovation. While some of these research projects engaged with very similar empirical situations as initially described by Chesbrough (2003), others engaged with considerably different types of organizations, actors, and products. For example, scholars began to describe platform-mediated crowdsourcing of ideas as a form of open innovation (Ebner et al., 2009), or referred to open innovation to describe how government agencies allow citizens to provide feedback on the design of public services (Heimstädt & Reischauer, 2019; Mergel & Desouza, 2013).

Rather than dismissing these projects as unrelated to the initial scope of the open innovation concept, the open innovation research community included these projects by flexibly “re-conceptualizing” (Dahlander & Gann, 2010, p. 699) its definition of openness (see Rangus et al.,

2016; West & Bogers, 2014, 2017). For example, established open innovation scholars argued that adjacent organizational domains such as strategy could be analyzed through the lens of open innovation as well (Chesbrough & Appleyard, 2007). Serving as an 'obligatory point of passage' (Mehrpouya & Willmott, 2018, p. 729) for new research on open innovation, the academic entrepreneurs were able to continuously expand the definition of openness. Such an expansion of the definition created a win-win situation for established and emerging scholars, as it meant more opportunities to publish and hence raising numbers of citations for everyone involved.

As the research community on open innovation grew, it was not only able to expand its territory vis-à-vis other research communities (Mehrpouya & Willmott, 2018), but also to establish itself as a relevant actors for firms and other audiences of business research. Global conferences on open innovation were not limited to academic discussions, but attracted high-status representatives from industry as well. Through managerial training, consulting services, and a constant flow of open innovation researchers who traded an academic career for an industry job, the concept of open innovation was transferred from innovation research back into the firms, some of which served as empirical grounds for the concept in the first place. While we know little about the ways in which people in organizations mobilize the concept of open innovation (a few tentative ideas can be found in Lichtenthaler, 2011, pp. 79–80), we can assume that when a concept like open innovation begins to travel through organizations, its definition becomes even more broad and flexible over time. As we will now show for the case of open science, the use and definition of openness can differ drastically when the concept originates not as a theoretical lens but as a device to organize a community around a common effort.

Openness in science: Prognostic and rigid

The concept of open science was initially developed by a small group of activist academics who – inspired largely by new digitally-mediated forms of communication and collaboration – wanted to change the way scientists make their results available to other scientists and to the public. As a foundation for their peer-driven occupational change movement (Howard-Grenville et al., 2017), these activist academics developed a very precise definition of what openness means in the context of scientific knowledge (Molloy, 2011). In contrast to closed science, they defined open science as one whose outcomes are 'accessible, reproducible, and re-usable without legal, social or technological restriction' (Open Knowledge Foundation, 2006). In the following years, members of this nascent open science movement mobilized this definition to imagine and experiment with more 'open' versions of scientific practices, such as open access journals, open data repositories or open educational resources (Bartling & Friesike, 2014). Other than in open innovation, openness in open science was initially not developed as an analytical category to describe and explain new practices, but as a prognostic frame to imagine and mobilize support for change towards specific practices. Through the prognostic concept of openness, activist academics initially referred not to what *is* but what *should be*.

While scientific practices such as open access publishing or open data sharing are widely accepted in many disciplines today, the open science activists in the 2000s were either simply ignored (e.g., by most policy-makers and research funders) or criticized for their convention-breaking vision of science. While some critics simply feared that greater openness in science might erode established quality standards (e.g., pre-prints are not peer-reviewed), others framed the open science advocates as an 'anti-corporatist' movement, which seeks to 'collectivize production' and 'deny the freedom of the press' to traditional academic publishers (Beall, 2013, p. 596). This

challenging context explains why the activist academics took great care in protecting the precision of their definition as a focal element of their movement and a tool to identify antagonists. Since its initial formulation in 2006, there have been a handful of updates on the wording of the initial definition of openness, however each of these updates has been rather marginal and aimed at creating less rather than more ambiguity (Open Knowledge Foundation, 2015). Also, these updates have not been phrased by individual members of the movement but resulted from long deliberations within the community (Lainchbury & Pollock, 2015).

The open science advocates not only maintained their definition internally, but also actively policed acts of 'openwashing' (Heimstädt, 2017) – situations in which actors in our outside of science used the 'open' label in ways which conflicted with the movement's definition of openness. One of these policing practices was to publicly shame individuals or organizations on social media using the hashtag #openwashingnominee. Policing of openness, however, also took place towards a broader and more general audience. At the onset of the open science movement, most large academic publishers rejected the idea of a transition to open access models of publishing. However, driven by transnational science policy initiatives such as Plan S in Europe (Else, 2018), academic publishers gradually begun to adjust some of their publication practices and publicly presented themselves as supporters of the open science movement. Among many open science advocates, these strategic maneuvers were considered a form of openwashing. For example, in an op-ed in the newspaper *The Guardian*, the open science activist Jon Tennant criticized the European Commission's decision to hire academic publishing company Elsevier as a consultant on new open science policies. After listing episodes and activities in which Elsevier has apparently breached the values of the open science community, he concluded that 'it seems like a profoundly undemocratic practice to have a company with such an anti-open history now

with such a powerful position in the future of open science in Europe'. Even more drastically, he added: 'That's like having McDonald's monitor the eating habits of a nation and then using that to guide policy decisions' (Tennant, 2018).

Above, we showed how the concept of open innovation was developed by innovation researchers and was later transferred into organizations through management education and consulting. The career of open science as a concept proceeded the other way around. Open science was developed by academics, but not as a primary outcome of their research but as a device for transforming their own profession. Only after new practices emerged from these mobilization efforts, was the prognostic concept picked up and translated into an analytical concept by science scholars (Smart et al., 2019; Vicente-Saez & Martinez-Fuentes, 2018) and policy makers (Blümel et al., 2019; European Commission, 2016; Fingerle, 2019). Instead of adopting the definition of open science as developed by the activist academics, many science scholars and policy makers developed their own definitions of open science (for a review of definitions see Vicente-Saez & Martinez-Fuentes, 2018), which not necessarily complied with the open science movement's definition. This concurrence of definitions already begins to create confusion and conflict, as the analytic concept flows back into the lifeworld of activist academics and their prognostic use of the label. In the following we sketch the unintended consequences that may arise when we try to merge the concepts of openness across the domains of innovation and science.

Unintended consequences of a close coupling

Historically, the ways in which openness has been defined and mobilized differed between innovation and science. As concepts began to travel and communities around these concepts continued to grow, these differences might have become blurry to some policy-makers and

researchers. However, it is not despite but exactly because of this demarcation problem that we should be aware of the unintended consequences that a close coupling of open innovation and open science might yield. In other words, these consequences would not be unintended, if the difference between the two spheres had been more generally apparent. In the following, we discuss three types of unintended consequences, which have become salient through our historical comparison of open innovation and open science. Being more reflexive about these unintended consequences can enable policy-makers and researchers to re-evaluate their plans and expectations regarding a close coupling of the two domains.

First, a close coupling with open innovation might *alienate focal members* of the open science movement, thereby hampering the movement's potential to reorient science towards new societal challenges such as post-truth populism. Today, the open science movement is a heterogeneous community with some radical and some more pragmatic 'schools of thought' (Fecher & Friesike, 2014). When policies encourage a close coupling of open science and open innovation there is a substantial threat of alienating the activist academics who identify strongly with the movement's definition of openness. This threat will become particularly salient when a coupling with pecuniary practices of open innovation, such as 'selling' or 'acquiring' (Dahlander & Gann, 2010) is promoted, as these practices are clearly at odds with the orthodox definition of openness in science described above. When policy initiatives fail to acknowledge this incongruence, we can expect that activist academics will try to mobilize resistance against the coupling, for example by convincing their peers to boycott reviewing for open innovation-related projects. If unsuccessful with their resistance, we can even expect that activist academics will stop voicing their concerns and exit the movement (Hirschman, 1970). Losing such activist members, will diminish the potential of the open science movement to reorient scientific practices towards

societal challenges. For example, losing activist members of the open science movement might make it difficult to perform radical and risky 'journal flips' from closed access to open access models (Fecher & Wagner, 2015).

Second, a close coupling with open innovation might *suppress generative collaborations* between science and practitioners, which are not geared towards innovation. For example, desirable relations between science and practitioners can be oriented towards values of maintenance and care (Graziano & Trogal, 2019; Russell & Vinsel, 2019). In times of growing concerns regarding the psychological and ecological viability of globalized capitalism, an orientation towards maintenance and care seems as generative for a sustainable future as an orientation towards (responsible) innovation. Channeling research funds primarily to the interface of open science and open innovation, would diminish values of care and maintenance in universities and other research institutes.

In technology-oriented domains of science, collaborations with practitioners are oftentimes implicitly equated with innovation. However, this excessive focus on new and 'innovative' projects regularly leads to IT-related 'zombie projects' (Anthony et al., 2015) in organizations, which get neither completed nor discontinued and are straining individual employees as well as firm performance. Making room for research-practice collaborations which are oriented towards the maintenance (or even the discontinuation) of existing IT projects and infrastructures might lead to greater well-being for individuals and firms than yet another innovation project does. In the humanities and social sciences, there has recently been a surge of collaboration between open scientists and practitioners which focus on maintenance and care rather than innovation. Under the label 'Open GLAM' open science advocates from the humanities collaborate with galleries, libraries, archives, and museums towards the goal of providing access to and maintaining cultural

artifacts (Blagoev et al., 2018; Passel & Rigole, 2014). We also find collaborations that are focused on maintenance and care in the life sciences. A recent example is a collaboration between the Public Library of Science (PLoS) and the World Health Organization (WHO). During the onset of the global Covid-19 crisis in early 2020, all seven PLoS journals pledged to forward all submitted manuscripts related to Covid-19 directly to the WHO to support their global crisis management (simultaneous to sending the manuscripts out for peer review) (Heber, 2020).

Third, a close coupling between open science and open innovation can lead to *new but unethical business practices*. Oftentimes, visions of a closer collaboration between science and innovation implicitly assume that outcomes of these interactions take the form of new technologies such as medical drugs. However, creating new openings of scientific practices can also give rise to new business models and services, which by no means need to be oriented towards broadly shared societal goals such as 'truthful' politics (Smart et al., 2019). An example of this unintended consequences is the transition from traditional publication models to open access forms of scientific publishing. Although the rise of open access publishing has drastically increased the (potential) audiences of scientific communication, this transformation has also given rise to the new business model of predatory publishing. Like most reputable open access journals predatory journals charge Article Processing Charges, but perform peer review only superficially or not at all despite claiming to do so (Dobusch & Heimstädt, 2019; Shen & Björk, 2015). First, such predatory journals extract funds and resources from already marginalized groups in science (e.g., those who lack sufficient training to identify legitimate journals) (Severin et al., 2020). Second, predatory journals can provide a fertile ground for the strategic dissemination of pseudoscience and fake news (Dobusch & Heimstädt, 2019). Another innovative yet unethical business practice that arose through the shift towards open access publishing is the 'double dipping' of hybrid

publishing models (Mittermaier, 2015). In the hybrid publishing model research institutions can 'free' individual article (i.e., publish them as open access) by paying Article Processing Charges. However, as not all articles of a given journal are openly accessible, the research institution pays the publisher a second time when subscribing to the journal. While some publishing houses adjust their subscription fees to the number of individual articles that an institution has 'freed', others charge the full subscription rate.

Conclusion

Both, policy-makers and researchers have recently called for a closer coupling of open science and open innovation. In this essay, we have contrasted the historical developments of openness in science and innovation to foreshadow three unintended consequences of such a close coupling. Reflecting upon these consequences, implications for both policy-makers and researchers become apparent.

For *policy-makers*, implications of our study depend on the policy domain. For science policy, our study suggests that the allocation of resources towards open science projects should not be contingent on promises to enable innovation but should also allow for open science projects that aim at goals like access, maintenance, and repair. For example, science policy should allocate resources not only for the development of new but also for the maintenance of established technological infrastructures that underpin open science practices. Also, science policy should allocate resources for the diffusion of open science practices across academic institutions, not only to those projects that promise to create novel open science practices. On a societal level, such projects contribute to the common good as much as innovation-oriented projects do. For industrial and economic policy, our study suggests that rather than trying to establish shared definitions and

standards of openness between industry and academia, industrial policy should also revisit disclosure requirements for large data-hoarding firms (Zuboff, 2019). As recent work demonstrates, current dynamics are gradually shifting scientific research from academic institutions inside the boundaries of firms (Hartmann & Henkel, 2020). Rather than progressively coupling science and innovation, economic policy-making should therefore reassess whether measures should be taken to carefully decouple research on emerging technologies from the strategic objectives of powerful technology corporations.

The implications for *research* that our study makes depends on the researchers' primary matter of interest. For researchers interested in scientific practices and the changing role of science in society, our study suggests that more attention should be paid to forms of collaboration between science and non-science actors, which are not aimed at innovation. Better understanding these types of coupling will ultimately yield a better understanding of the specificities and opportunities of a more selective coupling between open science and open innovation. For researchers interested in open innovation, our study suggests that unpacking the different ways in which people in organizations claim, configure, and contest openness in their everyday activities might generate new and unexpected research findings. In recent years the open innovation community has been highly successful in identifying more and more domains of organizing as a case of open innovation (i.e., government or strategy). Our study suggests that accepting forms of openness in such domains as different (rather than integrating them conceptually) can help the open innovation community to overcome what Mehrpouya und Willmott have called 'corrosive effects of knowledge branding' (2018, p. 730) and secure the future relevance and provocativeness of their research.

Probing ways in which science and innovation can contribute to the mitigation of societal problems such as ‘post-truth populism’ is a responsible path that has recently been taken by policy-makers (Blümel et al., 2019) and researchers (Smart et al., 2019) alike. With this study, we contribute to this nascent debate by pointing out the complexity and intricacies of openness. Only by accepting the multiplicity of openness, we believe, the concept can be put to use without turning into a populist trope itself.

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