

Article

How Cities Learn: From Experimentation to Transformation

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Abstract

Cities must change rapidly to address a range of sustainability challenges. While urban experimentation has prospered as a framework for innovation, it has struggled to stimulate broader transformation. We offer a novel contribution to this debate by focusing on what municipalities learn from experimentation and how this drives organisational change. The practicalities of how municipalities learn and change has received relatively little attention, despite the recognised importance of learning within the literature on urban experiments and the central role of municipalities in enabling urban transformation. We address this research gap, drawing on four years of in-depth research coproduced with European municipal project coordinators responsible for designing and implementing the largest urban research and innovation projects ever undertaken. This cohort of professionals plays a critical role in urban experimentation and transformation, funnelling billions of Euros into trials of new solutions to urban challenges and coordinating large public-private partnerships to deliver them. For our respondents, learning how to experiment more effectively and embedding these lessons into their organisations was the most important outcome of these projects. We develop the novel concept of *process learning* to capture the importance of experimentation in driving organisational change. Process learning is significant because it offers a new way to understand the relationship between experimentation and urban transformation and should form the focus of innovation projects that seek to prompt broader urban transformation, rather than technical performance. We conclude by identifying implications for urban planning and innovation funding.

Keywords

experimentation; innovation; municipalities; process learning; urban transformation

Issue

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1. Introduction

Municipalities must address a multitude of challenges relating to climate change, transport, neighbourhood planning, jobs, energy, social inclusion, health, waste, and now Covid-19. In this context, urban experimentation has prospered as a framework to enable innovation and transformation in cities (Caprotti & Cowley, 2017; Hajer & Versteeg, 2019). While the jury is out on whether

the experimental turn represents the further hollowing out of the state or a genuine opportunity for more inclusive and innovative urban development (Evans et al., 2019), there is a consensus that, as yet, urban experiments have struggled to drive a broader transformation of cities (Grandin, Haarstad, Kjærås, & Bouzarovski, 2018). Governments and funding bodies question why seemingly successful innovations fail to be adopted at scale. Part of the problem is the tendency for many urban

sustainability challenges to be addressed through competitive project funding. Municipalities design projects to test new solutions relating to energy, mobility, waste, ICT, and so forth with little systematic consideration given to previous results from similar efforts or other places. Externally funded projects are always liable to be unsustainable, as they end once funding runs out. Even municipalities that are adept at developing projects to secure funding often end up with a patchwork of exemplars that are poorly integrated either with each other or policy goals (Cugurullo, 2018; Hodson, Evans, & Schliwa, 2018). As a result, even successful innovation projects struggle to translate into broader urban transformation.

The central argument of this article is that municipal learning constitutes a missing link between urban experimentation and transformation. We build this argument by focusing on how urban innovation projects are designed and enacted by city coordinators, a cohort of professionals employed within municipalities and tasked with developing projects to address place-based sustainability challenges. Capturing the insights of this group is significant to understand how urban experimentation links to transformation, as they play a key role in testing and scaling up innovations across the energy, ICT, transport, and green infrastructure sectors. These innovation projects form the primary vehicle through which governmental funding bodies aim to stimulate broader urban transformation. Drawing on interviews and workshops with city coordinators conducted over a four-year period, we show how learning to experiment more effectively is the most important outcome of urban innovation projects, which, if captured effectively, enables broader transformation.

The article proceeds as follows. We review the literature on how learning has been conceptualised in relation to urban experiments and municipalities, arguing that there is a gap between work focusing on urban experiments and work focusing on learning. We then present findings from research conducted with 18 city coordinators, representing collective experience gathered through almost one billion euros of projects funded through the EU H2020 funding programme. Coordinators recognise the need to design these projects more effectively in order to drive broader transformation and we develop the concept of process learning to show how urban experimentation can reshape organisational practices, structures and relations. The penultimate section discusses ways in which such learning can be supported. We conclude that organisational processes rather than technical performance should form the focus of innovation projects that seek to prompt broader urban transformation, and identify significant priorities for urban planning and innovation funding.

2. Urban Experimentation and Learning

While not necessarily being subject to the same levels of democratic accountability and oversight as the

forms of planning and government that it often replaces (Caprotti & Cowley, 2017), experimentation promises a short cut to rapid urban transformation. It is this positive promise of experimentation in a very narrow, practical sense that we unpack in the current article. We understand urban experimentation as a systematic activity devised to generate objective evidence by introducing a measure or solution into an urban environment in a limited and controlled way (Caniglia et al., 2017). Experimentation is valuable in the basic sense of generating evidence about what works, but also in the more ineffable sense of generating buy-in and capacity across a range of organisations that promotes broader urban transformation (Voytenko, McCormick, Evans, & Schliwa, 2016). Besides objective evidence, stakeholders gain subjective personal experience, generating social learning, better decision-making, and legitimising solutions. While these effects have received increasing attention, less work looks how organisations are changed through involvement in experiments. Before considering this question, it is useful to briefly clarify the terminology surrounding urban innovation and experimentation.

A palette of partially overlapping terms and approaches relate to urban innovation that are often used together or interchangeably, including urban experiments, living labs, pilot projects, and demonstration projects. Experimentation is sometimes used for any interaction of users with prototype solutions (Schuurman, De Marez, & Ballon, 2016) or ad-hoc trial and error approaches. The term urban experiment is rarely used in policy or funding briefs, in part due to concerns over being seen to test things on citizens, but also because funding agencies have been keen to decentre innovation funding from the university sector towards implementation. As a result, terms like pilot or demonstration projects tend to predominate from design phase to the evaluation of complex solutions in real environments before market adoption (Thabane et al., 2010). The term pilot project or pilot is often used in EU funded research projects alongside demonstration project and demo. They suggest a similar focus on testing how a technology works in real world environments, either to determine the route to adoption (to pilot) or to convince key stakeholders that it works (to demonstrate). Each involves an element of experimentation, however implicitly, as they are intending to discover something new in an explicit and robust way.

Rather than talk about urban experiments as objects of study, we refer to urban experimentation as an approach and associated set of practices that characterises contemporary urban innovation and the profusion of place-based approaches like pilots, demonstrations, and living labs (Evans, Karvonen, & Raven, 2016; Nevens, Frantzeskaki, Gorissen, & Loorbach, 2013). If cities are to reinvent themselves then municipalities and key organisations across the public and private sector need to experiment with doing things in different ways. We are interested in what cities learn about the

process of urban experimentation, rather than the technical evidence concerning the performance of a specific trial or pilot. Our contention is that moving from a project to changing business as usual relies on how lessons from experimentation are captured and embedded into organisations. The remainder of this section considers how learning has been conceptualised in the literature on urban experimentation and the role of municipalities in this.

Three recent reviews covering approximately 200 publications (of which around half are European in focus) show how key strands of thought position learning in relation to urban experimentation (Kivimaa, Hildén, Huitema, Jordan, & Newig, 2017; Laakso, Berg, & Annala, 2017; Sengers, Wiczorek, & Raven, 2016). Sengers et al. (2016) present a systematic review of the sustainability transitions literature from the 1990s to 2015. Processes related to learning are identified as the main analytical focus of several of the categories, including second order learning relating to niche nurturing processes in niche experiments, social learning processes in bounded socio-technical experiments, and broadening, deepening, and scaling up processes in transition experiments. The capacity and capabilities of municipal actors are not explicitly considered, although can reasonably be postulated to form a critical determinant of urban transitions that depend on the ability of cities to experiment effectively. Kivimaa et al. (2017) review the transition and climate resilience literature, drawing on a transition management framing, and assess empirically described experiments and their objectives, outputs, and outcomes. The review identifies seven categories of outcome, three of which are related to learning: changed discourse linked to strategic vision and rhetoric; policy or institutional change; and changed citizen or consumer habits. The review discusses the need for long term evaluation of transition experiments to be able to share lessons to benefit subsequent experiments but there is little discussion of organisations or how this happens in practice. Laakso et al. (2017) draw similar conclusions in their review of climate governance experiments, suggesting that the lack of models available to those designing, conducting, and evaluating sustainability experiments means that selection of the most suitable experimentation framework or methodological tools is challenging. The review concludes that existing typologies do not provide a holistic picture of the functions and uses of experiments, nor how specific outcomes are achieved. They advocate learning within experiments to provide better understanding to those designing, conducting, and evaluating them, although stop short of identifying specific processes for making this happen within or between organisations.

Overall, while learning is commonly identified as important to urban experimentation it rarely receives explicit treatment. This trend characterises approaches to urban experimentation that see them as niches whose core purpose is to effect higher system or policy change

(Ghosh et al., 2016; Smith & Raven, 2012; van den Bosch, 2010; van den Bosch & Rotmans, 2008; Williams, 2016), rather than the transformation of individuals and organisations. As Bögel, Pereverza, Upham, and Kordas (2019, p. 367) state, while organisational realignment is clearly central to transition studies, “this is currently not supported by strong theorization on organisational change.” Organisations shape the practices and beliefs of key actors, which in turn constitute the ways in which urban experimentation takes place. Bögel et al. (2019) identify three levels of organisational change: institutionalised logics that frame organisational activity; approaches, methods, and tools; and micro-level factors relating to individual participants. We are interested in how learning can drive change inside municipalities, in particular how micro-level factors like individual experiences in projects can subsequently shape approaches and institutional logics and structures. Returning to urban innovation, McCrory’s (2016) review of urban living laboratories and the types of learning that takes place within them identifies a similar set of levels. The living lab approach focuses on involving users as co-creators and experimentation in real-world settings (Almirall, Lee, & Wareham, 2012). There are definitions of living labs both as a design research methodology (Dell’Era & Landoni, 2014) or organizational structure (Voytenko et al. 2016), and living labs are often permanent entities organized by a dedicated organization or local stakeholder ecosystems that host projects in a specific area of innovation. McCrory (2016) views learning as a central component of the urban living laboratory approach and, whilst not interchangeable with collaboration, finds that it tends to be linked to either the group, an organisation, or society more generally. Where experiential learning is a shared experience, it can lead to social learning, which is an important step to what he calls transformational learning. Combining these insights suggests a sequential process through which learning can drive organisational change, although McCrory stops short of considering how this enables broader urban transformation.

To summarise, the literature on urban experiments tends to neglect the specific processes through which learning takes place, while work on organisational change and learning tends to stop short of showing how these processes enable material transformation. By focusing on how experimentation changes municipalities this article aims to bridge these two perspectives. The final point to consider here concerns the degree to which municipalities are a special case among urban organisations. Our focus on urban transformation through experimentation naturally leads us to focus on municipalities, as they play a central role bringing organisations into partnerships to address urban challenges through project-driven approaches (Karvonen, Cook, & Haarstad, 2020). In their study of the role of municipalities in urban living lab projects, Kronsell and Mukhtar-Landgren (2018) identify them as occupying three possible roles: promoter, enabler, and partner.

As with all organisations it is important to note that municipalities comprise a range of functions and divisions, and may occupy different roles sometimes in the same project. Similarly, municipalities differ in terms of their structures, cultures, and powers across different national contexts. Clearly, though, municipalities have governmental capabilities and powers that other urban organisations do not, and are rarely ‘just another partner’ in urban projects (Jones & Evans, 2006). We are explicitly interested in municipalities as enablers who play a central role in developing and executing innovation projects. Their enabling role means that changing how municipalities operate, specifically making them more effective at experimenting, represents a large potential gain in terms of accelerating urban transformation. That said, the arguments concerning the importance of learning from experimentation and subsequently transforming organisations hold in principle for a range of different types of organisations that commonly engage in urban experimentation, from companies to charities to universities. We return to this point in the penultimate section.

3. Methodology

While most approaches in the field consider learning from urban experiments to be important to broader transformation, this is often considered at a relatively abstract level and neglects the empirics of how this plays out in practice. This oversight resonates with our own experiences leading monitoring and assessment for an urban innovation project called *Triangulum*, a EU H2020 funded Smart Cities and Smart Communities project which ran from 2015 to 2020. At the start of this project, partners were focused on the technical delivery of their projects, but from two years in they began to talk about the challenges of partnership working and how they were learning to do things in more innovative ways. This was especially the case for city coordinators, who were increasingly concerned that while such learning was the most valuable outcome for them it was not being captured within the formal project. Through a series of workshops and focus groups we explored this to understand what this learning was, how to capture it, and what it meant for cities. In this sense, the topic of municipal learning was co-produced with city coordinators, and we adopted the model of co-production to conduct the subsequent research. Co-production is increasingly common in urban research, especially with municipalities (Simon, Palmer, Riise, Smit, & Valencia, 2018). Including participants in designing and shaping the research led us to a practical and experiential focus, and we adopted a transdisciplinary approach that was led by the research participants (Doucet & Janssens, 2011). The resulting concept of process learning is an attempt to capture a phenomenon that bridges the practice of experimentation, organisational learning, and urban transformation.

The EU’s H2020 Smart Cities and Communities urban innovation programme makes a valuable case study to

understand the links between urban experimentation and broader transformation. It is long running, having been established in 2014, which means that it is possible to study outcomes and reflect on the experiences of those involved. It is also exceptionally wide ranging, covering all countries eligible for H2020 funding plus observer countries from outside of the European orbit, and involves public bodies, private companies, third sector organisations, and communities. Although focused on testing smart solutions in real urban settings, the goal is to achieve more sustainable cities and the technologies range from energy and ICT through to buildings and mobility and are intended to be monitored in relation to a series of technical, social, economic, and environmental factors. It is also the largest single funding programme in the world focused on urban research and innovation, and has played a substantial role in shaping the ways in which European cities are approaching sustainability (Haarstad, 2017). To date, nine projects have received a total of €210 million funding, including €25 million for the *Triangulum* initiative. Perhaps most importantly, the H2020 Smart Cities and Communities programme explicitly focuses on funding demonstration projects to prompt broader transformations of cities through what is called replication, meaning market uptake of sustainable innovations across European cities and beyond. This is significant because project partners have first-hand experience trying to use individual demonstration projects to promote broader change. Working with coordinators from Eindhoven, Stavanger, Manchester, Leipzig, Prague, and Sabadell on the *Triangulum* project it became clear that they play a key role in urban experimentation and transformation. Municipal project coordinators design and implement large-scale urban innovation projects and coordinate large public-private partnerships to deliver them. Most importantly, many have long track records of involvement in urban innovation projects that represent an exceptional repository of knowledge relating to the challenges of translating successful projects into broader changes. Finally, this group seems to be less visible in existing research on urban transformation.

In terms of data collection, we hosted four workshops with municipal coordinators involved in *Triangulum* between 2016 and 2019. A survey was administered online at the start of the fourth year of the project to identify key outcomes for all project partners including but not limited to the city coordinators. This survey focused on a broader range of processes relating to learning, including data sharing and use for example, but also asked about city-level learning and what kinds of approaches were most effective for sharing knowledge and learning between partners. This survey was followed up with semi-structured interviews with project partners to focus in on the challenges of promoting city-level transformation. Two facilitated workshops explored these issues in more depth. The first was delivered with the *Triangulum* partnership, bringing together coordinators from each of the six cities involved. A second

workshop, advertised to all nine H2020 Smart Cities and Communities projects, focused on project assessment. It was hosted at the University of Manchester with participants from five other projects, including city coordinators, academics, and other smart city professionals. These projects represented approximately 120 partner organisations working in 30 cities across Europe to demonstrate more than 100 new technologies in real world settings. They also comprised more than €150 million of research and innovation investment from the EU and partners. Every project team agreed that the most important outcomes of the projects related to learning how to experiment more effectively, but that these outcomes were not being captured by formal assessment and evaluation activities. The level of consensus among participants is noteworthy given differences between the municipalities involved and the challenges pertaining to innovation in different sectors. Data collection was completed by seven in-depth interviews carried out remotely in May and June 2020 with city coordinators recruited through earlier workshops (three from *Triangulum* and four from other H2020 projects). The focus of these semi-structured interviews was to add further depth and rigour to the findings from the facilitated workshops, and all were digitally recorded with permission and fully transcribed to preserve participant anonymity. The qualitative results from the interviews and the workshops have been thematically analysed to identify key themes, commonalities, and differences in opinions across the interviewees and workshop participants.

Overall, this article is based upon four years of in-depth research co-produced with coordinators from five of the nine projects that make up the world's most concerted effort to date to seed urban transformation through place-based innovation projects. The draft paper has been shared with participants as part of the review process to continue the process of co-production, and co-authored with one of the city coordinators with whom these ideas have been discussed since 2016. We now turn to the findings and develop the concept of process learning as a key link between urban experimentation and transformation.

4. Urban Innovation: Reinventing the Wheel and the Need for Effective Experimentation

When asked about their motivations for developing urban innovation projects, our interviewees positioned their innovation projects as an opportunity to invest in city infrastructure and improve the life of their citizens rather than as experiments. As one UK coordinator put it, “when you come at it from a city perspective, you wouldn't necessarily look at it as an experiment. You'd look at it as an opportunity to get some cash to do stuff.” An experienced city planner from the Netherlands shared a similar view, saying “I don't think many cities now really see it [sic] as experiments, the

economic situation out there is such that they are having to show the real value, not doing experiments for experiment's sake.” But while city coordinators did not see their pilot projects explicitly as experiments, they were trying to learn things—most importantly how to implement new solutions at scale. While broader studies have concluded that broader transformation is not a self-evident goal of urban experimentation (Kivimaa et al., 2017; Laakso et al., 2017), for our interviewees it was. A UK coordinator stated, “the real reason to do it is that it's supposed to act as a catalyst to effect city wide change rather than just filling in a bit of a gap on the map.” According to one Finnish coordinator, “demonstration projects will be kind of examples that this is possible, concrete examples for other stakeholders and also inside the city organization.” Interviewees also identified the need to better design projects to promote local uptake and agreed that an experimental focus would have greatly enhanced their ability to deliver this goal. In terms of project design, interviewees highlighted the need for better ways to find about the results from previous demonstrations. As one Dutch coordinator put it, “if you don't know it, you can't read about it and you will start reinventing the wheel again...You could do it much more scientifically.” Our interviewees noted that there is very little learning from elsewhere or use of evidence when designing specific projects. The Dutch coordinator went on to suggest anecdotal evidence tended to inform choices about what to focus on rather than systematic review: “It was not a controlled search for projects that were done before and then analysed and said ok what are the lessons learned if you would take these good examples from the period 2006 to 2012.” When learning and inter-city exchange took place, it was based on personal experience and contacts. Individuals learn by taking part in projects and then try to implement their know-how in subsequent projects and persuade others in the city or elsewhere, without frameworks that would help them to store, analyse, and share the insights in a more organised way. Funding opportunities, policy, and local plans provide the context for urban innovation, but specific projects tend to be initiated by entrepreneurial city coordinators. As one UK city coordinator noted, “predominantly it's quite often an individual who's a little bit of an entrepreneur, a bit of a maverick, and prepared to chase the funding.” Consortia are built on existing relationships and personal links, and ideas for specific interventions are largely driven by local partners.

Better experimental design to learn from previous demonstrations would enable more effort to be focused on filling key evidence gaps. Scholars are calling for unification of real-life experimentation approaches that would enable better comparison between cities (Robinson, 2016). In environmental sciences, unified approaches have been proposed to design coordinated distributed experiments that would enable to test solutions in different environments (Demuzere, Bechtel, & Mills, 2019; Fraser et al., 2013). Laakso et al. (2017, p. 6)

make a similar argument that it is important to understand the “aims and goals of an experiment, but also the ways the experiment is related to the other experiments and their outcomes...especially at the local level, where a lot of different, overlapping experiments are conducted simultaneously.” Demonstration projects are by definition usually deploying technologies at higher technology readiness levels with a large body of existing technical evidence concerning their performance. More often than not, demonstration projects simply repeat assessments of technical performance and fail to fully address the range of social, political, and economic factors that determine its ability to be adopted more widely. For example, existing e-cargo bike interventions have demonstrated demand for inner city delivery from businesses using a leasing model, and proven carbon savings and operator satisfaction. An individual city developing its own e-cargo bike project may decide not to experiment with leasing or purchasing, and not to monitor km travelled or operator satisfaction. They may instead focus on secure bike storage and maintenance services and identify what skills and organisational changes are required for such a scheme to be adopted by key stakeholders in their city. In relation to ensuring the replicability of urban innovations, it makes better sense to test a similar technical solution with similar stakeholders in similar cities in different countries than to test different solutions with different types of stakeholders across different urban contexts. While demonstrations, pilots, interventions, and so forth are often used interchangeably in both policy and practice, each indicates a subtly different end goal. In that pilots are concerned with finding a route for others to follow they would logically follow on from demonstration projects that seek simply to show something works.

It makes intuitive sense to describe past projects more analytically and store the evidence in a database so that it is easier for cities to access previous results and design interventions that build on past work (Sengers et al., 2016). The EU’s Smart City Information System used templates to capture impact evidence from all smart city interventions funded through the H2020 programme, while private sector initiatives like Babel host business cases based on impact evidence and financial performance. Such attempts have met with limited success. Speaking about the European Commission, the Dutch coordinator stated that although “they have spent so much money...they cannot get the cities to tap into that knowledge base....It seems too difficult. It seems that everybody starts from scratch.” The broader funding environment contributes to this oversight as it uses specific projects to drive market replication, overlooking the political context within which organisations adopt solutions. Initiatives like Smart City Information System and Babel that seek to provide comparable technical summaries of different technologies struggle to capture the governance context within which projects took place, or how organisations must change to enable different kinds

of innovations to be successfully adopted. As one city official asked:

We’ve done all these demos [projects], what have we learnt?...We’re doing all these experiments and we know the technology is going to work, but it’s the actual operation and commercialisation that’s stopping it happening at a bigger scale....Can we design a demo [project] to focus on the scaling, not the technical [performance]?”

Cities do experiment and learn, but implicitly and without a clear methodology or dedicated resources for capturing learning. Significant time and resource are wasted reinventing the wheel, often repeating tests of technical performance, at the expense of learning how to change. The next section looks at how cities learn to experiment more effectively.

5. Process Learning: The Missing Link

The most important benefits from involvement in large-scale urban innovation projects identified by city coordinators concerned how to undertake experimentation. As a UK coordinator put it, “a lot of the lessons that we’ve learnt are how not to do it again.” Similarly, a Finnish coordinator noted, “I learned everything from zero....I know there have been similar projects before but nobody ever collected the basic information the basic steps—what is needed, who to contact....I am amazed that nobody ever invented the basic thing that you should really document also [sic] the processes.” Coming to the end of a five-year H2020 smart city project, another coordinator noted that:

Processes are what we know so far, the data is a little bit inconclusive and hasn’t had the full evaluation that’s probably required for us to be able to use that effectively, but in terms of processes [we know] what works and what doesn’t work.

A UK coordinator went further, suggesting that while their smart city project appeared as a set of technological pilots, it actually constituted a “deep examination of their municipal processes” and systems of organization within the city. This type of result from projects can be called process learning, whereby organisations learn new processes that enable them to experiment more effectively. Ensuring that individual experiences are captured as learning and embedded into organisational processes was identified as a key priority by coordinators. Learning most commonly started with individual experiences among those directly involved in projects. City coordinators understood the importance of ensuring continuity of staff between projects to retain learning, and highlighted the importance of sharing these insights across departments. As one UK coordinator noted, “we try to make sure those lessons and processes are continuing through

to other departments.” A common insight involved translating the results from individual projects into the day-to-day operations of cities through including operational units in innovation projects. The nature of urban innovation is such that “the people that have set up some of these cities, the mavericks, it becomes their little project and they aren’t the right people necessarily to be able to take it to that commercialisation and scale.” One example given was that a project on active transport needs to include highway engineers if specific project results relating to things like cycle infrastructure are to result in changes across the city. Clearly this becomes more challenging the larger and more byzantine a municipality is.

Coordinators highlighted different ways in which they were embedding lessons into their organisations as new processes. In Leipzig, lessons related to the need to enable collaborative working with organisations from across the city and provide platforms to enable data to be exchanged between different siloes within the municipality. These were embedded as organisational change through the creation of a cross sectoral Digital City Unit, which has subsequently rolled out city-wide policy and strategy. Stavanger similarly created a smart city office, and Sabadell recognised the importance of being able to bring different parts of the municipality together and created an over-arching smart city platform. In this case, learning how to experiment more effectively created new processes that were embedded as organisational change and have subsequently accelerated urban transformation. More than three quarters of the coordinators highlighted the importance of changing structures to enable collaboration within municipalities. As one German coordinator put it, “you need a change of the mind-set and that you need to change structures within the municipality, how municipalities are working together....For example, E-mobility we are not responsible unit within the city so I can’t just carry out the project.” In other cities, process learning occurred through cultural rather than structural change. Softer approaches involved convincing city administrators of the benefits of innovation, and embedding principles and normalising new ways of working. Eindhoven created ambassadors within their organisation who were involved with the project but based in other departments to act as “the stepping stones” leading from the project to a broader change in culture and governance. The Prague coordinator developed training and a public exhibition of work to drive broader cultural changes within the municipality derived from the practical experience of doing things in a different way through urban innovation projects. Similarly, the Norwegian coordinator noted that the change of mind-set among local politicians derived from the demonstration of a “new methodology” to achieve the city’s goals. A final example from the UK involved working with external agencies, in this case the UK Design Council, to develop a structured project development approach that could then be rolled out within relevant departments. As these exam-

ples show, the concept of process learning provides a way to understand how individual and group learning can be translated into organisational change, ranging from training and cultural messaging to the adoption of new tools, to actual changes to the structures of organisations. Alternative approaches to process learning reflect different municipal structures and bureaucracies. For example, smaller cities like Stavanger and Sabadell are often more easily able to work jointly across their operations, and create new structures to enable this. In each case the municipality itself was strongly engaged in the project. Larger cities like Prague, which are split into relatively autonomous districts, tended to rely more heavily on culture change and influencing local politicians, and are often represented by a part of the municipality specifically engaged in innovation.

Process learning enables physical transformation by changing organisational practices that commonly prevent new solutions being adopted at scale (Smink, Negro, Niesten, & Hekkert, 2015). One of the UK coordinators described the challenge of deploying a smart grid that was designed to share energy across the estates of three different organisations. The key barrier was the lack of contractual framework to govern shared control of the system, including risk and liability in terms of failures and outages, and legacy costs of maintenance. This work stream spent four years out of a five-year project resolving contractual and trust, rather than technical, issues. These challenges relate to organisational structures and practices, and unblocking them requires new processes to enable deeper collaboration. As one Dutch coordinator recognised, “technologies do not operate in a vacuum.” By bringing cities into contact with new technologies, experimentation enables different organisations to understand how they need to change in order to accommodate an intervention. Organisations need to change if they are to accommodate new solutions at scale and be physically transformative (Bulkeley, Castán Broto, & Edwards, 2015), and in this sense urban experiments are inevitably governance experiments even if they are not conceived as such (Rocle & Salles, 2018). Given this fundamental tenet of the socio-technical approach, it is perhaps surprising that more attention has not been paid to the ways in which organisations need to reshape themselves in response to material interventions, whether they be e-bikes, smart grids, or sustainable logistics hubs.

6. Taking Learning Seriously

Process learning was simultaneously highlighted as the most beneficial outcome for cities involved in urban innovation projects, and yet it is almost entirely absent from official project monitoring and evaluation. One problem is that it is simply assumed to happen. When asked about the importance of organisations learning to do things in new ways, one senior figure from an EU funding body simply stated that they expected learning to

“happen anyway.” As a German coordinator of two consecutive H2020 projects stated, “I think it is still a little bit underestimated....We really didn’t have the chance to really talk about the city situation in each city on the official agenda.” While there is increasing recognition in the literature that progress cannot be assessed solely by specific measurable results like reductions in carbon emissions (Laakso, 2017; Mickwitz, Hildén, Seppälä, & Melanen, 2011), innovation in practice is increasingly driven by quantifiable key performance indicators capturing direct impacts. When it comes to scaling up and broader urban transformation, a narrow focus on market-driven replication hides the range of processes that are required to articulate technical solutions into different urban contexts. Funding schemes position commercial markets and technical performance as the motor of change in cities, but pay little attention to how cities develop new organizational processes. City coordinators learn that replication is not so much about technical performance but the approach to smart city governance that enables them:

The devil isn’t so much in the technology—you can get it working—but the devil is in the stakeholders....We never bothered too much with these questions and for me, these questions are really essential and this should be the start.

As a German city coordinator noted:

You have to understand what the background of the city is and what is their framework they are working in. It’s not just writing the template for use cases and “handing” them over to another city and then they can do it.

The realisation among city coordinators was that this final step required “another way of looking at municipalities and local government” that goes beyond policy papers and business models. The concept of process learning can support this area of work by showing how specific projects can drive new municipal governance models. One coordinator spoke of the need for new “city models” that present evidence-based cases for changing how municipalities operate. McGuirk, Dowling, Brennan, and Bulkeley (2015) identified a similar process in relation to carbon management in Australia, whereby cities were using urban experiments to test new governance practices and partnerships. The idea of city models is closer to the notion of urban transformation that our analysis has generated, based on a model of organisational change driven by successful innovation projects. In terms of rapid urban transformation, understanding the evidence for and value of new city models represents an important future area of research (Grandin et al., 2018; Sengers et al., 2016).

Learning from other cities was identified as a critical prompt to change organisational practices and cul-

ture. For example, “seeing how other cities approach things and how they think—seeing [your] counterpart and how they react—normalising things” was identified as key. As one coordinator from the UK stated, “face to face sharing and learning is huge....Those things I think are invaluable and I really don’t know how you measure it.” She went on to give a concrete example of how their city learned from others with a strategic unit dealing with smart city and digital transformation issues to develop their own equivalent unit. Learning between cities provides space for:

Those who are of the mind-set that they don’t want to stand up all the time on a smart city expo platform and say how wonderful they are, they actually want to sit in a room and solve the issues and talk more openly.

The lack of attention paid by researchers to city-to-city learning may reflect a bias in political science approaches that primarily view individual interventions through the lens of scaling up or impacting higher levels of policy making. Focusing on learning within and between cities suggests a flatter set of relations, whereby “a variety of agencies are involved in allowing relatively localised interventions...to travel from one place to another, or become implemented across a wider variety of territorial and governance contexts” (Bouzarovski & Haarstad, 2019, p. 265). Interviewees identified the importance of sharing between cities across the whole project life-cycle—before, during, and after projects. Rather than cities each trying to do this with increasingly stretched resources, new governance arrangements are required to pool resources and expertise. Coordinators identified working with standard setting organisations, forming networks, and adopting a lead/follower model as other strategies to enable city-to-city learning.

Governance arrangements with the ability to organise innovation in specific city-regions are critical to facilitate broader uptake of new solutions (Kroll, 2015). Examples include Regional Innovation Councils in Norway, or in relation to health, Medical Innovation Centres in the Czech Republic. These governance arrangements bring cities, universities, NGOs, and businesses together at the regional level to promote innovation. Coordinators identified this direction of travel, pointing to emergent initiatives like Eindhoven Brainport and Stavanger Smart Region. Although in their infancy, such arrangements should enable the design of more effective innovation projects by marshalling existing evidence and previous local experience in a systematic fashion. Partners would not need to reinvent the wheel in terms of collaborative processes and relationship building, and would be able to more easily contribute their expertise. Further, such arrangements would support trans-local networks to effectively share insights between cities (Bouzarovski & Haarstad, 2019). Taking one element of the quadruple helix, local universities would be ideally placed to curate the knowledge base

on local demonstrations and lessons and set it within its global context. The question of how universities are fulfilling this kind of role more effectively has begun to receive attention (Cocchia & Dameri, 2016; Karvonen, Martin, & Evans, 2018; Trencher, Bai, Evans, McCormick, & Yarime, 2014; Trencher, Yarime, & Kharrazi, 2013), but the practicalities of how these experiences can more effectively drive organisational change in the sector has not.

7. Conclusions: From Experimentation to Transformation

Our findings show process learning is necessary to translate successful urban innovation projects into broader transformation. Process learning involves learning to experiment more effectively and embedding new processes into organisations to enable them to change how they engage with cities. Capturing such learning is hard (which is why it has not been done), but important. The concept of process learning informed the European Innovation Platform for Smart Cities and Communities Smart City Guidance Package (Borsboom-van Beurden, Kallaos, Gindroz, Costa, & Riegler, 2016) and the challenge of capturing it has been taken up by the European Smart Cities and Communities task group on monitoring and evaluation. While city coordinators were loath to call their projects experiments, they recognised that a more explicit consideration of experimental design would generate more focused evidence to drive local uptake. The curation of local expertise, evidence, and experience as well as coordination across different cities and countries could be done more efficiently and effectively by broader, regional governance arrangements. Ideally, this would entail dedicated professionals focusing on designing experiments to drive transformation and capturing, sharing, and applying the resulting lessons.

Our analysis holds five implications for urban planning and innovation funding. First, municipalities need to capture learning to transform their operations. From a funding perspective this involves recognising business models are only part of the solution and include explicit requirements to justify the selection of innovation projects to test new governance models, and require work streams to robustly assess failures. Second, monitoring and evaluation should use qualitative methods to capture process learning and organisational change. A broader approach may mitigate the dangers of narrowly conceived technology projects reproducing or exacerbating existing inequalities and power imbalances (Cowley & Caprotti, 2019). Capturing impacts is important but, as many urban funding programmes have found, positive impacts do not necessarily stimulate broader change. Third, funding before and after innovation projects would support more effective experimentation and leverage value out of completed projects in terms of ensuring process learning is captured and shared. Fourth, funding may need to migrate from

the project level to the (city-)regional level in order to support regional innovation partnerships and efficient and effective innovation ecosystems. For municipalities, such umbrella networks would generate useful and transferable evidence and lessons, but require a shift towards a more formal model of inter-city collaboration. Universities and research institutes have a role to play here, and it is useful to ask how they might change more fundamentally in order to enable more effective transdisciplinary knowledge co-production. Finally, while the overall findings of this article are remarkably consistent across different kinds of cities and municipalities, the details of exactly how municipalities are structured, the powers they have, and the local governance arrangements in which they operate clearly shape how they engage in experimentation and the degrees of freedom they have to subsequently change. Understanding and capturing the dynamics of municipal transformation presents an important topic for further study.

Overall, our findings highlight an intriguing tension. The goal of urban innovation is to stimulate the transformation of cities, but little attention is paid to how innovation changes the organisations that make them up. We have focused on municipalities as the central players in urban innovation projects, but the point extends across the range of organisations that make up the quadruple helix. Organisations must change in order to be able to make use of new technologies and enable their uptake, otherwise even highly successful technical demonstrations will remain stranded. That we argue for a greater role for municipalities may not be surprising given our focus on city coordinators, but this emphasis should be set against the reality that market-driven models of urban transformation have not fully delivered the required rate of change over the past decade. Our cities still need transforming and the problem of why even successful projects tend not to be taken up widely has not yet been solved. Funding bodies and companies have underestimated the importance of organisational transformation as the twin of physical transformation. In many cases they have simply assumed that organisations will change. Evidence from more than two decades of significant investment into urban innovation suggests that they do not. The process by which municipal organisations learn and change is surely a key ingredient of urban transformation and should be considered more centrally by funding instruments and researchers.

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Conflict of Interests

The authors declare no conflict of interests.

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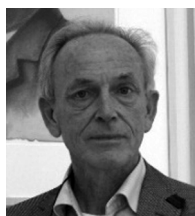
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