

Exploitation as innovation: research ethics and the governance of experimentation in the urban living lab

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“Experimentation has a life of its own.” Ian Hacking (1983: 23)

Abstract

As data technologies become the medium of experiment for living labs, they become less a collaboration between citizen and researcher and more a test of how commercial actors can influence the public. Two new practices suggest we should apply research ethics rules: first, that the experimentation taking place does not aim to test technology using people, but to test people using technology; and second, that such experimentation is explicitly designed to understand how the population outside the lab can be influenced and manipulated, and therefore has a political character that research ethics can give us some leverage over.

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Introduction

Cities have always been sites of experimentation and innovation. With the advent of datafication, however, the city has taken on a new role as the space where technology can be tested and developed on, and for, different publics who themselves can be tested, monitored and influenced. The European Network of Living Labs (ENOLL) has 140 members worldwide on five continents,¹ though this is just a microcosm of a larger landscape. In this landscape labs may take the shape of a whole city, as in Abu Dhabi’s Masdar, or of a local experiment that is not defined as a lab, such as Alphabet’s Sidewalk Labs project to build a new data-driven urban neighbourhood in Toronto (New York Times, 2017) or Uber’s ‘testing’ of automated vehicles on the streets of American cities (San Francisco Chronicle, 2018). The range of objectives and practices involved in these experiments is so huge that a useful taxonomy would be difficult to achieve. They could be described as a new evolution of urban planning, where the availability of sensing technologies, including citizens themselves used as sensors, enables the testing of new initiatives to become more continuous, granular and immediate. The new technological experimentation taking place in cities has as much of a commercial as a public interest logic, and involves partnerships where city authorities, rather than driving the innovation in question, may be contractors, interested bystanders, or – in some cases – landlords renting ‘their’ urban space in return

¹ <https://openlivinglabdays.com/about-us/>

for a good deal on a new development or system, or in return for the brand of an innovation- or business-friendly city.

Urban geography has largely assessed these processes of testing and innovating using 'live' publics as a necessary step in understanding the possibilities technology offers for urban development. Evans et al. (2016: 2) describe urban experimentation as 'a framework within which to arrange instruments, materials and people to induce change in a controlled manner, and subsequently evaluate and learn from those changes.' As a description of the way in which urban developers and authorities attempt to stimulate innovation this is accurate. However it does not offer a critical account of which actors are doing the arranging, the evaluating and the learning. In the datafied city, as the civic resistance to Alphabet's Toronto project has demonstrated (Bliss, 2019), it matters who is in charge of the experiment. In other domains than urban development, however, this has always mattered. Our rules for experimentation in research, and clinical research in particular, were formed through human catastrophes. The struggles occurring at the time of writing in Toronto, and the critical responses to the development of smart cities all around the world (Datta, 2015; Greenfield, 2013; Monahan, 2018; Wood, 2016), demand an analysis of power, and of the particular features of power at the public-private intersection (Author, 2015).

What is missing so far, however, is an interrogation of urban experimentation that takes seriously the issue of research on human subjects, and asks what norms, rules and boundaries are appropriate. This is part of the agenda of Critical Data Studies, whose aim is to 'contest the creation, commodification, analysis and application of data' (Author et al., 2016) through an understanding of its power and politics. A critical approach can surface how systems are being used, for example, to create financial efficiency at the expense of due process for the vulnerable (Eubanks, 2018); to test out new technologies such as automated vehicles in ways that pose real risks to people in the street (San Francisco Chronicle, 2018); to commercialise what was previously public territory (New York Times, 2017); or to nudge city-dwellers into different patterns of behaviour (Galič, 2019). In the industrial design and technology literature the language of citizens as 'users' and the celebration of 'disruption' in relation to various effects of the living lab is common (Brankaert & den Ouden, 2017; Burbridge, 2017; Laurell & Sandström, 2016). Is being 'user-centric' (Bergvall-Kåreborn et al., 2009) the same as being beneficent, however? And what should we make of an experiment that aims to disrupt governance, institutions and social behaviour?

Testing ways to influence the public is not the aim of every living lab: some aim to understand, for example, how different ways of designing public space or infrastructure can help the handicapped navigate the city (Sainz & Bustamente, 2014), or to surface citizens' subjective needs in relation to city infrastructure (Juujärvi & Pessa, 2013). These labs experiment on things, using people. But instances where people themselves are the experimental subjects, rather than the technology, suggest that we need to have options for regulating such experimentation. This moves us into the sphere of justice and ethics rather than innovation and economics. With impressive foresight, Powell and Vasudevan encouraged geographers in 2007 to pay attention to 'how the spaces of scientific activity might be best conceptualized and addressed' (2007: 1790), identifying 'a pressing need for investigation of the provenance of the experiment.' (2007: 1792). This suggests that one route to address new forms of exploitation through living labs is to use a Critical Data Studies approach to theorise 'the spatialities of science' (Powell & Vasudevan, 2007) in a way that incorporates considerations of research ethics as a tool for addressing experimental injustice.

In this paper I will interrogate the composition, objectives and ethics of a new class of living labs which are currently visible evolving in the Netherlands. I will use a research ethics lens to understand the implications of the normalisation of public-private space and practices such as hyper-nudging (where infrastructural or behavioural interventions are devised and tested using real-time data emitted by the people experiencing them). As urban experimentation becomes simultaneously more prevalent and less visible to the public, research ethics can help us ask what kind of power is being exerted through experimentation.

The literature on the ethics of living labs is thin, mainly because they are not usually addressed as either research or experimentation. Despite the title of 'laboratory', research methodology for living labs is not codified in the way it is in other scientific contexts. This may be because of the central role of commercial actors who are regulated differently from researchers. A scan of the literature on experiments in cities is rich with examples of public sector experimentation facilitated by private-sector technology, where city-dwellers' role is often framed as 'citizen participation' rather than that of the research subject. This framing of living labs as doing collaborative development rather than research – whether that is the testing or demonstration of particular products or systems, or of a particular approach to a problem – means that so far considerations of research ethics have largely gone missing.

The paper centres around a case study: a planned living lab in the Netherlands which presents itself as a place of full-service techno-social experimentation where residents are invited to give up unprecedented levels of information about their lives. Based on communications with, and from, the designers of the lab,² I will explore the idea of the urban living lab as an explicitly experimental zone, and will outline the case for a research ethics approach to governing this kind of experimentation. This exploration will be based around three main questions. First, what kind of experimentation do the designers of the new generation of living labs see themselves as engaged in? Second, what kind of obligations on the part of labs towards their human subjects are implied by that experimentation? And last, what does this mean for the governance of living labs by city authorities?

[The Brandevoort II living lab: a city neighbourhood as experimental enclosure](#)

In Brandevoort, a neighbourhood in the municipality of Helmond, near Eindhoven in the eastern Netherlands, a living lab is being built at the time of writing. The lab, run by the Brainport Smart District project, is known in the planning stages as Brandevoort II to distinguish it from the existing community of Brandevoort. The lab will be a series of collaborations between the project (a public-private initiative including regional and city authorities and technology companies) and external actors who will use the lab as a testing ground for the technologies they are developing. The Brandevoort II community is envisaged, as of 2019, as consisting of a hundred newly built houses where a demographically representative sample of Dutch families will be selected to live at a huge discount on their rent, in exchange for data about those people's activities and behaviour. People will be able to exchange for rent data on their social media activity, their television viewing and internet use, and their movements and activities within their houses, translated by various sensing devices such as smart televisions and

² The empirical research in the paper is drawn from personal communications in meetings and unpublished materials shared in the region to explain the project's aims, as well as public statements from the project's leadership.

other connected objects, wearable devices that track behaviour, and cameras in the living spaces. The lab's developers plan to make discounts on rent proportionate to the amount and intimacy of data shared (Financieel Dagblad, 2019), with limits – in one conversation an official from the project voiced the concern that people might attempt to 'share too much', for example data from bathrooms or bedrooms, if stimulated sufficiently by financial incentives.³ The experimental zone covers the entire neighbourhood: the streets will feature lampposts hung with sensors including wifi to capture passing phone traffic, and automated vehicles will be allowed on the streets. The neighbourhood health clinic will also be 'connected', so that information can be compared between people's worn sensing devices and their health checks. The University of Tilburg, also situated in the province of Brabant, will use the lab to conduct research on people's interactions with local authorities and with each other, including research focusing on the interaction between ethnic groups in the neighbourhood.

The Brandevoort II site, on one level, is a purely commercial experiment. There are 19 commercial actors named in the developers' presentation (UNsense, 2019), ranging from supermarkets to makers of geolocation systems for automated cars. The main media partner is Talpa, the media conglomerate responsible for originating the 'Big Brother' television series. Other partners include one of the Netherlands' biggest health insurers, power companies, lighting specialists and Apple. It is also marketed as an experiment in nudging: the city authorities plan to draw information from the project about how to make people behave in a more environmentally sustainable way by testing their responses to different technologies, such as automated cars, in a neighbourhood setting.

What does it mean, though, to call Brandevoort II a neighbourhood? The rhetoric of the lab developers and the Brainport corporation (Financieel Dagblad, 2019; UNSense, 2019) mainly conveys economic motives: the project's materials and the public presentations speak of profitable 'data-driven innovation', but the language of experimentation is also prevalent. The project will improve its inhabitants' 'physical, mental and social health through adaptive, resilient and future-proof design' (UNsense, 2018, author's translation).⁴ This will be achieved by motivating people to change their behaviour to view data about their personal lives as tradeable, an 'alternative economic model' that will have the effect of 'enriching the socially relevant discussion with economic returns' (UNsense 2019). The leaders of the project note that a meta-experiment will be taking place to see whether people can be persuaded to treat their activities and behaviour as tradeable goods.

In the sense that people will live there in houses, Brandevoort II will be a neighbourhood. But it is designed to be other things as well. Some of these things are explicit: it will be a laboratory where behaviour can be studied and manipulated under controlled conditions, and a testing ground for new systems, devices and products. Some, however, are implicit: the village will also be a showcase to market those new systems and products; it will be a site for the development of new research and data analytic techniques; and it will be a data marketplace where the lab's owners and operators broker the data of its inhabitants for consumption elsewhere. Peter Portheine, a member of the provincial council for Brabant, where Brandevoort II will be situated, told the press: 'we aren't just doing safe things here, we are experimenting too. Otherwise you never get disruption.' What exactly Brandevoort II is designed to disrupt is the central question of this paper.

³ Personal communication.

⁴ All documents about the Brandevoort II lab in this paper are translated by the author from the Dutch.

Does a living lab conduct experimentation?

The leaders of the Brandevoort II project are clear that the settlement is a living lab. What this means in terms of experimentation, however, deserves some attention. The literature on urban experimentation shows a broad spectrum of types, from bottom-up citizen initiatives such as the urban garden planning experiment in Kreuzberg, Berlin (Wendler, 2016) at one end to direct attempts to influence behaviour in particular pre-defined ways, including the commercial (e.g. Galič, 2019) at the other. The citizen-driven end of the spectrum raises few ethical issues about power and experimentation, since initiatives are genuinely collaboration with local residents. At the opposite end of the spectrum, however, sits a type of top-down urban experimentation that has characteristics of both academic and clinical research.

There are (at least) two distinct literatures on urban living labs. The first derives from human-computer interaction and innovation studies, and describes the people who experience the work of the lab as 'users', 'end-customers' or 'consumers' (e.g. Kviselius et al., 2008). The second is from urban geography, and largely focuses on people as residents in the experimental zone who may be involved in the experiment, but are less subjects than participants. This second view underlies Marvin and Silver's taxonomy of urban living labs (Marvin & Silver, 2016: 52), which cites four different logics: economic growth, pursued through neoliberal experimentation around sustainability technologies; academic knowledge generation regarding urban futures; modelling and testing new applications such as sensors and apps; and finally post-capitalist experiments which aim to find non-market ways of addressing sustainability questions. The authors note that these logics may overlap. Experiments are frequently collaborations between city authorities and commercial partners, where in many cases a living lab is a space carved out from the public rules and norms of the city to provide the lab's users with the opportunity to test out new systems or products on the public, who may or may not be aware of that testing. This type of lab is modelled as much on the notion of commercial research and development as it is on urban development, and the research conducted there often has a clear commercial objective.

What all these types of living lab experiment have in common is that they display certain assumptions about the agency of the experimental subject. In the geography literature focusing on urban residents, as in the human-computer-interaction and innovation literature focusing on the values living labs are based on (e.g. Barcenilla & Tijus, 2012, Sainz and Bustamante 2014), the citizen is attributed value as the beneficiary of the experiment, for example the person whose city becomes more sustainable or who gains economically or political agency by being situated as a user of the experiment's results. The citizen is also situated as a problem-owner (Barcenilla & Tijus, 2012: 5261): someone who asks the scientist 'please let me ask...' and who asks the industry partner 'please let me participate', and in return is asked about their experiences and preferences. This kind of experiment, as framed in the literature, is characterised by reciprocity and common aims. If, however, we look at purely data-driven enquiry in living labs, the citizen rapidly moves out of the frame as anything but a potential beneficiary. The city authorities become the users of innovation, and the scientific and industry partners are freed from the need to ask the citizen anything: instead sensors do the job of asking and recording people's experiences and preferences, often without the conscious involvement of the people using them. In the case of the two most highly publicised Dutch living labs, Stratumseind (Galič, 2019) and Brandevoort II, the experiment's value is to a great extent based on lack of awareness on the part of the human subjects,

since if they are fully aware of the data being collected and how it is being used to influence them, they may not behave naturally and display their actual attributes and preferences.

As living labs become the main stage for urban experimentation we see research that, through the medium of surveillance and manipulation, aims to influence more intimate things: the way people move through the city, or even how they feel or behave. There is usually a claim of the public good involved: the moral agenda of the living lab is that of sustainability, of efficiency to save public funds, and public safety. Evans and Karvonen describe urban laboratories overall as ‘mechanisms that mobilize place to generate economic wealth and stimulate more resilient urban conditions’ (2014:413). This is the overarching claim of living labs: give us a space to experiment and we will deliver better, more sustainable living conditions. In the language of urban innovation, however, there is no vocabulary for the potential social cost of such experimentation.

Ethics researcher Jacob Metcalf has claimed that ‘data-intensive research is pushing the limits of established ethics conventions’ (Metcalf, 2016). Living labs are one place where we can watch this process occurring and try to understand what it means for both research ethics and urban governance. Metcalfe and Crawford have challenged the idea that big-data research can successfully conceptualise the human subject, given that to do so means to reverse the assumptions of classic research ethics. Traditionally, the aim is to guard the tangible research subject from direct negative effects, such as an adverse reaction to medication. Conversely, in data-driven research where data is collected remotely on the mass scale, for example through social media, the researcher is not making an intervention directly upon the subject and the problem instead becomes one of guarding society from harm downstream of the research (Metcalf & Crawford, 2016). Living labs illustrate this kind of ethical problem while adding a new layer of complexity: they do collect people together for intervention in exactly the way classic research ethics understand experimental subjects, yet the process of experimentation through data is ethically opaque because it is conducted through remote data collection and analysis.

Hacking (1988:153) describes experimental science as unified across the disciplines due to ‘the pervasiveness of a widely shared family of devices’ used in experimentation. Although Metcalf and Crawford make the case that the methods of data-driven research diverge from other forms of science, Hacking has a point: we can see a genealogical link with the life-science experimentation he described (1988:154) as ‘biological collaboration’ designed to surface the ‘autonomous and independent activities of nature’. We find innovation research applying this biological experimentation model to humans in the living lab: Schuurman et al. define the urban living lab both as ‘public R&D’ (2011: 10) and as ‘an extension of laboratory experiments, aiming to get more accurate and naturalistic user information by having more long-term data and allowing observation of everyday activities’ (2011: 3), a description that has much in common with Hacking’s biological model. This suggests that the subject’s unawareness is a feature, rather than a bug, in datfied experimentation.

Brandevoort II brings together four different categories of experiment: first, the classic scientific controlled experiment where the environment is created for testing how freely people will sell their data; second, clinical experiments on bodies where signals from the sensing instruments in the environment, the clinic and on people’s bodies will be analysed to understand how people respond to commercial and social stimuli; third, experiments on the collective, where people are studied as a network to see the community effects of intervention, and last, experiments in governance where the lab is also designed to produce knowledge of how the people, as a public, responds politically and

psychologically to particular interventions. If this is the new model for the living lab ('pushing the envelope', as the project's leaders call it (Financiele Dagblad, 2019), it suggests that the research ethics approach may also provide a starting point for political critique.

This is problematic, however, given that one central characteristic of the new digital living lab is the absence of claims to be conducting scientific inquiry. In the case of Brandevoort II the public-facing discourse of the project leaders primarily focuses on economic outputs: the stated aim is to commodify the subjectivity of experience, as much as to study change under controlled conditions (Financiele Dagblad, 2019). This supports the idea of adding a political dimension to an ethical critique: Pickerill (2019: 120) analyses urban experimentation as a vehicle for 'neoliberal expansion' that is not targeted at making the city safer or more friendly to its citizens, but at opening up new possibilities for the private sector, and argues that this advocates for inquiry centering on questions of politics and justice. In Brandevoort II, the lab's founders express the aim to find out whether people can be persuaded to see their personal data as a good to be traded⁵: this is the overarching research question of the lab, and it is both psychological and political. The lab will also offer space for experiments in citizenship and democracy: how people organise, how they relate to local authorities, and how they make claims where necessary about the working of the lab itself (Financiele Dagblad, 2019). Such experimentation has politics – literally, it is experimentation on the polis which aims to have effects on the way people engage with governance and citizenship.

What are the obligations implied by this experimentation?

Although the planned Brandevoort II lab takes the form of an experiment on human subjects, this does not lead to clarity about the obligations this imposes. This is because it is not established what rules commercial partnerships with the public sector should follow when they conduct research on people. The constellation of actors involved in Brainport Smart District is governmental, commercial and academic, but given that the overall identity of Brainport is as a public-private partnership (PPP), it is not clear what set of rules it should be governed by, other than law.

To the extent that the public-facing discourse of the project acknowledges risk, it is risk to privacy. The aim that 'residents of Brandevoort must continually be stimulated to share data' is followed by the claim that data will be "'anonymised'" (sic – developers' quotation marks) 'from personal to household level' (UNsense, 2019). The latter is a nod to data protection, as is the plan to conduct an informed consent process for incoming residents. The planning document cites a 'Board of Ethics' which will advise on 'data ownership, privacy, rules and possible commercial advantage for the end user' (UNsense, 2019). 'Rules' are cited by the project's leaders as concerning the risk that people will give up too much privacy in return for financial advantage and authorise data collection that is too invasive, for example by offering to place cameras in bathrooms.⁶

Data protection and privacy provide one avenue to think about this problem, but are insufficient. One central characteristic of data protection is the aim to separate out our ability to behave contractually about the data we produce from our need to protect our identities and dignity from exploitation. While the transactional component of data protection, such as in the GDPR, tells us that we may lend our data out in exchange for services, the human right to privacy that is at the heart of it states that our digital

⁵ Personal communication with the author.

⁶ Source: personal communication with project leaders.

selves are inviolable. Floridi, writing of the connection between privacy and dignity, suggests that the modern data economy demands we develop 'a philosophical understanding of human nature that is adequate to the digital age and our information societies'. For him, this is based on 'the protection of privacy as protection of personal identity: "'my" in "my data" is not the same "my" as in "my car"', he writes; 'it is the same "my" as in "my hand", because personal information plays a constitutive role of who I am and can become.' Data protection is a useful way to think about this problem in terms of the practical limiting of contracts that can be made concerning personal data, but does not provide tools for thinkig about the broader political implications of manipulating people through de-identified data, or of using the data collected on other populations entirely.

This suggests that the duty of the city in relation to the living lab goes beyond ensuring everyone involved complies with data protection regulations, and instead surfaces a broader set of duties. A living lab such as Brandevoort II has no particularly malevolent nature or objective, but the way in which it presents a packaged population for experimentation by the highest bidder recalls Kranzenberg's first law, that 'technology is neither good nor bad; nor is it neutral' (Kranzberg, 1986: 545). The lab makes it possible for people to be disempowered, and for their digital selves to be sold and re-sold, in new ways.

Although inadequate to addresss this problem on its own, data protection can tell us something about the kind of controls we might want to apply on experimentation. It shares a genealogy with research ethics for experimentation on human subjects, which have been most clearly articulated in the medical domain starting with the 1948 Nuremberg code motivated by the crimes committed by doctors under the Nazi regime. From this came the World Medical Association's 1948 Geneva Declaration and 1964 Helsinki Declaration, both of which set out the rules medical researchers should follow when conducting research on people. These ethical principles became accepted across different research domains, and today researchers conducting research on human subjects are held to the following key principles: respect for the subjects of the experiment, including their autonomy, privacy and informed consent; the balancing of risk to individuals with benefits to society (these last two also being fundamental principles of data protection); systematically selecting participants, having proposals reviewed independently; the professional regulation of researchers; and having funding depend on these ethical standards (Metcalf, 2016).

Research ethics codes have been used on the community level as tools for political leverage in situations of power asymmetry, most notably by indigenous communities that have found themselves the subjects of academic and commercial research. These community-level applications focus not only on obtaining informed consent, but on the good faith that has to accompany that process. One notable example is the South African San people's guidelines for research conducted on their communities, which demands honesty, respect, care and justice. They demand informed consent, but note that it requires 'absolute transparency in all aspects of the engagement, including the funding situation, the purpose of the research, and any changes that might occur during the process.' They state their reason for this in terms that evoke the aims of the new living lab:

'We have encountered lack of respect in many instances in the past. [...] Researchers took photographs of individuals in their homes, of breastfeeding mothers, or of underage children, whilst ignoring our social customs and norms. Bribes or other advantages were offered.' (San Institute, 2017)

The use of informed consent has been the focus of the living lab's designers during the preparation phase. However, it is unlikely that residents' consent could be considered informed due to the nature of the lab. Profiles and inferences based on data from lab residents will be used to predict and influence the general population through the work of the corporations involved. No matter how diligently the lab's authorities explain the aims of the data processing, it is unlikely they can predict how the data or profiles produced will be used in the future. One example of this is health data, classified by the law as especially sensitive and subject to special safeguards: the lab's leaders promise that they will 'protect everything that can reveal personal health' (Financieel Dagblad, 2019). However, digital phenotyping research (Venkatesan, 2019) demonstrates that health information can be extracted from a myriad of apparently unrelated data types. These data sources include social media, but also passive data collected via the use of devices, location data and use patterns from connected objects, of the kinds to be collected in the Brandevoort II lab. From sensed metrics such as keyboard accuracy, location patterns, and speed of interaction with devices, commercial health researchers can infer both an individual's state of general health, their mental health and signals of specific conditions the person may be unaware of themselves (New York Times, 2019). It is unlikely the project managers will be able to treat all these data as sensitive health data, or that residents of the lab will be aware of the state of the art in digital phenotyping, or what it can say about their state of health.

To add to the problem of informed consent, any children under 13 living in the lab will be legally unable to consent to the use of their data by the lab's corporate clients. Instead their parents will have to consent on their behalf. This will mean consenting to extensive surveillance of their children, including in environments such as the street and the clinic where they might not expect to be monitored. To do this requires an unrealistic level of certainty from parents that the lab's surveillance of their children will not be intrusive and exploitative. Residents will also be consenting to surveillance on behalf of anyone who comes to visit, whether they are a friend, relative or someone delivering a package. The sensors in the lab will not distinguish between residents and non-residents: anyone with a phone emitting a signal becomes a subject of the experiment.

This makes for a level of obligation on the part of the lab's organisers that is difficult to fulfil. If we add to this the responsibility to make sure that the uses of data are non-exploitative (including developing a definition of this), it becomes increasingly unlikely that the lab can be put into operation without creating or reproducing vulnerability. If people agree to live in surveilled space then change their minds, it is hard to see how they could withdraw from the experiment without disadvantage, another key tenet of research ethics. If withdrawing results in homelessness, or at least significant unplanned financial disruption, there is such a strong incentive to stay that it is hard to see how consent could be freely given unless a family were so wealthy that housing costs were not material. Here we find the paradox of self-selection: wealthy people are unlikely to apply for free rent in return for personal data.

A focus on data protection and privacy concerns (UNsense, 2019) is reasonable, given that data technologies are the medium of experimentation. However, this also has the effect of allowing the lab's managers to direct critics to data protection and privacy regulations as a source of protection and redress instead of addressing the politics and ethics of experimentation. If we look at the other issues in the framework of research ethics, going beyond informed consent and privacy to the regulation and review of research projects, we are in murkier territory. In data protection the subject is conceptualised as autonomous, aware and able to assert her own interests. In contrast, research ethics relating to experimentation assume the worst: that a human research subject is disempowered with respect to

knowledge, understanding and agency. While data protection aims to level the playing field so that people can contract with others for the use of their data, research ethics assumes a different kind of vulnerability. Although both types of regulation stem from a single historical point – the crimes of the Nazi regime – they aim at different types of protection against different levels of exploitation.

In the Dutch research environment that intersects with Brainport's work – the university-based social sciences on one hand, and the work of technical universities on the other – these principles have been articulated in two main statements: one by the social scientific community (Netherlands Deans of Social Sciences, 2018) and the other by the technical university community (Gorp & Andriessen, 2015). In contrast, private-sector research review is patchy. Lemmens (2010) indicates that a decade ago research ethics boards had been established to review clinical research conducted in the private sector because in relation to 'the growing commercialization of medical research... [t]hey fulfill a clear demand and need from industry.' He also notes that such boards developed, at least in Canada, because review boards from academic institutions lacked the capacity to review research outside the academy. This problem was also visible when big data allowed epidemiological research to engage increasingly with the private sector, starting in 2010 with the research group Flowminder's work on mobile phone metadata after the Haiti earthquake. The review board at Karolinska University, the home institution of the group's founder, noted that it would not be able to review further projects occurring beyond its institutional scope (Author, 2016). In the case of Brainport, the planning involves a review board created specifically for the project (Financieel Dagblad, 2019). Yet if that board focuses on the classic concern of direct harm in relation to the subjects of the research, rather than to those associated with them or to society at large, this diminishes the applicability of the review process.

On one level, it is easy to define the obligations of urban authorities to the subjects of a living lab, because they are the same as they are in the city at large: to serve the needs of the population; to ensure the security and sustainability of urban life, and to promote community and cohesion. Cities are not businesses but communities, continually evolving spaces of negotiation, compromise and conviviality. However the creep of public-private space (Galič, 2019) and the increasing shift to the private sector of what used to be public-sector responsibilities for planning, monitoring and evaluating (Author, 2015) makes new permutations of injustice possible. This creates a new set of tasks for city authorities: they must prevent and remedy injustice and exploitation stemming from the mixing of commercial with public service motivations. Research ethics (or a public-private version of that set of rules) is, like privacy rights, likely to be resisted as an obstacle to innovation. Yet preserving the 'right to the city' (Harvey, 2003) suggests that public authorities must regulate urban space in ways that preserve the autonomy and dignity of the city's residents, and guard the 'right to have rights' (Arendt, 1979) by determining and enforcing the publicness of urban space, no matter what interactions with the private sector are occurring.

Implications for the governance of living labs

The challenge of governing the coming generation of living labs is substantial. It takes what has been a relatively uncontroversial mechanism of innovation and marketing, and connects it to the problems of the data economy, surfacing societal-level problems of power, legitimacy and competition. Cohen (2018) has written of the contemporary data economy as a 'biopolitical public sphere' where people are farmed for their data by corporations. Ronell's vision of experimentation as the essential reflexive lens of modernity, which 'has everything to do not only with the way the policing of political sites and bodies

takes place in our modernity but also with our experience of reality in general' (Ronell, 2003: 656), can be found intersecting with Cohen's vision of biopolitical exploitation in the datafied living lab. This new, digital evolution of the experiment represents an extreme version of the biopolitical problem, where public and private-sector rationales of experimentation and innovation come together to potentially create a profitable, well-controlled public for auction to the highest corporate bidder as a testing ground.

I have argued that this is a problem of research ethics, and thus requires intervention by authorities rather than self-regulation by corporations. Intervention upon whom, though, is not a simple question. City authorities endorse a living lab's presence in urban space; commercial firms shape its objectives and processes; academic researchers use it to conduct research, which in turn is supported by both private and public funds; and the national government is also implicated if a lab has effects on the national level, as does the Brandevoort lab given its claims to be a testing ground for governance and e-democracy innovation (Financiele Dagblad, 2019). This suggests that choices must be made about how to set and enforce rules in relation to this new type of living lab.

Who is accountable if residents in a city neighbourhood give up the right to have rights? This has not previously been a question for local government. If the municipality and its commercial partners together create a living situation for residents that places autonomy and freedom at risk, the current argument that this is innocuous as long as individual-level privacy is preserved seems insufficient. The data gathered by the lab will not only have implications for privacy, as it exposes attributes and pressure points with wide-ranging applications relating to a range of freedoms. Freedom of association, freedom of thought and speech, freedom from political manipulation, the right to information, and many other issues implied by the living lab's proposed structure and activities, are related to but not the same as privacy. They are freedoms that privacy underpins, but they are best guarded not through data protection alone, but through a broader set of tools in the sphere of politics and governance. Cohen's point is important here: if we can legally be farmed for our data, we have larger problems than data protection. Furthermore, we should take seriously Ronell's warning that as the experiment becomes the world and vice versa, it becomes important to ensure people can identify what is real and what is manipulated. If they cannot, any form of resistance or even choice becomes moot.

If we know the 'what' of this governance problem, this may lead us to the 'who' and the 'how'. Research ethics has proved an important (though often imperfect) tool for regulating the behaviour of researchers, including under conditions of academic-private collaboration. The framework, if fully applied, combines a skeptical lens on power and authority with practical tools for governing action. If we agree that people are the subjects of the new living lab, rather than technology – and this is something the Brainport project's leaders are clear about (Financiele Dagblad, 2019) – this suggests that rather than exempting commercial actors from regulation as researchers, we should instead include them and ask how the existing rules on experimentation can be applied.

Research ethics frameworks are effective at attributing accountability upwards to project leaders rather than horizontally to those taking part in the experiment, but have the disadvantage that they rely heavily on institutional review boards for scrutiny and enforcement. This demand for scrutiny and transparency is problematic for governing a data-driven lab model because both data processing and analysis take place in commercial partners' databases, which are likely to be covered by commercial secrecy provisions. This suggests that this is a case where independent scrutiny is necessary, of the kind

used in financial auditing. For such oversight to be meaningful, it would have to have benchmarks against which to test the lab's practices. This implies clear and specific contractual agreements between commercial partners and city authorities, not only on data collection but also on analytics and use. In this arrangement, the residents of the lab would be able to give informed consent as long as the city authorities took responsibility for making sure the contract was not broken by exercising scrutiny and enforcing the rules.

The creation of an auditing apparatus for such labs would be a technical and regulatory challenge, and would necessitate the creation or repurposing of authorities to do the work. Another piece of the apparatus necessary to make research ethics operationalisable would be to establish limits to how long a given experiment can take, and how new actors and experiments can be instituted. We can see from other data-driven living labs such as Stratumseind (Galič, 2019) that while a lab may have an official end date, unless the technology involved is disassembled and removed it tends to attract new parties and continue to operate, while original agreements to protect city residents become obsolete. The provision of a sunset clause in the contract between city and commercial partners would be one way to avoid this, so that the city had to re-contract to begin new experiments beyond those residents had originally agreed to.

We should not assume that firms will be eager to comply with any regulation of their activities in living labs. One of the main attractions of the living lab for commercial partners is the claim that anything can be done there, as openly stated by the organisers of Brandevoort II (Financieel Dagblad, 2019). It is possible that firms would not find a regulated lab useful for data-driven experimentation. One thing is clear: self-regulation by technology companies has had far-reaching effects on people's rights and autonomy, and by increasing companies' freedom to experiment and presenting the public as willing subjects, we can expect more extreme consequences than we have seen so far. Firms involved in instrumenting the city increasingly make a stand for self-regulation by attempting to define the terms under which they can be controlled. One example of this is Alphabet, Google's parent company, attempting to define a new class of 'urban data' as a regulatory object, something that is being resisted by community activists who wish to make the company follow the same rules as other commercial data processors (Valverde, 2019).

The kinds of intervention the Brandevoort II lab is designed to make possible are already present all around us. Hyper-nudging, the micro-targeting of marketing and political messages, digital phenotyping and affinity profiling are all symptoms of a turn in the use of data technologies from blunt instrument to surgical intervention on autonomy. They also mark a turn from the public sector to the public-private technology partnership as a mode of intervention on the community or the population level. Somehow this turn has occurred without a corresponding provision for accountability and governance, so that corporations are still regulated as if they were peripheral to the public interest. As they increasingly acquire a reach and capability of affecting the population that has previously been confined to policymakers, this challenges us with finding appropriate ways to govern this power. The challenge of applying research ethics to corporations is not only a practical one, but a political one too. It is a tool for interrogating this shift to private-sector power, for thinking about the kind of accountability we want to impose on it, and for asserting the right to do so. It is an exercise in accountability as much as a final answer, but by raising old questions it may help to answer new ones.

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