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Tensions and Trade-offs in Real-World Laboratories – The Participants' Perspective

Real-world laboratories have made their way into policy programs and corporate agendas. They are expected to foster innovation on both the local and wider societal scales through co-creative settings in the “real world”. Yet little attention has been paid to how these multiple expectations affect micro-level practices and pose challenges for the heterogeneous actors involved in these settings. Two case studies show the emerging tensions relating to participation, temporality and space, and the ways in which participants perceive and deal with them.

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Real-world laboratories (RwLs) are currently in the spotlight for political planners, public-private partnerships, engineers and researchers who pin their hopes on sustainable, socially fair and innovative solutions to tackle some of the most complex issues of today's societies (Schäpke et al. 2017, Schneidewind and Scheck 2013, Wagner and Grunwald 2015). Although most prominently invoked in the context of smart cities and energy transitions, the RwL approach to innovation has made its way into national policy programs, innovation strategies and transformative research agendas across various empirical domains (BMW 2017). The objective of these initiatives is the development, testing and demonstration of future socio-technical innovations in heterogeneous, transdisciplinary constellations (Engels et al. submitted, Jahn and Keil 2016). They build on the idea of “collective experimentation” (Felt 2015) in order to create socially robust knowledge (Nowotny 2003).

RwLs have recently been defined as spaces for scientific as well as societal learning, striving for the scalability and transferability of their results (and thus contributing to transformation processes), by applying an experimental and transdisciplinary mode of research (Schäpke et al. 2017). Research to date has not attended

sufficiently to the underlying contradictions and tensions and how these play out within the initiatives' daily work (an exception focusing on living labs is Leminen et al. 2015).

We draw on empirical data from two self-proclaimed RwLs¹: a regional renewable energy network, striving to become a pioneer region for energy transitions (*Energieavantgarde Anhalt*²), and an urban smart energy campus, which is working on the integration of electric vehicles into smart energy grids (*Forschungscampus Mobility2Grid*³).⁴ Both cases stage themselves as RwLs and fulfil the basic criteria of RwLs mentioned above. But the comparison of our two cases also reassures the finding that RwLs are not based on a coherent theory of change like niche experiments or transition experiments, instead both have to develop their own methodology (Schäpke et al. 2017, p. 46). The empirical data from these two very different cases allows us to identify emerging tensions inherent to RwLs and particularly the ways participants deal with them in their everyday practices, relating to

- participation (between cohesion and openness),
- temporality (between exploration and exploitation), and
- space (between local and global).

Over the course of several years (three in the one case, five in the other), we conducted 25 face-to-face interviews⁵ with actors both

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1 For a more detailed description of the two RwLs see www.oekom.de/supplementary-files.html#c11350.

2 www.energieavantgarde.de

3 www.mobility2grid.de

4 Our research is funded by the German Federal Ministry of Education and Research as part of the research initiative *Research Campus – Public-private partnerships for innovations*, and by the innogy Foundation for Energy and Society.

5 The interviews were digitally recorded and transcribed.

on the strategic and operational level. The interviews were designed to identify barriers and drivers of cooperation, and to understand the structure and development of the initiatives. As academic project partners we also had access to informal meetings. In addition, we used secondary data including websites, the minutes of project meetings and publications by project partners. The transcripts were coded inductively using qualitative data analysis software following grounded theory (Mayring 2003, Corbin and Strauss 2008).

Emerging Tensions in Real-World Labs

This paper contributes to existing theoretical work on paradoxes and tensions in open innovation settings and organization studies with in-depth empirical data. Leminen et al. (2015) define a set of three tensions in living labs relating to the management, users, and the innovation model, which result in seven different paradoxes. Organization studies have shown that paradoxical tensions are numerous and manifold (Smith and Tushman 2005), and that organizational tensions arise from different roles and role patterns of multiple stakeholders in networks of open innovation (Nyström et al. 2014). Even though Schöpke et al. (2017) point to the dual objective of RwLs to understand and shape change simultaneously, to our knowledge so far no study has systematically focused on the tensions in RwLs.

We argue that the identified tensions are inherent to RwLs, irresolvable, of permanent character, and potentially leading to outcomes that were not foreseeable (Leminen et al. 2015). Each tension takes shape and oscillates between two poles, which are not oppositional but rather gradual. The tensions may alter over time and affect the RwL's performance to varying degrees.

Participation: Between Cohesion and Openness

Participation refers to the composition of actors involved in RwLs, with the main focus on the tension between openness towards new participants and cohesion within the existing group. Since both RwLs under investigation address challenges in the context of energy transitions, they assemble heterogeneous actors from various sectors (mainly from energy, mobility, and information and communication technologies) as well as organizational domains (such as industry, academia, civil society, and public-private partnerships). Users may participate as well if they are part of the network. Our research revealed that actors perceive heterogeneity as both a prerequisite and a major, unprecedented challenge for innovation practices. Despite the seemingly growing consensus that transdisciplinary cooperation between scientific, business and societal actors nurtures “innovations of a new kind” (Felt et al. 2016, p. 732), our analysis shows that new actors might not only enrich the collaboration by bringing in new knowledge and network connections, but simultaneously threaten the cohesion and destabilize the actor constellation.

Our cases illustrate a great variety of attempts to deal with heterogeneity on an organizational level and to institutionalize cooperation. In the regional case the actors founded an association designed to be as open as possible towards new participants, particularly towards citizens, and to create an overarching framework for diverse activities (e.g., for public representation and the eligibility for external funding). Openness at the outset – not only institutional but also in terms of content – proved crucial in attracting new supporters by enabling them to connect their particular interests with the overall vision of the RwL (Engels et al. 2017). However, over time, as the project develops, openness comes at the expense of making visions concrete and realization calls for greater cohesion.

In case of the urban smart energy campus, participants had to find ways to bridge the differences and to create a mutual basis for cooperation that did not exist before, in particular when competitors “sit at the same table” and innovation activities become mutually observable. Collaborative activities are constantly distorted by the fear and actualization of competition – even more when sharing the same physical space. Issues addressed by RwLs, like the integration of energy and mobility businesses, re-configure collaboration beyond formerly separated sectors and disciplines (Canzler et al. 2017) – and it is the potential of RwLs to explore these new modes of collaboration and participatory formats.

Temporality: Between Exploration and Exploitation

Even though RwLs are usually set up to create a strategic niche away from market pressure, we found proof of detailed descriptions of ongoing exploration practices and at the same time a strong drive towards economic exploitation. Actors experience intense pressure to produce marketable solutions and to secure an application-oriented approach. Some companies expect direct profits from their engagement and push for utilization. In order to deal with the dual temporal challenge, actors in both cases strongly advocate demonstrating and staging their innovation activities, such as autonomous driving trials or bidirectional charging stations. Stakeholders design RwLs as flagship and showcase projects and invoke them as strategic trajectories for accelerating new technologies and business models by giving them greater visibility, attention and attractiveness – notably beyond the spatial constraints of the experimental site itself. RwLs thus seem to need showcases to justify themselves to their transdisciplinary audience.

In the case of the urban campus, one incumbent in the mobility sector provided technical components for testing the controlled charging of electric vehicles but soon reduced its engagement noticeably when the company realized that they would generate less revenue in the RwL setting than in the regular market. Another example is the foundation of an association that was a necessary prerequisite to receive state funding for the establishment of a long-term research initiative and showcase project. All

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partners had to deal with issues concerning exploitation at very early stages, even before the collaboration activities really started. We observed similar mechanisms in the case of the regional energy network: one company expected the RwL to deliver usable technological insights relatively quickly as a basis for pending decisions in its daily business. In these moments, innovation becomes a matter of temporal structure: the real-world settings are not only dependent on the specific context (Schäpke et al. 2017, p. 17) but also the urge to make visible both the process of experimentation and its results. A time-sensitive perspective (Felt 2015) on RwLs points to the processes of negotiation between trial-and-error attitudes on the one hand and the aspiration of rapid demonstration and economic exploitation on the other. Different interpretations of time – ranging in our cases from an unmanageable, collective societal transition process to the achievement of pre-defined goals – are deeply interrelated with questions of control and power (Felt 2015).

Although most open innovation processes are based on methodologies that distinguish between different stages and phases (Almirall et al. 2012), our analyses reveal the empirical simultaneity of exploration, exploitation, and demonstration. Contradictions between exploration and exploitation are not a new phenomenon in organizational activity, yet the demand for exploitation we observe in RwLs does not build “on an organization’s past” (March 1991, Smith and Tushman 2005, p. 522) and on existing products, but rather on future innovations.

Space: Between Local and Global

The third tension we observed relates to the notions of space and scale, and how activities in RwLs simultaneously form and are formed by local peculiarities. The contradictory relation between a broader generalizability and transferability of results (Schäpke et al. 2017, p. 49) and the local embeddedness and value creation is at the heart of the RwL in conceptual terms, and it strongly affects actors’ performances and decisions. In our interviews, participants stressed the twofold challenge: to produce exportable and reproducible, “lab-like” results within local settings addressing global challenges (e.g., the mitigation of climate change or the creation of the future smart city), and, at the same time, to respond to local needs of sustainable regional development. In the regional case actors reflected on this “irresolvable contradiction” and their fear of becoming “guinea pigs”. Unlike descriptions of changing user roles towards “equal participants and co-creators of value” (Leminen et al. 2015, p. 2), our data indicates that participants perceive their pioneering role rather as a burden that comes with expectations of (regional) value creation.

Although differing in scale, RwLs expand general transition approaches by emphasizing a distinct spatial delineation, a geographically defined area to capture innovation activities. By turning particular sites, like a campus or an entire region as in our cases, into testing grounds for new ideas they become inevitably a linking point between the local and the global (Evans et al. 2016, Jasanoff

2010). The alignment between these two levels, notably through practical modes of collaboration between local and supraregional actors, is a major tension in the regional case study, and eventually led to an organizational split into two, a local and a supraregional, project offices, yet, still working towards the RwL overall goal.

Our data further suggest that actors perceive existing national legal frameworks as the greatest constraints to their local experimental activities. In the case of the urban smart energy campus, actors repeatedly came into conflict with legal requirements in their attempts to create business cases for the integration of electric vehicles and smart energy grids. As a counter-strategy, they developed work-around solutions that they themselves however flagged as impractical. For example, due to legal barriers, users who charge their electric vehicles on campus pay fees for parking instead for power consumption.

The separation between a scientifically controlled inside and an uncontrolled outside found in traditional laboratory settings (Guggenheim 2012, p. 101) is turned upside down in RwLs, because they place experimental practices purposeful into a given social context (Caniglia et al. 2017). We suggest conceiving of RwLs not only as instruments to foster change on a global level but rather as sites of social learning (Wagner and Grunwald 2015) about the local socio-cultural settings in which they are embedded, and about the normative visions of the actors who engage in it (Jasanoff 2010).

Managing Real-World Labs – Managing Tensions

We have highlighted three distinct yet interrelated tensions in RwLs which illustrate their fragile and contested character as well as their potential. Actors develop various strategies to deal with this set of immanent tensions on an operational level; for example, when facing strong pressure of economic exploitation or regulatory constraints for technological use cases. It becomes obvious that RwLs as sites of experimentation and public demonstration serve at once as testing grounds for new modes of collaboration, reconciling temporalities, and as spatial links between global challenges and local strategies (Engels et al. submitted).

When attending to heterogeneity as a key asset of RwLs, so-called border crossers, skilled social actors who are travelling in different cultural and institutional worlds, may enhance collaboration through the creation of common arenas of exchange and perform translation work (Canzler et al. 2017, p. 27). Such actors understand the requirements of the different social worlds and may bridge differences through the production of shared meanings. Participation is a matter of deciding how participants constitute themselves as a collective and develop a group identity rather than relapsing on the role of affected individuals, citizens, or consumers (Felt 2015, Krohn and Weyer 1994). Heterogeneity and participatory events are “valuable moments” (Felt 2015, p. 16) of RwL during which the complexities of the sociotechnical issues at stake can be better addressed.

In light of the finding that market pressures for early demonstration (even of immature technologies or business models), managers and policy makers should pay attention to contradicting underlying temporalities and to the power structures embedded in them (Felt 2015). In our view, RwLs are particularly useful as a platform for exploration practices and, to a lesser extent, exploitation. If taken seriously, these unique real-world settings allow for a more open, creative and collaborative approach to learn about innovation than competitive and strictly regulated market structures.

Dealing with general regulatory constraints in specific local settings, actors currently call for policies to implement protected spaces comparable to “special economic zones” as a means to create more controllable conditions and to leave regulatory real-world constraints behind. It might prove useful to apply and extend the idea of experimental clauses as particularly appropriate instruments at the level of municipalities or states. They allow a temporary, very specific exemption of existing regulations to gather information about an “alternative reality”. Regulatory tinkering in society should however happen under conditions of responsibility (Felt 2015, p. 16, Stilgoe et al. 2013), which require a (time intensive) constructive engagement with alternative approaches and the agreement from all RwL participants.

Managing RwLs means dealing with tensions that are “not likely to be eliminated by one’s choice of action” (Leminen et al. 2015, p. 3). Rather managers who initiate RwLs and participants should “embrace the contradictions”, which requires skills that can host the tensions and the associated inconsistencies rather than privileging an unattainable consistency (Smith and Tushman 2005, p. 523 f.). The hope for contribution to transformation processes will only occur by attending to and dealing with the tensions lying at the very core of RwLs – between openness and cohesion, exploration and exploitation, local and global.

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