

Michiel de Lange · Martijn de Waal
Editors

The Hackable City

Digital Media and Collaborative
City-Making in the Network Society

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Foreword: Tackling the Challenge of Speed

What are cities? Some people say they consist of networks (transport, water, electricity, waste), and other think they are made of structures (houses, roads, pipes and wires). Most fundamentally, though, they consist of people. We are the city.

The way we are the city has been changing lately, assisted by smart gadgets most people have started to use, and the ubiquitous platformisation of almost any business from groceries to insurance. The speed of this change has created the pressure for city organisations to change the way they manage the city, deliver urban services and renew urban spaces.

Currently, most cities cannot cope with the speed of change. Legacy systems—physical infrastructures, outdated IT systems, organisational models and practices—are notoriously slow to change. Cities lack competence in understanding digitisation, experimenting with technologies and approaching challenges flexibly. Business models, funding models and procurement practices are underdeveloped, do not support technological innovation and are often unsuitable for multi-stakeholder strategic collaboration.

City governments are used to lead by strategies and policies. Those are still needed, but the process of developing them must become much faster. If planning takes five years, plans are out of date before they are even ready. Joy's law says that “no matter who you are, most of the smartest people work for someone else”. Shifting the mindset from “city as governance” to “city as an enabler” can help the city administration to tackle the challenge of speed. This book covers many examples of renewing the city by open collaboration, experiments, design methodologies and agile development, which can deliver results faster and in an iterative manner.

In order to create the digital and physical infrastructure which can accommodate a crowdsourced way of problem-solving and solutions from different developers, cities must also change the way they work with technology. Traditional city systems are monoliths—proprietary, complex, costly, and locked in to their vendors. Instead, cities need technologies and infrastructure which can connect different sectors together in a lightweight, modular manner, with components provided by multiple vendors, sharing enough core protocols and data to be interoperable.

Such horizontal systems are necessary, for example, for data clearing, management and sharing; user dashboards; secure identification; capturing, managing and exchanging value; and digital security.

Horizontal integration between systems must be done wisely, though. Cities are not machines, for which you can develop an operating system. They are much more like organisms, as complex as the range of human activities in them. Cities are not companies, either—they do not operate like big corporations. The level of complexity in an average city far exceeds that of any company.

Cross-domain harmonisation of city systems should be done by using loosely coupled interfaces and “bring your own service” approach. Different subdomains can develop and run services which are just right for them. These systems are connected over a shared backbone only when the connection is necessary and only harmonising the minimum amount of data and interfaces. Maximum interoperability and resilience to future needs should be achieved with the minimum level of integration, focusing on data models and APIs which are connected using, for example, microservices and other flexible architectures.

Working with technologies and innovation should be seen as a core activity of a city, as much as urban planning. Cities and companies should systematically share good practices, replicate working solutions, exchange information with each other and develop solutions together. Lastly, cities need to understand investment and business models and become informed clients and partners for the companies. This volume serves as a fundament for such a Future Cities agenda. The notion of a hackable city provides an alternative to the relentless and rapid platformisation mentioned above and entails a people-centric view of city-making with the help of technologies and innovation.

London, UK

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Digital Cities 11 (C&T 2019, Vienna)

TBA

Digital Cities 10 (C&T 2017, Troyes)

Aurigi, A., & Odendaal, N. (2019, in press). Designing Smart for Improving Place: Re-thinking and shaping relationships between urban space and digital technologies. Amsterdam, The Netherlands: Elsevier.

Digital Cities 9 (C&T 2015, Limerick)

de Lange, M., & de Waal, M. (Eds.). (2019) The Hackable City: Digital Media & Collaborative City-Making in the Network Society. Singapore: Springer.

Digital Cities 8 (C&T 2013, Munich) & Digital Cities 7 (C&T 2011, Brisbane)

Foth, M., Brynskov, M., & Ojala, T. (Eds.). (2015). Citizen's Right to the Digital City: Urban Interfaces, Activism, and Placemaking. Singapore: Springer.

Digital Cities 6 (C&T 2009, PennState)

Foth, M., Forlano, L., Satchell, C., & Gibbs, M. (Eds.). (2011). From Social Butterfly to Engaged Citizen: Urban Informatics, Social Media, Ubiquitous Computing, and Mobile Technology to Support Citizen Engagement. Cambridge, MA: MIT Press.

Digital Cities 5 (C&T 2007, Michigan)

Foth, M. (Ed.). (2009). Handbook of Research on Urban Informatics: The Practice and Promise of the Real-Time City. Hershey, PA: Information Science Reference, IGI Global.

Digital Cities 4 (C&T 2005, Milan)

Aurigi, A., & De Cindio, F. (Eds.). (2008). Augmented Urban Spaces: Articulating the Physical and Electronic City. Aldershot, UK: Ashgate.

Digital Cities 3 (C&T 2003, Amsterdam)

Van den Besselaar, P., & Koizumi, S. (Eds.). (2005). Digital Cities 3: Information Technologies for Social Capital (Lecture Notes in Computer Science No. 3081). Heidelberg, Germany: Springer.

Digital Cities 2 (Kyoto 2001)

Tanabe, M., van den Besselaar, P., & Ishida, T. (Eds.). (2002). Digital Cities 2: Computational and Sociological Approaches (Lecture Notes in Computer Science No. 2362). Heidelberg, Germany: Springer.

Digital Cities 1 (Kyoto 1999)

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Introduction—The Hacker, the City and Their Institutions: From Grassroots Urbanism to Systemic Change



Martijn de Waal and Michiel de Lange

Abstract In the debate about smart cities, an alternative to a dominant top-down, tech-driven solutionist approach has arisen in examples of ‘civic hacking’. Hacking here refers to the playful, exploratory, collaborative and sometimes transgressive modes of operation found in various hacker cultures, this time constructively applied in the context of civics. It suggests a novel logic to organise urban society through social and digital media platforms, moving away from centralised urban planning towards a more inclusive process of city-making, creating new types of public spaces. This book takes this urban imaginary of a hackable city seriously, using hacking as a lens to explore examples of collaborative city-making enabled by digital media technologies. Five different perspectives are discussed. Hacking can be understood as (1) an ethos, a particular articulation of citizenship in the network era; (2) as a set of iterative and collaborative city-making practices, bringing out new roles and relations between citizens, (design) professionals and institutional actors; (3) a set of affordances of institutional structures that allow or discourage their appropriation; (4) a critical lens to bring in notions of democratic governance, power struggles and conflict of interests into the debate on collaborative city-making; and (5) a point of departure for action research. After a discussion of these themes, the various chapters in the book are briefly introduced. Taken together they contribute to a wider debate about practices of technology-enabled collaborative city-making, and the question how city hacking may mature from the tactical level of smart and often playful interventions to a strategic level of enduring impact.

Keywords Smart cities · Citizenship · Civic media · Participatory urbanism
Planning and urban design · Hacking and hacker cultures

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1 The Parallels Between Hacking and City-Making

‘Hacking’ has long been part and parcel of the world of computer science, ICT and media technologies. From radio amateurs in the early twentieth century to the US west-coast computer culture that gave rise to first personal computers in the 1970s and the rise of the free/libre and open-source software (FLOSS) movement in the following decades, users have been figured as active creators, shapers and benders of media technologies and the relationships mediated through them (Roszak 1986; Levy 2001; von Hippel 2005; Söderberg 2010). In general, hacking refers to the process of clever or playful appropriation of existing technologies or infrastructures or bending the logic of a particular system beyond its intended purposes or restrictions to serve one’s personal, communal or activism goals.

Where the term was mainly used to refer to practices in the sphere of computer hardware and software, more recently ‘hacking’ has been used to refer to creative practices and ideals of city-making: spanning across spatial, social, cultural and institutional domains, various practices of ‘city hacking’ can be seen in urban planning, city management and examples of tactical urbanism and DIY/DIWO urban interventions. Various authors have by now described the rise of ‘civic hackers’ (Crabtree 2007; Townsend 2013; Schrock 2016), where citizens are cast in the role of tech-savvy agents of urban change, usually working towards the public good. For instance, in the guise of monitorial citizens (Schudson 1998) that make use of open data to hold governments accountable (Schrock 2016); or as coders that take part in programs like *Code for America* to create apps or websites that can help solve problems posed by local authorities (Townsend 2013); or alternatively, as participants in hackathons that code more speculative prototypes to spark discussions around issues of concern (Lodato and Disalvo 2016).

Furthermore, moving beyond the application of technology to civic life, the ethos and spirit of various hacker movements have been invoked to describe new forms of bottom-up, grassroots and collaborative city-making. Lydon and Garcia (2015) connect their tactical urbanism paradigm to the iterative, learning-by-doing approach of the hacker movement. Caldwell and Foth (2014) describe the emergence of DIY-placemaking communities around the world, partly inspired by hacking cultures and their ethos of shaping, bending and extending technologies to their needs, often beyond their intended use. In professional circles, Gardner (2015) sees a similar shift in the profession of architecture at large. Architects are moving from the position of ‘the self-conscious designers of modernism, with its unassailable belief in social engineering’ to an ethos of hacking, projecting their imaginations of better futures onto the ‘full and buzzing activities and structures’ of the existing world. Examples are abundant. In Raleigh, North Carolina, a student in landscape architecture and urban planning, Matt Tomasulo, set up a guerrilla wayfinding system to improve the walkability of the city that has gained traction around the world (Lydon and Garcia 2015). In São Paulo, a group of concerned citizens occupied the Lago Da Batata, a central city square in the gentrifying neighbourhood Pinheiros. They reactivated it as a public sphere by programming it with

various activities, epitomising a broader reclaim-public-space movement in Brazil (Montuori et al. 2015; de Waal and de Lange 2018). In another example, in Rotterdam, The Netherlands, an architectural office appropriated a vacant office building in Rotterdam's Central Station District, while also revitalising its derelict surrounding public space through the construction of a partly crowd-funded pedestrian bridge that relinks various sites in the area (Gardner 2015).

What these examples have in common is that the term hacking is used to evoke a participatory alternative to top-down smart city technology implementations. Hacking suggests a novel logic to organise urban society through social and digital media platforms. It suggests a move away from centralised urban planning towards a more inclusive process of city-making, creating new types of public spaces. This logic of hacking is touted as slightly subversive, informal, yet highly innovative and is associated with collaboration, openness and participation. The term can be used to highlight critical or contrarian tactics, to point to new collaborative practices amongst citizens mediated through social media, or to describe a changing vision on the relation between governments and their citizens. In sum, these discourses on hacking and the city may pave the way towards a new paradigm for smart cities, urban informatics and urban governance: *a hackable city* that combines bottom-up (albeit often professionally initiated) civic organisation with the opening up of top-down government structures and procurement processes.

The articulation of civic hacking is especially interesting in this regard. *Hacking* in these examples refers to the inspiration found in the playful, exploratory, collaborative and sometimes transgressive modes of operation found in various hacker cultures, constructively applied in the context of civics and politics. At the same time, it also connotes the centrality of digital media technologies as tools for mobilisation, communication and civic organisation. As Saad-Sulonen and Horelli (2010) point out, many self-organising civic groups rely on extensive ecologies of digital artefacts, even if their activities themselves are not centred around technology. In addition, the adjective of *civic* denotes that these activities not only concern societal issues, but should also be understood as taking on a less adversarial position than 'regular' activists (or some hacker cultures for that matter) (Hunsinger and Schrock 2016; Schrock 2016). Civic hackers are seen as working with—or trying to reform—governments and other institutional actors to address societal issues, such as as inequality, community representation, housing affordability and sustainability. The civic hacker, Schrock (2016) writes, seeks 'to ease societal suffering by bringing the hidden workings of abstract systems to light and improve their functioning.'

With this volume on hackable cities, we aim to build upon these discussions and further explore the affordances of digital media, urban informatics and smart city technologies for practices of collaborative city-making in the era of the network or platform society (Castells 2002; van Dijck et al. 2018). It contains chapters based on revised and extended papers presented at the ninth edition of the Digital Cities workshop series, titled *Hackable Cities: From Subversive City-Making to Systemic Change* held on 27 June 2015 in conjunction with the 7th International Conference on Communities & Technologies (C&T) in Limerick, Ireland (de Lange et al. 2015). In these contributions, hacking is used as a lens or metaphor to explore both concrete

practices and theoretical, critical explorations of collaborative city-making, usually using digital media technologies. The book continues the conversation and discussion threads started at the Digital City 7 and 8 workshops, which culminated in a volume focussing on the citizen's right to the digital city (Foth et al. 2015a).

We find hacking a useful lens to explore these emerging practices of collaborative city-making, as it can be understood in five ways. First, hacking can be understood as an ethos, a particular articulation of citizenship in the network era. In a hackable city, citizens are organised into urban publics (de Waal 2014) or collectives (van den Berg 2013) around particular themes. Working together, they attempt to appropriate, improve upon or restructure existing arrangements, varying from the programming of public space to the production of energy or the organisation of welfare provisions.

Second, hacking can be understood as a set of specific practices and ways of collaboration that can be described, analysed and conceptualised. Here, we also see a shift in the roles and relations between citizens, professionals and institutions. In many instances of civic hacking, professionals such as architects or designers are in the lead, presenting themselves as 'urban curators' or 'community orchestrators'.

Third, the lens of hacking allows to shift attention from these practices to a set of affordances of institutional structures that allow or discourage their appropriation. A hackable city does not just refer to civic organisations aided by digital technology, but also to the 'hackability' of systems of urban infrastructure, governance and polity. To what extent have institutional parties found ways to open up their workings for interventions ('hacks') by civic actors?

Fourth, hacking can also be understood as a critical lens, bringing in a normative dimension and notions of conflict and power struggle. To what extent are these collaborative practices truly democratic and inclusive? What kind of 'city hacks' should be encouraged and which ones are unwelcome, and who decides about that?

Last, in response to the critical approach, hacking can also be embraced as a form of action research in which academics stage participatory research projects that iteratively explore the affordances of digital media for collaborative processes of urban planning, management and social organisation, to contribute to liveable resilient cities, with a strong social fabric.

The perspective of this book on the hackable city combines these five perspectives and brings out both normative (what should a hackable city look like?) as well as practical perspectives (how could such an approach be enacted?) in the application of technology to city-making. This is important. As the notion of hacking is ported from the field of software development to civic life, it is used ambiguously, loaded with various ideological presumptions. For some, it exemplifies that citizens have started to embrace a new 'hacker ethic' of decentralised governance, reputation-based meritocracy and playfulness. Urban hacking is then about empowering citizens to organise themselves around communal issues and empowering them to perform aesthetic urban interventions. For others, it raises questions about governance: what is the legitimacy of bottom-up movements? How can traditional practices of democratic politics be remade to make room for civic initiatives? For yet another group, the term is mostly a masquerade for neoliberal politics in which libertarian values appear in the discursive sheep's clothing of participatory buzzwords like 'Web 2.0', 'collective

intelligence', 'crowdsourcing', 'open-source ethics', or 'sharing economy'. Furthermore, a key question that remains largely unanswered is how 'city hacking' may mature from the tactical level of smart and often playful interventions to a strategic level of enduring impact.

The latter is one of the most important foci of this book. The contributing authors have described and analysed various tools, practices and trajectories that seek to leap the gap (or in some cases have failed to do so) between subversive, often isolated practices of city-making enabled by digital media and the promise of systemic change towards more democratic and collaborative cities that have been brought up in discourses around hackable cities. As such we want to contribute to the further development of the debate around civic media, civic hacking, smart cities and smart citizens. We want to move this debate forward from the (promises of) practices of computer-aided community organisation to a more systemic understanding of the interactions between institutional actors such as local governments and bottom-up civic initiatives in the context of democratic societies.

2 Hacking Against the Smart City

In that debate, more than just an empirical category, the hackable city can be understood as an urban imaginary concerning more democratic and collaborative forms of urban planning and city-making. This imaginary can be placed against another, more dominant vision on the role of technologies in the future city: that of the smart city (Ampatzidou et al. 2014; de Waal et al. 2017). Although definitions of smart cities also vary widely (Hollands 2008; Allwinkle and Cruickshank 2011; Caragliu et al. 2011; Nam and Pardo 2011; Chourabi et al. 2012; Brynskov et al. 2014; Kitchin 2014a; de Waal and Dignum 2017), in dominant visions of the smart city, technologies such as digital sensors collecting urban data, online platforms and the application of various algorithms are presented as more or less neutral tools that can optimise the management of urban infrastructures and resources or even solve urban problems, such as traffic congestion, parking, and safety.

This approach has been criticised for various reasons. Many have pointed out that such an approach is based on a top-down and technocratic 'solutionism' that serves the interests of companies rather than citizens (Greenfield 2013; Morozov 2013; Ampatzidou et al. 2014; de Waal 2014; Foth et al. 2015a; Cardullo and Kitchin 2017; Morozov and Bria 2018). Many smart city schemes seem to underwrite neoliberal approaches of urban governance in which 'the logic of choice, consumption and individual autonomy' is favoured and the market is seen as the best way to determine what is best for the city (Cardullo and Kitchin 2017). In reality, the most prominent form the smart city has taken is that of a 'platform society' (van Dijck et al. 2018). This term highlights the fact that various urban infrastructures such as transport and traffic management are now turned into dynamically priced and algorithmically governed on-demand consumer services made available through platforms such as Uber and Airbnb. It is internationally operating corporate actors that provide these services,

who have set up their own schemes of governance, including the management of identities and reputation systems.

The criticism here is not about data being used for optimisation of urban processes per se. It is about data analytics being used in urban governance and management through the application of non-transparent algorithms, instigated by non-democratic actors that cannot be held accountable by the public, and that it is initiated without democratic debate about the underlying values these systems serve (Kitchin 2014b; Foth 2017). This smart city vision of neutral technologies providing ‘urban solutions’ negates or at least depoliticises the intrinsic conflicts at play in processes of optimisation. After all, who defines the optimum, and whose interests does this optimum serve? As Brynskov and Foth have argued, cities are wicked problems that cannot be solved by the application of an algorithm (Foth and Brynskov 2016; Foth 2017; Estrada-Grajales et al. 2018). Whereas the rise of digital media technologies initially led to optimistic accounts of a ‘participatory culture’ (Jenkins 2006), in which citizens would be empowered by technologies of communication and collaboration, Foth (2017) has pointed out that instead we face the emergence of a data-driven ‘algorithmic culture’ (Striphias 2015) that may bypass democratic processes of governance, transparency and accountability. It is time, therefore, Foth et al. (2015a) argue, that citizens reclaim their ‘rights to the digital city’.

The hackable city serves as a model to think through such an alternative imaginary. Whereas the smart city often takes a solutionist and depoliticised approach, introducing technologies as a means to ‘neutrally’ solve urban problems, the hackable city departs from the city as a political site. It highlights a vision of the city as a site of both collaboration as well as struggle and conflicts of interests. In this account, new media technologies enable citizens to organise, mobilise, innovate and collaborate towards commonly defined goals. Yet the hackable city also recognises the messiness of such a process, the conflicts of interest at play and the continuous struggle between the alignment of private goals, collective hacks and public interests. As an alternative imaginary, the hackable city is not a progressive alternative panacea to a neoliberal smart city that will by itself bring out a harmonious, inclusive resilient city, if only citizens would start using the right technological tools and governments would be willing to listen to them. Rather, as a lens, the hackable city aims to bring out the underlying dynamics and (sometimes conflicting) values at stake in city-making. It revolves around using the affordances of digital technologies to find new ways to organise civic initiatives and align these with processes of democratic governance and accountability in a society that is increasingly technologically mediated.

3 Hacking as an Ethos

In this process, the metaphor of the hacker opens up an alternative deployment of digital media technologies; it calls for citizens to take on ‘ownership’ (de Lange and de Waal 2013) in the process of city-making, defined as the degree to which city dwellers feel a sense of responsibility for shared issues and also have the capacity to

take action on these matters. Hacking is then in the first place understood as an ethos: a particular way of being in the world. Hacker cultures at large have been defined and described in various ways, ranging from a subcultural techno-cultural *jouissance* to models for participation-based governance (Powell 2016); from libertarian *cypherpunks* developing cryptography tools to safeguard private communication from government or corporate interference, to a countercultural post-hippie generation who consider computers as tools for liberation, expression and self-organisation, to the rise of communities engaged in the collaborative production of free and open software (Levy 2001; Turner 2006; Coleman and Golub 2008). In the case of civic hacking, a more particular instance of these hacker cultures is instantiated. A (civic) hacker is someone who does not take the world around them as it is but tries to remake it and improve upon it with all means at hand. Hacking is about playfully appropriating existing structures and systems, in an explorative and iterative way in a process of learning-by-doing. Civic hackers do so in a spirit of collaboration and sharing and in many instances work towards a common good (Ampatzidou et al. 2014; Estrada-Grajales et al. 2018; Travlou et al. 2018). They deploy ‘information technology tools to enrich civic life, or to solve particular problems of a civic nature, such as democratic engagement’ (Hogge 2010). Civic hacking ‘engages with political causes through designing, critiquing, and manipulating software and data to improve community life and infrastructures of governance’ (Schrock 2016, 583). Civic hackers, as one influential definition has it,

eschew efficiency, instead seeking to amplify and accelerate the natural sociability of city life. Instead of stockpiling big data, they build mechanisms to share it with others. Instead of optimizing government operations behind the scenes, they create digital interfaces for people to see, touch, and feel the city in completely new ways. Instead of proprietary monopolies, they build collaborative networks. (Townsend 2013)

The emergence of this ethos can be linked to a broader change in the definition of citizenship that has been summarised as a shift from ‘dutified’ to ‘actualising’ citizenship (Bennett and Segerberg 2013; Gordon and Mihailidis 2016a). The former refers to the collective enlistment of citizens in organisations such as churches and unions; the latter can be understood as the organisation of citizens in collectives around issues they are intrinsically motivated for (Levine 2016). Traditional ways of local community-based organisation of citizens and social capital have given way to the emergence of networked publics (Varnelis 2008), assemblages of networked-individuals (Wellman 2001) around issues of concern (Foth et al. 2016; de Waal and Dignum 2017; de Waal et al. 2017). According to Franke et al. (2015), this development should be understood as a reaction to the privatisation of the public domain. As traditional public and civil society organisations have become bureaucratised and more and more market-oriented, citizens try to reclaim the lost ground through commons-based self-organisation around themes such as health, education, or public space (Franke et al. 2015). Faehnle et al. (2017, n.p.) speak of a ‘self-organisation turn’, in which ‘active citizens adopt new roles and increasingly “shape and make” their cities through new self-organised forms of action, powered by the internet and social media networking.’

However, the normative debate around the implementation of a hacker's ethos in society at large is far from settled. As Coleman and Golub (2008; Coleman 2011) have convincingly demonstrated, various hacker cultures can be understood as various interpretations of Western liberalism. On the one hand, some groups can be placed in liberal and libertarian traditions of 'negative freedom', i.e. the freedom from coercion by the state and other actors. Hence, the focus various hacker cultures have placed is on cryptography and freedom of speech issues. Coleman links this vision to liberal visions that argue that the 'public good come from private vice'; that is, public benefits will emerge when individual actors are given the freedom to act out of self-interest. Curtailing the strive for individual rewards, be it through the market place or in the form of recognition and reputation, would be seen as not only an infringement on individual rights, but also undermining of the public good. It is not far-fetched to draw a line from this perspective to the Silicon Valley start-up scene and the libertarian ideology expressed by various tech entrepreneurs. These, too, have been placed in the tradition of hacker cultures, with their agile methods of software development and openness with regard to, for instance, the production of APIs that allow for various actors to join the ecosystem provided by these companies. As Rayner (2018, n.p.) claims in his book *Hacker Culture and the New Rules of Innovation*, the open-source movement 'democratised innovation, placing a vast realm of free or cheap software tools introduced hacker mindsets and practices into the startup ecosystem'. Hacker entrepreneurs now fill tech hubs, and this will automatically produce the public good, Rayner claims, because 'they bring out what is best in human beings—our social nature, our creative spirit and our capacity to innovate'.

Civic hacking has mostly been placed in a different tradition that centres on principles of 'positive freedom', that entail the creation of conditions for equality and individual freedom through collective action. The free software and anti-copyright movements can be placed in this tradition. Copyright here is understood as a mechanism to privatise knowledge and other forms of intellectual capital, curtailing the opportunities for individuals to learn, develop and express themselves. Free software, made available as a commons through peer production, does provide citizens with means for expression and mutual exchange. This version of liberalism puts public values at centre stage of economic production and social organisation. Or formulated differently, a free individual is a citizen that 'develops, determines, and changes his own desires and interests autonomously through self-expression, debate and reasoned deliberation' (Coleman and Golub 2008). A prerequisite is of course that citizens are enabled to do so. The establishment of public institutions that guarantee these freedoms, such as the provision of education and a well-functioning public sphere, take a vital role in these visions (Coleman ad Golub 2008). Referring to Richard M. Stallman's free software movement, Coleman and Golub (2008) see 'a liberal version of freedom that invoked the virtues of sharing and pedagogy'. For Stallman, hackers collaborating in the free software movement formed a collective that subscribed to shared norms and values.

It is this interpretation of hacking that has become a source of inspiration for various civic hacking movements. For instance, Medosch (2018) has shown how

current notions of the digital commons are derived from this particular interpretation of liberalism in hacker culture. These have manifested themselves amongst others in community-run wireless networks that emerged from the 2000s on. Here, hackers well-versed in technological skills worked together in wider social networks to establish a communal infrastructure that could serve as an alternative to dominant commercial ones. For Medosch, these initiatives illustrate that technological development is not an autonomous force but is shaped through ‘social exchanges and cooperative practices between communities of practitioners’ (Medosch 2018).

4 Hacking as a Practice of Collaborative City-Making

It is these practices that we turn to next. Hacking can not only be understood as a particular ethos, but also as a particular set of practices, consisting of new forms of civic organisation and professional engagement. If indeed civic hackers mobilise around issues of communal concern, employing ecologies of digital artefacts, what then are the platforms and practices through which they do so, and how can they be designed? As Gordon and Mihailidis have argued, our interest there should not so much lie in the reified features of the (digital media) platforms themselves, but in the practices through which they are enacted. In their analysis of civic media, which they define as ‘the technologies, designs, and practices that produce and reproduce the sense of being in the world with others toward common good’ (Gordon and Mihailidis 2016b), they bring out the notion of ‘communities of practice’. These communities of practice cannot be reduced to individual actions that are undertaken but bring out the ‘participation in an activity system about which participants share understanding concerning what they are doing and what that means in their lives and for their communities’ (Lave and Wenger 1991 cited in Gordon and Mihailidis 2016b). The notion of ‘hacking’ brings out such a broader (sub)cultural context.

Amongst others, it draws attention to the production of knowledge and management of expertise, a central theme in many hacker communities. In the discourse around civic hacking, hackers are not just seen as mere appropriators who create a simple hack to solve a local problem. Hackers are more broadly envisioned as ‘experts capable of applying technical knowledge to bring about systemic change’ (Schrock 2016, 592), where the source of this expertise is widely debated. Hacker cultures centre around merit and processes of mutual learning, rather than officially sanctioned expertise, where know-how is often more important than knowledge. The point is not that expertise does not matter (quite the contrary, peer-recognition of one’s clever solutions is understood as a key reward), but rather that the process of producing knowledge and expertise is opened up. Hence, the often-made connection is between civic or urban hacking and processes of ‘open innovation’ and ‘living labs’. As Baccarne et al. have written, these living laboratory formats are understood as expression of a hacker’s ethic, as they ‘promote the idea that anyone is capable of performing a variety of tasks rather than relying on paid experts or specialists’ (Baccarne et al. 2014).

At the same time, and although they are often described as ‘bottom-up’, many practices of ‘hackable city-making’ are initiated by professionals, be they designers, architects or those working in the cultural and art sectors, bringing in particular sets of expertise, grounded in community organisations as well as in the application of design skills. These professionals have started to redefine their role; rather than grand designers they see themselves as ‘community orchestrators’ or ‘urban curators’ who organise publics around issues or places (van’t Klooster 2013; Beer et al. 2015; Gardner 2015). In a related discussion, recently Foth et al. have argued for design professionals to embrace ‘citizen-ability’ rather than usability as the main goal for interaction designers: design that promotes the ability as citizens to use technologies (Foth et al. 2015b). This perspective builds upon disciplines with longer traditions such as participatory design and extended planning (Saad-Sulonen and Horelli 2010). Similar to these approaches, professionals acting as civic hackers aim to bring out the local knowledge of stakeholders while bringing in their professional domain knowledge, in processes of open innovation.

This does not mean that authorship has vanished, but rather that it has shifted. It lies not in the signature designs they deliver, but rather in the stories and process of ‘imagineering’ around these projects (Gardner 2015). Alternatively, it can be found in the design of ‘dramaturgies’, defined by de Waal (2017) as ‘the design of local settings and stories and the orchestration of events by which collective action is organized in time and place’. Hacking as a lens can help to bring out the ‘thickness’ of situated practices involved in collaborative city-making, as well as point out the various roles and relations emerging in these processes.

5 Hackability as an Affordance of Systems

The notion of ‘hackability’ further extends these relationships. The goal of many urban hacks can be understood as part of a broader agenda of systemic change. Practices of hacking are not just about ‘infrastructuring’—the continuous reworking of technologies and infrastructures to adapt them to the needs and realities of particular users—but also about ‘institutioning’—attempts to rework the organisation and logic of institutions, existing or new, in relation to a project’s systemic goals (Pipek and Wulf 2009; Dantec and DiSalvo 2013; Huybrechts et al. 2017). Civic hackers, Hunsinger and Schrock have found, are increasingly willing to work with institutions rather than just opposing them, as the anti-authoritarian stereotype of the hacker has it. In their vision, civic hacking can be understood as practices that shape new spaces for collective action. ‘As technologies and their communities of practice changed’, they argue ‘new spaces were needed that reached beyond established collectivities of group, community, and organization’ (Hunsinger and Schrock 2016). The civic hacker can then be seen as an interstitial figure, perhaps even the ‘missing link’ between insular bottom-up movements and the top-down structures of government. That is at least the promise that belies in the figure of the civic hacker.

Whether or not that promise is realised is not only a matter of hacking practices, but also about the openness of systems and institutions to these hacks. Hacking is not just about the practices of making-do, collaboration and appropriation, but also about the affordances of the infrastructures or systems at play. The notion of ‘hackability’ shifts the attention to the structures of these systems. To what extend do they allow or even welcome ‘civic hacks’? And to what extent do they ward off attempts at systemic change? To stick with the metaphor: do local governments provide APIs or even their source code? Or do they instead build firewalls? Research so far shows a mixed picture. As we will also see in this volume, governments around the world have started experiments in opening up the process of city-making, encouraged by various (policy) frameworks and visions of ‘energetic societies’ (Hajer 2011), ‘spontaneous cities’ (Urhahn Urban Design 2010), ‘the participation society’ (Tonkens 2014), ‘do-democracy,’ (Ministerie van Binnenlandse Zaken en Koninkrijksrelaties 2013) or ‘responsive cities’ (Goldsmith and Crawford 2014) and ‘big society’. What these visions have in common is that they encourage governments to be more responsive to citizens and/or professional initiatives. In these visions, governments set up the larger policy frameworks, defining public values in democratic procedures. Yet they open up the field of execution to various actors—collectives of civic hackers—that can contribute to these goals. In turn—inverting Schudson’s analysis—governments themselves become monitorial governments, using for instance technologies of big data and social media to dynamically tune their policy-making process to societal developments.

The implementation of such visions of hackable cities has proven to be difficult. The logic of institutions and the fluid, networked assemblages of civic hackers around issues of concern are difficult to reconcile. Government usually seek to follow standard procedures working towards clearly defined indicators of success, in line with the underlying democratic logic of accountability and predictability. After all, governments need to be accountable, protect their citizens and act as reliable partners. Bottom-up initiatives of civic hackers tend to be much more open-ended in character, working iteratively, and do not care much for extended procedures. In the spirit of hacker movements: they just start without a clearly defined end goal, and adjust their plans on the way (van den Berg 2013; Beunderman 2015). Governments have also a hard time recognising collectives of civic hackers as potential partners. As they often involve professionals, they are not always seen as entitled to grants for bottom-up communities (Van den Berg 2013). And when it comes to policy execution, so far governments often prefer to work with larger, established parties. For instance, research by Joost Beunderman shows that in the UK the opening up of city-making processes through instruments as *Right to Challenge* and *Right to Bid* has mainly profited private outsourcing companies (Beunderman 2015). As de Waal, de Lange and Bouw conclude (2017), to embrace the ideal of the hackable city and its practices of collaborative city-making, much more experimenting and learning is needed at the institutional level. Again, the notion of ‘hackability’ provides a lens to bring out the attempts of institutions to embrace practices of collaborative city-making, as well as a way to bring out the conflicting logics and processes of negotiation between institutions and collectives of civic hackers.

6 Hacking as a Critical Lens and an Action-Based Research Approach

So, a heavy load rests on the shoulders of civic hackers. They are to self-organise around issues of communal concern, improve the world step-by-step, challenge existing paradigms of knowledge and expertise on the way, while working towards systemic change and reinvigorating democracy. Meanwhile they have to face challenges with regard to their legitimacy and negotiate their contributions to public values with institutions of (local) governance.

Are we perhaps asking too much of this by now mythical tribe? Various criticisms have pointed out that the rhetoric of participation at the heart of the civic hacker's ethos runs the risk of 'responsibilisation' (Iverson 2011), befitting a broader neoliberal trend of the dismantlement of the welfare state. Rather than making societies more democratic, it could lead to a situation in which governments step back from their duties to safeguard public values, outsourcing the management and responsibility of essential public provisions to civic initiatives (Thomas et al. 2016), whereas the citizens that are most apt to take on these challenges are those that are highly-educated and already well connected with local institutions (Tonkens et al. 2015). In addition, one could question the legitimacy of these civic initiatives. As Hill (2016) has posed, they may be social, but are they democratic? These collectives may claim their 'rights to the city', (Lefebvre 1996; Mitchell 2003; Harvey 2008) but whose rights are they exercising exactly? After all, Thomas et al. argue that the right to the city is a collective one, rather than an individual one, that should be incorporated in 'the collective exercising of power in the processes of urbanization' (Thomas et al. 2016). Furthermore, various authors have argued that it would be naïve to expect that self-organisation would automatically lead to positive outcomes. On the contrary, open systems, Rantanen and Faehnle write, are always vulnerable to misconduct and manipulation (Rantanen and Faehnle 2007).

What these valuable criticisms demonstrate is the conflation of two discussions and fields of study around civic hacking. On the one hand, hacking as we have described it here is both a practice and set of affordances that can be studied empirically and critically as 'community of practices'. On the other hand, the notion of a hackable city brings out a normative debate about democratic governance and civil society in the network or platform society, producing imaginaries that have become performative in social organisation, political debates and policy.

Research into the hackable city has started to combine these formerly separate domains. As Kitchin has argued, the risk of normative debates is that academics maintain their ivory tower positions, referring to the perils of dominant smart city imaginaries while these work their ways into society at high speed (Kitchin 2016). 'Critical scholars', he argues, 'have to become more applied in orientation: to give constructive feedback and guidance and to set out alternatives and to help develop strategies, not just provide critique'. That does not mean that critique is not valuable.

On the contrary, as Morozov and Bria state (Morozov and Bria 2018), constant ideological and intellectual work is needed to think through the application of new technologies in society in relation to power and their implications for democratic governance. Yet, being critical is not enough. The rapid application of technologies in society requires that researchers put their principles into action and contribute to their translation ‘into practical and political outcomes’ (Kitchin 2016). In this line of thinking, Foth and Brynskov have suggested ‘participatory action research’ as an ‘indispensable component in the journey to develop new governance infrastructures and practices for civic engagement’ (Foth and Brynskov 2016). The lens of the hackable city can serve as a critical reminder for these methods. It underpins both ethos and praxis: normative discussions about principles and value systems of urban governance, as well as practices to discuss and shape these principles in collaborative ways and take on a learning-by-doing and iterative approach in their implementation, including cycles of critical appraisal to see whether indeed these interventions live up to the goals and expectations.

7 Overview of the Book

It is such an approach that informs the contributions to this volume. Taken together, they explore normative points of view with regard to citizen empowerment and inclusive democratic governance in an emerging network or platform society. They also share their attempts to put this model into practice, by designing new modes of iterative and inclusive urban design and dramaturgies for collaboration. This includes the search for new roles for and relationships between citizens, professionals and institutions. They also divulge the struggles these initiatives have run into, trying to make the leap from subversive yet isolated acts of bottom-up city-making to systemic change and institutional reform.

The first part is titled *Design practices in the hackable city* and explores a core principle of hackable city-making: the notions of iterative design and beta-testing. A hackable city is not made by top-down applied master plans but comes into being through the orchestration of stakeholders with sometimes conflicting interests who iteratively design, test and try out urban improvements. In the first chapter, **Luke Hespanhol and Martin Tomitsch** explore the appropriation of public spaces as a means to test out new ideas for city-making. Their notion of plug-in interfaces draws the attention to the use of portable interactive technologies that can temporarily be deployed in public space, creating choreographies that are based on pre-existing architectural and social affordances and situated social dynamics. Their chapter describes a first exploration of design parameters for such plug-in interfaces.

Viktor Bedö analyses the strengths of street games as tools for prototyping in urban design. As he argues, ‘for the duration of the game, things that are not present at an urban site outside the game become present in the fiction of the game and thus in players’ experiences’. This allows for the temporarily modification of the affordances of a particular urban site and encourage players to test out these affordances. As they

are played in the real city, this leads to a deep immersive experience that also leaves space for emergent phenomena and real-life interactions by players that were not foreseen by the developers. As these games usually have rather simple rule sets, feedback from the playing sessions allows for rapid redesign of the prototypes and thus contributes to an iterative process of knowledge generation.

In a similar vein **Joel Fredericks, Glenda Amayo Caldwell, Marcus Foth and Martin Tomitsch** explore the use of ‘pop-up interventions’ in public space as a new methodology to engage communities in the city-making process. The authors argue that the combination of digital and physical media used in their temporary urban interventions has the potential to provide more inclusive forms of community engagement. A middle-out perspective in which designers or researchers working from a participatory action-research perspective could connect local communities with local government agencies (LGAs), by designing situated, contextualised interventions that address local issues in an accessible way in public space. Working in a broader context of media architecture, urban informatics, civic media and digital placemaking, the authors describe two of their own pop-up interventions and have reworked their outcomes into an ‘urban acupuncture framework’ that could serve as a guide for the design of future interventions that could make the process of city-making more interactive, building a bridge between policy makers actively looking for more inclusive ways to gather input from the citizenry and local communities actively identifying topics for discussion.

In the second part *Changing roles* we shift attention to new roles and relations between actors that are emerging in a hackable city. Hackable city-making often revolves around the organisation of collectives around issues of communal concern, and this leads to new practices of social mobilisation and community organisation that in turn need to be matched with (professional) design efforts that depart from the interests of the community involved. In the context of hackable city-making, these roles have been described as the ‘urban curator’ or ‘community orchestrator’. **Rosie Webb, Gabriela Avram, Javier Burón García and Aisling Joyce** explore collaborative city-making practices from such a perspective and bring out the role of the ‘network weaver’. This person or organisation plays a pivotal role in opening up traditional of civic participation. These are usually limited to passive forms of public consultation on projects, often after most detailed design decisions have already been made. Instead, network weavers engage their professional skills to help local communities organise in long-term placemaking processes. Through a broad variety of activities, they contribute to building up mutual trust, develop ideas and prototypes in co-creation sessions, manage expectations and interface with local institutions. The ‘Designing with Communities’ framework introduced in this chapter based on their experiences with the Adaptive Governance Lab (AGL) at the School of Architecture at University of Limerick (SAUL) describes this new emerging role for designers/professionals in more detail.

In the following chapter, **Matthijs Bouw and Despo Thoma** describe their experiences as urban curators, more specifically as developing architects, who as ‘leaders from behind’ have organised collective building groups in Amsterdam Neighbourhood Buiksloterham. When traditional masterplanned and institutionally driven

development failed due to the financial crisis, in this brownfield redevelopment site in Amsterdam various collectives emerged that started to build their own homes, organising themselves under the flag of the circular economy. A new model for area development emerged here, and looking at this through the lens of the commons, Bouw and Thoma argue that such an approach is both more resilient and delivers a better quality of life for its future residents.

Next, **Gabriele Avram** provides a series of action-research-based insights in the emergence of a ‘hackable city’ initiative in the Irish city of Limerick in 2011. In an era of economic downturn, various actors adopted the central idea of the television show *Local Heros* to organise a local community to address and overcome local issues and needs. In a detailed description of the process, she shows how a ‘hybrid community’ emerged, organised a series of events and later dissolved again. As online and offline practices were combined, ‘digital objects’ played an important role as focal points around which the community organised and represented itself to larger audiences. In her analysis, she shows how the success of initiatives as the Limerick Local Heroes can be understood through the notion of ‘scaffolding’: the adaptation and localisation of existing (social) formats and templates. In this case, a television show provided a recognisable dramaturgy that was easily understood by all participants. Similarly, a broad range of freely available and widely used digital tools could easily be used to set up a range of communal practices. These practices allow for the weaving of local community threads that in themselves make it possible for new publics to emerge around issues of concern even after the initial initiative has dissolved.

As a final contribution to the second part **Annika Wolf, Daniel Gooch, Jose Caverio, Umar Mir and Gerd Kortuem** shift attention to open data and digital platforms as one of the ways that local communities can identify topics for discussion, explore opportunities to address them and formulate solutions. However, as these authors show, it may be overly optimistic to expect that opening-up datasets will by itself invite civic organisation around collective issues. First of all, data literacy in society is still low, and initiatives are needed to address that issue. Further, based on three data-driven projects carried out in Milton Keynes, they argue that the empowerment of citizen collectives could also benefit from professionals and institutions such as researchers and community organisations taking up a role as organisers or curators. They can use their professional skills and networks to get the project off the ground and connect citizens with local institutions needed in the implementation. Yet, while this may be a productive approach, it also raises its own questions. Such a model depends on the availability of financing at the collective level. It also places these collective organisers in a position of power deciding which projects they will support. A hackable city, they conclude, is in need of new types of policies and governance models that allow citizens a greater degree of freedom in their hacking activities.

The third section, *Hackers and institutions*, further explores that last point. How do local institutions relate to practices of hackable city-making? How can they initiate, stimulate or regulate them in line with their principles of democratic governance and accountability? And how can hackable city initiatives themselves be governed? **Fiona McDermott** brings in such an institutional perspective. She describes how between

2012 and 2016 the city of Dublin ran the DCC Beta-programme to bring an approach of small-scale experimentation and iterative design to urban planning. In addition, ideation for and evaluation of these projects was organised in close collaboration with both individual citizens and civic society organisations. As such, the project was a serious attempt to create an ‘urban innovation system’ that would tap into the collective intelligence of the city at large. While the collaborative design process worked well, McDermott argues that the connection between the experiments and institutional structures of democratic decision-making needs to be developed further. One of the issues that emerged over the course of DCC Beta was the need for a coherent mechanism for prioritising projects.

Cristina Ampatzidou explores the role that games can play as a setting and focal point for communal action as well as a communicative interface between collectives and institutions. Using the concept of emergent gameplay, she describes how games can trigger social interactions between players that lead to ‘civic learning’. The latter refers to the process through which citizens become familiar with a city’s institutions and legal procedures, acquire the skills needed to navigate them and develop a sense of ownership towards issues of communal concern. Likewise, these game sessions could also trigger form of what analogously could be called ‘institutional learning’. The debates and the exchange of knowledge and insights triggered by the game could inform institutional officials about attitudes and concerns of citizens and civic organisations.

Concluding this section, **Richard Beckwith, John Sherry and David Prendergast** approach the issue of governance from a perspective of data stewardship. Openly accessible data, they write, is often argued to provide the best ways for citizens to organise themselves around relevant issues and hold accountable those in power. However, making all data available as open data can also lead to community impacts that are undesirable. They argue that urban data should be understood as a rivalrous good that requires stewardship by the community. In a case study, they analyse the discussions around stewardship in a community that collected data about floodings. To whom exactly should that data be made available? While the data collected by the community allow residents to organise around an urgent local issue, publishing that data in wider circles could also lead to higher insurance or lower real estate prices, even after the issue itself has been resolved. Controlling the flows of information, the authors conclude, is one way that communities express and steward their culture. Considering how communities choose to steward their culture (and their shared information) allows us to see that it is not just the information but also shared beliefs about that information that should define the practices of data governance.

In the last section of this book, *Theorizing the hackable city*, we move towards a number of theoretical perspectives through which collaborative city-making could be understood, further contributing to the normative debate about the hackable city. First, **Irina Anastasiu** proposes to revive Lefebvre’s ‘right to the city’ as an approach to participatory city-making. From this perspective, digital technologies can aid citizens in their willingness, ability and right to act upon their cities and gain a sense of ownership to their direct surroundings. While such a stance could be incorporated into existing liberal-democratic models of urban governance, it could ultimately pave

the way for a radically new model for a grassroots democracy, based on a notion of citizenship that is closely related to the hacker's ethic. In her chapter, she develops a taxonomy that could aid in the analysis and design of tools and practices to bring about such an 'urgent utopia'.

Next, using Murray's six-step model for social innovation, **Ingrid Mulder and Peter Kun** explore practices of hackable city-making and conclude that so far, successes have mainly been achieved in the first three phases of the model. They describe hacking, making and prototyping as practices that are well fitted to (1) explore social issues and stretch the boundaries of existing imaginations as well as current legal confines, (2) explore solutions in collaborative processes and (3) communicate the ideas generated through prototypes. However, the leap from this 'fuzzy front-end of city-making' to (4) sustaining and (5) scaling these ideas towards (6) systemic change through co-creative partnerships so far has been less developed. Hacking, in other words, opens up the process of city-making, but in itself that is not enough. A broader approach, including political, organisational and cultural aspects, is needed to ensure that bottom-up and middle-out practices such as hackathons can grow into more than just generators for ideas and truly contribute to change for the common good.

Doug Schuler provides a framework for what he calls 'holistic hacking'. Hacking, he argues, could all too easily be understood as revolving around a single intervention, an improvised appropriation of this or that infrastructure to meet some goal or another. However, practices of democratic and inclusive city-making in the network era need a more holistic approach. His overview of seven spaces or spheres of action can be helpful to understand how various independent hacks working in various domains can be sufficiently coordinated so that they help bring about a common goal, working towards systemic change. Each of these spaces—from the spaces of governance and institutional organisations to physical spaces and infrastructure space—has its own actors organising that space, and—importantly—its own particular affordances to be 'hacked', shifting the perspective from hacking as a practice to 'hackability' as an index of openness and opportunities for social innovation and change.

This volume concludes with a final reflection on hackable city-making by co-editor **Michiel de Lange**, who—like Bouw and Thoma—bases his analysis on his fieldwork with a community of 'self-builders' active in the Amsterdam brownfield redevelopment site of Buiksloterham. The key argument he makes is that hacking provides a productive frame to look at emergent city-making practices from a cultural and situated perspective. Despite the obvious differences between 'original' hackers and self-builders, the notion of 'hackable city-making' provides an analytical frame to look at city-making in terms of ethos, praxis, and structural affordances. De Lange refers to a heuristic model for 'hackable city-making' developed as part of a research project on The Hackable City, which describes the relations between individuals, collectives and institutions in practices of collaborative city-making. This model, he argues, is not simply descriptive or prescriptive but provides an entry point for critical yet affirmative discussions about hackable city-making.

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Part I

Design Practices in the Hackable City

Power to the People: Hacking the City with Plug-In Interfaces for Community Engagement



Luke Hespanhol and Martin Tomitsch

Abstract This chapter presents a discussion about the design and development of bespoke “city hacking” initiatives focused on community engagement. We draw from the literature in the field to propose a definition of *plug-in interfaces* as portable interactive technology deployed directly to public spaces on a temporary basis and addressing pre-existing architectural and social affordances. We then present a series of short-term cross-sectional field studies where we make use of two distinct plug-in interfaces to contrast different design scenarios against three core contextual constraints: (1) *technology familiarity* of the interfaces; (2) *level of integration* of the interfaces into the built environment; and (3) nature of *pedestrian activity* ordinarily unfolding in the urban precinct. We then discuss the observations from the studies and derive some initial findings regarding the utilisation of plug-in interfaces as tools for city hacking with the purpose of developing community engagement campaigns with rapid deployment and quick turnaround.

Keywords Urban interaction design · Urban interfaces · Smart cities
Community engagement

1 Introduction

This chapter presents findings from a city hacking initiative focused on community engagement. It is structured as a series of short-term cross-sectional field studies evaluating the effectiveness of placing tangible user interfaces in public thoroughfares for the purposes of public consultation on local community matters.

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Community engagement initiatives provide public venues for citizens to partake on decisions affecting their immediate environment (Gianluca et al. 2013), allowing local governments to take actions informed by public opinion and aligned with the community concerns (International Association for Public Participation Australasia 2009). However, face-to-face meetings, online surveys and other traditional methods of consultation are often disconnected from the social-cultural context (Fredericks and Foth 2013; Gianluca et al. 2013; Schroeter et al. 2012; Valkanova et al. 2014) or not easily accessible. Consequently, they often fail to reach representative proportions of the public.

In order to overcome those barriers to civic engagement, various initiatives (Behrens et al. 2014; Mueller et al. 2012; Schroeter et al. 2012; Taylor et al. 2012) have been proposed for situating digital polling interfaces directly in public spaces, therefore lowering the entry barrier. However, a common observation from those studies is that passers-by often do not notice the interfaces (Fredericks and Foth 2013; Gianluca et al. 2013; Taylor et al. 2012), which leads to low levels of participation. Recent research has demonstrated that the effectiveness of digital interventions in public spaces is highly determined by constraints imposed by the local context (Behrens et al. 2014; Hespanhol and Tomitsch 2014), including the type of digital media devices used, how familiar they are to general members of the public, how integrated they are to the physical built environment, their level of distribution across the urban precinct, how the digital interfaces are introduced to passers-by as they walk through the public space, how many people can simultaneously interact with them at any given time, the type of feedback provided, and so on. To that end, we propose the utilisation of low-cost portable interactive technologies deployed directly to public spaces on a temporary basis—as a platform to investigate three common contextual constraints (Hespanhol and Tomitsch 2015): (1) *technology familiarity* of the interface; (2) *level of integration* of the interface into the built environment; and (3) nature of *pedestrian activity* ordinarily unfolding in the urban precinct. Furthermore, we propose the notion of *plug-in interfaces*—motivated, in turn, by architectural and social affordances offered by the public space and resulting in temporary choreographies of interaction—as a method for hacking the city to design lightweight community engagement initiatives.

To address the first aspect, we implemented two interfaces: (I1) an iPad running a traditional online survey; (I2) a portable ready-made device using audio to ask “yes/no” type questions to passers-by, who could cast their votes by placing their hands on top of sensors embedded in the device. By using those two interfaces, we sought to compare the effects of technology familiarity versus the placement of devices as unfamiliar urban furniture. For testing the level of integration of the interfaces into the built environment, we deployed each of them in two configurations: (C1) attached to a street pole next to where people walked; (C2) mounted on a portable stand, placed on the sides of the thoroughfare. Finally, for gauging the impact caused by the nature of pedestrian activity, we adopted two different locations for running the studies: (L1) pedestrian crossing controlled by traffic lights; (L2) fully pedestrianised thoroughfare.

We ran a total of eight field studies testing all combinations of the above variables. In each study, we observed conversion rates and the behaviour of passers-by in regard to noticeability and discoverability of the interfaces. From the observations gathered, we then derived initial insights regarding motivational factors for impromptu interaction and intuitiveness of the interfaces. We discuss the issues commonly faced by city hacking deployments for community engagement, as well as considerations about the validity of the observed public participation. We conclude by pointing out strategies for effectively employing plug-in interfaces as lightweight tools for similar bottom-up initiatives.

2 Background

Community engagement is an administrative strategy commonly used by governments and research organisations to learn about the views, opinions and ideas of local residents of a neighbourhood. Traditionally, they have taken the form of exhibitions about new development proposals, followed by public sessions held at town halls, where citizens gather to deliberate directly with the local authorities, voice their concerns and vote on possible outcome options based on their preferences. Yet, local government authorities themselves have started to acknowledge shortcomings on traditional civic participation initiatives (Fredericks and Foth 2013; Gianluca et al. 2013; Schroeter et al. 2012; Valkanova et al. 2014). For example, many people may not be aware of the community meetings and their schedules, or simply may not be able to attend them. Some individuals may also avoid fear of public embarrassment, feeling discouraged to express their opinions in front of others, especially if those defy the views of the majority. The use of online surveys for gathering feedback from local communities on development proposals addresses some of these aspects but also introduces participation barriers, as people need to discover and be able to access the online platform and have to make time to complete the surveys (Fredericks and Foth 2013). The view that individual public spaces and communities have individual requirements has encouraged the design and development of bespoke technologies to engage specific sections of the communities directly within the public spaces they use and provide a platform that appeals more directly to the patterns and concerns of their daily life (Taylor et al. 2012). Interaction designers and urban planners have increasingly grown aware of the fact that the design of interfaces for community engagement is strongly shaped by the physical, social and cultural contexts of the urban public space in which they are deployed (Behrens et al. 2014; Bilandzic and Venable 2011; Hespanhol and Tomitsch 2015). Those factors, of course, may significantly shift overtime, and awareness of this shift has led to more lightweight urban interventions, “hacking” various elements of an urban precinct by appropriating and augmenting them for a short period of time and with a purpose often unrelated to their original role in the public space. Caldwell and Foth (2014) investigated the emergent attempts to articulate placemaking specifically with digital media and interactive technologies through grassroots approaches generally referred to as “do-it-yourself”

Table 1 Theoretical angles informing plug-in interfaces

Theoretical angles		Design options
TA1	Contextualisation	Private and semi-public indoor spaces Public plazas Public thoroughfares
TA2	Agency and accountability	Top-down Bottom-up
TA3	Aesthetics of public interaction	Media modalities Placement Spatial layout Feedback strategies

(DIY) media architecture. Such a DIY mindset, coupled with the increasing affordability and availability of Web, tracking and social technologies, has also prompted numerous other instances of grassroots activism (Koeman et al. 2015; Kuznetsov et al. 2011; Vlachokyriakos et al. 2014), where the urban environment is temporarily hacked by its own citizens. Admittedly, in some of those instances, the city hacking interventions are actually designed by academic researchers, with the goal of creating new platforms through which citizens could eventually take over and participate in. Nevertheless, this trend reveals a shift in agency and accountability regarding civic participation, from a traditionally top-down agenda driven by government and occasionally consulted with people, to an emerging bottom-up movement rooted on self-organisation. Notably, this movement works actively towards persuading the authorities about new community solutions informed by peer feedback at the citizen level and supported by rapid urban prototyping carried out directly in public spaces.

In that regard, Matsuda (2010) also identified a similar turning point in broader social relations, observing an increasing appropriation of the public space for activities previously confined to private or semi-private environments, and pointing to a fundamental shift in individual forms of expression towards shared spaces, a trend he referred to as *augmented domesticity*. Digital technology has enabled experiential privacy in public spaces by offering instant and ubiquitous availability to personal data while providing acceptable levels of access control. Echoing Hill's (Hill 2008, 2010) realisation of the city as a platform—or “soft city”—Matsuda argued that the physical qualities of an urban space have become less relevant than its role as a platform for technology-driven social interactions:

As the public and private spheres established in the 19th century merge, and space is perceived differently by each person, this terminology [private/public space] can no longer express universal spatial qualities. (source)

Based on the points above, we can therefore articulate the use of public space for community engagement from three different—yet related—theoretical angles (Table 1).

The first informs the themes of engagement and participation from a socio-political perspective, particularly the attempts at *contextualisation* (TA1), referring to the

curated choice of specific public spaces for the deployment of lightweight community engagement urban interventions [e.g. plazas versus thoroughfares, as defined by Hespanhol and Dalsgaard (2015)]. The second angle relates to levels of *agency and accountability* (TA2) prompted by different mechanisms of top-down (government bodies) or bottom-up (citizens, community groups and design researchers) appropriation of public space for the purposes of community engagement. And the third angle relates to what we refer to as the *aesthetics of public interaction* (TA3), more specifically relating to the design aspects (media modalities, placement, spatial layout, feedback strategies, etc.) relevant to choreographing community engagement and placemaking. In this chapter, we attempt to use those three theoretical angles to inform our research in regard to investigating the utilisation of *plug-in interfaces*—portable interactive technology deployed directly to public spaces on a temporary basis—for the purposes of community engagement. As we will discuss in the next section, this is not an entirely novel concept, rather a direct consequence of the city hacking ethos born out of the above-mentioned bottom-up activism boosted by digital technology. Yet, definition and understanding of plug-in interfaces as a *design strategy* on its own right—particularly for the purposes of urban prototyping (Hoggenmüller and Wiethoff 2014; Korsgaard and Brynskov 2014)—is still largely lacking. To the extent permitted by the scope of this chapter, we propose a definition of plug-in interfaces and present a series of short-term cross-sectional field studies where we contrast different design scenarios against specific contextual constraints. Further, we present initial findings regarding the utilisation of plug-in interfaces as a tool for community engagement campaigns supporting rapid deployment and quick turnaround times.

3 Plug-In Interfaces

In the 1960s, the British avant-garde architectural group Archigram conceived Plug-In City, a futuristic concept for dynamic city planning (Sadler 2005). Plug-In City consisted of a central scaffolding framework spanning a very extensive area, where moveable modular residential and commercial units could be attached to, moved around or removed according to local urban planning and design requirements. Transportation, sanitation, computing and other essential services would be embedded into the central infrastructure and shared by the community but designed in a way that would allow them to be readily reallocated to other parts of the city, if necessary. By allowing a temporary and flexible deployment of urban resources, Plug-In City would enable adaptable collective living, integration of transportation and the accommodation of rapid change in the urban environment (Merin 2013). Despite its clearly utopian character, Plug-In City helped to forge a vision for a more agile, readily adaptable deployment of specific resources for well-defined purposes within the urban environment. By keeping the scope of the plug-in modules smaller, design solutions could not only become more realistic, but also their implementation less

risky—if a newly tried module failed its intended purposes, consequences would be less damaging, and reversing the change much easier and less costly.

The concept of *plug-in modules* has also been borrowed by information technology and extensively used since the 1990s in the design of software applications. Typically, plug-in modules consist of third-party software components that can be installed as extensions to existing applications, expanding their scope of features. Plug-in releases represent an extremely common platform for allowing controlled addition of features by independent developers to well-established applications such as Web browsers (Google 2015; Mozilla Foundation 2015), content management systems (Wordpress.org 2015) or integrated development environments (Vogel 2015).

Recently, concepts reminiscent of Archigram's Plug-In City have materialised both in specific niches of architectural designs as well as in the form of digital furniture in public spaces. Shipping containers, for example, have been used as temporary dwelling units, movable hotels or structures for pop-up community markets (Williams 2015). Due to their resilience and portability, they have also become a popular temporary housing option in Christchurch, New Zealand, following a 6.3-magnitude earthquake that hit the city in 2011 (The Press 2014). Likewise, small-scale digital devices extending the built environment for purposes of public consultation or tracking have become increasingly common, such as digital customer polling interfaces (Fig. 1). Plug-in initiatives are particularly well suited for grassroots, placemaking activities, for allowing the quick trial of new layers of public infrastructure that manage to fit—spatially as well as functionally—into perceived “urban gaps” resulting from vacant or underutilised sections of the city. More importantly, those added layers can be completely and seamlessly uninstalled after the event, without loss of features from the original design. PARK(ing) Day and Build A Better Block (Lydon 2012) are relevant examples of such grassroots plug-in initiatives.¹ Examples exist where, upon community endorsement on the outcomes of those initiatives, local governments approve their deployments as permanent new urban features—as is the case of the “parklets” installed at the Civic Centre in Canberra, Australia, illustrated in Fig. 2.

We can observe, therefore, a degree of interdependency between system and interface, whereby the plug-in character of the latter is a consequence of it fitting into the social and architectural affordances of the former. In that sense, plug-in interfaces represent more than just a temporary—or “pop-up”—feature added to an urban space: just like in Archigram's *Plug-In City*, they consist both of *systemic* factors—represented by an urban architecture designed with qualities that support (intentionally or not) appropriation by external agents—as well as *usability* factors—represented by the resulting urban interfaces, the mechanisms guiding their uptake by the community and the orchestration of the interactions with them by the various social actors involved. This is true regardless of whether the plug-in interface is designed as a physical, digital or hybrid addition to the built environment.

¹PARK(ing) Day is an internationally recognised event where parking spots in various cities and towns are transformed into pocket parks and parklets. See for instance <https://www.civicdesigncenter.org/events/parking-day>.



Fig. 1 Customer polling interface at Aarhus Airport, Denmark

In this chapter, we focus on plug-in interfaces that incorporate digital media. To that extent, examples of systemic factors include public infrastructure where sensors or devices can be temporarily installed at (such as poles, trees, fences and benches), provision of electrical power or Wi-Fi connectivity within an urban site, or even spatial affordances such as a wider sidewalk, an atrium, a lobby or unused corners of a plaza. Conversely, usability factors include the type of media device used to construct the interface, the kind of sensing mechanisms employed, how feedback is given to users, how many users can interact simultaneously, how discoverable and intuitive the interface is, the time taken to answer the questions asked, and how publicly or privately the interaction unfolds in the shared public space.

Following on from the concepts above, we therefore define *plug-in interfaces* as portable, interactive media technology, deployed directly to public spaces on a temporary basis and leveraging on existing urban infrastructure and social dynamics. Conversely, we define (a) *plug-in architecture* as the set of design properties observed in or assigned to a built environment that enables the accommodation of plug-in interfaces; and (b) *plug-in choreography* as the set of new social dynamics unfolding in the public space as a consequence of the deployment of a plug-in interface. The design and implementation of plug-in interfaces tap into the ethos of the Internet culture and agile practices (Silberberg et al. 2013; Urbagram 2011) to promote human-centred, participatory design of public spaces, whose features emerge



Fig. 2 Permanent parklets in Canberra, Australia

from its own live social dynamics through a low-risk iterative process that embraces change and swiftly adapts.

The notion of plug-in interfaces is, therefore, largely formal, in the sense that it is characterised by the spatial affordances of the public space architecture and the social dynamics of its target urban precinct, regardless of its actual purpose or content. However, it is precisely its property of being at the same time bespoke and hyper-local, yet easily adaptable and ultimately reversible, that makes it highly suitable for city hacking community engagement. As discussed above, community engagement and, more broadly, placemaking initiatives have typically been realised via top-down public consultation, following an agenda driven by the government. More recently, local government authorities have also resorted to lightweight urban interventions—often in the form of “pop-up” events (Fredericks et al. 2015, 2016)—in an effort to reach out to communities, especially citizens otherwise alienated by the traditional political process. Given their temporary deployment in public spaces, those government initiatives could arguably also employ plug-in interfaces and rapid prototyping as a design strategy—and, in fact, the insights from this article are also applicable to them. However, their agenda is still admittedly top-down in the sense that the questions asked and the data gathered are still under the control of a representative body. It is precisely the ability of plug-in interfaces to allow regular citizens also to “attach” temporary, lightweight digital media interfaces directly

into “suitable” sections of the built environment that makes them such a powerful tool for city hacking. In doing so, ordinary people can appropriate sections of the public urban space, while retaining agency and accountability over the consultation process with a relatively low budget. They can also subvert them for a controlled and temporary manifestation of urban activism, reversible by nature and limited in duration. By bringing rapid prototyping and continuous improvement into the urban planning field, plug-in interfaces promote an iterative approach to placemaking through direct consultation with the general public as well as with stakeholders—such as urban planners, local governments, urban interaction designers and community members. In the process, they also enable stakeholders to fail early, fail often, welcome community input in the elaboration and test of urban interventions, and attain continuous improvement from iterations of rapid prototyping.

Although, plug-in interfaces as a design strategy for urban prototyping and community engagement have not been previously formalised, numerous recent studies have started to trial plug-in interfaces as design solutions. In those studies, the researchers often assume the role of regular citizens and probe the ability of the designed plug-in interfaces to enable bottom-up and middle-out (Costa and Ferrão 2010; Fredericks et al. 2016) approaches to community engagement. Vlachokyriakos et al. (2014) adopted the principles of DIY Media Architecture to conceive *PosterVote*, a low-cost electronic voting system for conducting public surveys. The system is designed as an open-sourced kit consisting of two components: (a) a lightweight hardware set of buttons and LEDs; and (b) a paper poster placed on top of the hardware module and displaying questions to the community. People can then answer the questions by pressing the buttons, receiving some limited feedback on the interactive process from the LEDs. *PosterVote* is a plug-in interface for making temporary use of the affordances offered by public furniture—such as electrical poles, fences and walls—where the posters can be easily hung from or attached to, but later also swiftly removed without leaving traces. Given its low cost and portability, *PosterVote* makes an ideal platform for grassroots activism and can be easily distributed across a public space, allowing both dispersed and *in situ* social action.

The *Viewpoint* (Taylor et al. 2012) was a self-contained device unit that could be mounted on a wall or flat surface, allowing people to vote both with a mobile phone as well as by pressing physical buttons. The interface showed two information windows: (a) a question box with voting instructions and (b) a small screen displaying current results and cumulative number of votes. A rotating dial allowed users to scroll through previous polls to see the final results and any response provided. Three devices were deployed for two months, each in a different location within the community: a busy convenience store; the foyer of a community centre; and in the window of a local housing organisation. The results from the studies highlighted aspects related to credibility, efficacy and format of the interfaces. In particular, they pointed to the importance of keeping the interaction design simple and the positive effects of deploying the interfaces into locations where members of the community would normally already gather to discuss community issues, taking advantage not only of architectural affordances, but also of the social interactions already in place.

Steinberger et al. (2014) developed *Vote With Your Feet* as a tangible plug-in interface exploring the social and spatial affordances offered by a bus shelter. That was augmented by allowing citizens to take advantage of their time waiting for public transport to express their opinions on topics such as current affairs, cultural identity and local matters. The interaction mechanism was very straightforward and intuitive: a digital screen, mounted at the roof of the bus shelter, would display “yes/no” questions, one at a time. Once a question was displayed, people could cast their votes by stepping on one of two tangible buttons on the ground: one labelled with “Yes”, the other with “No”. Following the same principle of creating “serendipitous encounters” with the digital interfaces, *Visualising Mill Road* (Koeman et al. 2015) deployed low-tech polling devices in shops and cafes along a commercial road spreading two neighbourhoods, divided by a railway track. Each device was built from black cardboard boxes, embedded with electronic hardware to process and store the votes entered. On top of each device, a printed question was stuck above three buttons providing a canonical set of possible answers: agree, neutral or disagree. Citizens could vote in front of participating shops, in a way that would catch their attention as they walked up and down the street. Cumulative results were visualised with marks stencilled with coloured chalk spray along the street in front of each shop, exploring the affordances of visibility and walkability offered by the sidewalk pavement.

Adopting findings from the studies described above, such as making a conscious effort to keep the design of the voting interfaces simple, we developed our own case study. It consisted of a series of short deployments ran at our university campus, focused on testing the impact of certain contextual constraints on the observed participation by the general public. In the next section, we explain *why* we decided to investigate such a proposition, *where* we tested it, *what* interfaces we actually deployed, and *how* each interface was made available for citizens in the public urban space. Furthermore, we present the results of our studies and consider the design implications suggested by their outcomes.

4 A Case Study on City Hacking for Community Engagement

4.1 Why: Motivation

Above, we defined plug-in architecture as a process of opening up city-making and empowering citizens to develop plug-in choreographies as a set of new and situated social dynamics. As first line of enquiry, therefore, we decided to focus on the design of plug-in interfaces as elements fitting into the architecture and enabling choreographies.

When designing the deployment of digital interfaces to public spaces, researchers are repeatedly faced with three common contextual constraints: (1) the *technology familiarity* of the interface; (2) the *level of integration* of the interface into the built

environment it was deployed to; and (3) the nature of *pedestrian activity* ordinarily unfolding in the urban precinct. Technology familiarity refers to the extent to which passers-by would quickly make sense of the interface and learn how to use it upon a brief encounter in the public space. Level of integration relates to how much the interface blends into the surrounding architecture: for example, card readers on train stations are usually *installed into* local public furniture such as gates or station entrances (Fig. 3), while beverage machines or ATMs are often *placed alongside* other architectural elements in the public space such as walls or escalators (Fig. 4). Finally, the likelihood of passers-by stopping by an interface in a public space is determined by extrinsic factors such as the primary function of the space (e.g. connecting destinations, or else being a destination in itself) and the presence of other elements of interest nearby, such as shops, buskers, public art, benches or stairs (Mendelson 2015).

In order to get a better understanding about the impact of each of those contextual constraints in the levels of participation by the general public, we devised a series of field studies aimed at testing each of them with plug-in interfaces. The sections below describe our design approach for the study of each of those constraints.

4.2 Where: The Locations

To gauge the impact caused by the nature of pedestrian activity, we adopted two different locations for running the studies. The first location (L1) was a pedestrian crossing (Fig. 5(1)–(4)) on a busy wide avenue running through our university campus. The crossing is controlled by traffic lights both for cars and pedestrians, and pedestrians can indicate their intention to cross the road by pressing button-driven devices installed in electricity poles on each side of the zebra crossing. As we observed, pedestrians tend to adhere to traffic rules at that particular crossing, as it is located at a busy major road: they walk towards the area of the sidewalk immediately behind the zebra crossing (and therefore besides the electricity pole where the button-driven light control device is installed at) and then assess the status of the lights. If the lights are red, pedestrians press the device button and stand at the same spot for a few minutes waiting for the lights to go green. This waiting period offers therefore a window of opportunity for casual interaction with a plug-in interface.

The second location (L2) was a fully pedestrianised thoroughfare (Fig. 5(5)–(8)). Importantly, it was located in the same university campus as L1, so that we could ensure participation in all scenarios would involve members of the same community. The thoroughfare consisted of a 3-m wide concrete pathway running on a straight line through a small park flanked by faculty buildings on one side and a wide grassed area on the other. Sitting benches of different types are present on both sides of the pathway, which connects one of the campus' entrances and sport fields to a library, food court and other faculty buildings. As a result, the thoroughfare receives a continuous flow of pedestrians in both directions all day long.



Fig. 3 Transport card readers at a rail station in Sydney, Australia

4.3 What: The Plug-In Interfaces

As indicated by Table 2, to address technology familiarity (Blackler and Hurtienne 2007), we implemented two very distinct interfaces. The first (I1) consisted of a Web-based survey running on a 9.7-in. iPad Air (Fig. 6, left). The Web application would present the passers-by with a series of polar (i.e. “yes/no” questions). Walking up to the interface, participants would encounter a single question displayed on the iPad screen, above buttons corresponding to “yes” and “no” answers. Once participants answered the question, an animation would play confirming that the vote had been cast, followed by a visualisation of the cumulative results for that question gathered up to that moment, so that the participants could learn how their opinion stood in



Fig. 4 ATMs at a food court in Sydney, Australia



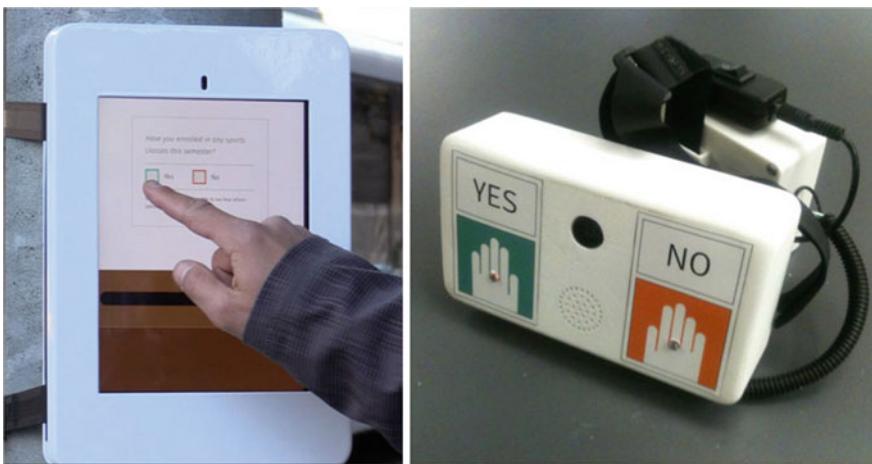
Fig. 5 Setups for the field studies

relation to their fellow citizens. After 30 s, the interface would display the next question, thus starting a new cycle.

The second interface (I2) consisted in a portable ready-made device using audio to ask “yes/no”-type questions to passers-by, once they were detected to be in the vicinity (within 3 m) of the device by a proximity sensor. After hearing the question (recorded by an English-speaking female actor), participants could cast a vote by

Table 2 Design scenarios addressing the contextual constraints

Contextual constraint		Scenario	Description
Where	Location	Pedestrian Crossing	People normally stop near the interface while waiting for the traffic light to turn green
		Thoroughfare	There is normally a steady flow of people walking past the interface
What	Interface	iPad	High technology familiarity
		Audio	Low technology familiarity
How	Configuration	Pole	Blended into existing street furniture
		Stand	New street furniture

**Fig. 6** Plug-in interfaces used in our studies

placing their hands on top of one of two cards labelled with “yes” or “no” (Fig. 6, right). The cards were embedded with sensors to detect the variation of light once a hand was placed on top of it, and a vote was only counted if only one of the two cards was covered. Like the iPad Web interface, upon computing a vote the audio device would present the participant with the cumulative results for that question, reading out loud how many other citizens had voted the same way. The cycle would then resume, with the device asking the next question if the participant stayed around or going silent otherwise until being approached by the next participant. The cycle would also resume in case of no vote being detected in the first place (e.g. if the participant walked away while the question was still being asked), timing out after waiting 10 s for a response.

Through those two interfaces, we sought to compare the effects of technology familiarity in the usage of urban plug-in interfaces for community engagement. We assumed the iPad interface to be perceived as more familiar—being a well-known device and given the fact we created the survey as a standard Web application.

However, we were interested in investigating how strong a role technology familiarity would play when presented in a rather unfamiliar context. Also, to facilitate the understanding of both interfaces, we designed them using a combination of very simple user actions, quick interaction cycles and complete independence between the questions, in order to produce *walk-up-and-use interface* scenarios (Jacucci et al. 2010). Our intention was to allow passers-by to join in or opt out from the interactions anonymously, at any time and at their own pace, therefore facilitating the interaction with the interface by individuals who would encounter them among other public space features in a way that was most likely sudden and unexpected. The same concerns with the passers-by choreography elicited by our plug-in interfaces led us to compose the survey with polar (i.e. “yes/no”) questions rather than asking for more articulated feedback from participants: we designed the plug-in interfaces to take advantage of impromptu encounters with participants on their way to do something else as part of their daily routines—a requirement derived, in turn, from the architectural and social affordances of the chosen locations, as described above. Given that polar questions demand very little time commitment, we expected, by adopting them, to minimise the impact of time availability as a potential factor influencing participation. Had we designed interfaces to “plug into” a more accommodating public space—for instance, a public park with plenty of seating spaces, or even a bus stop, where people would dwell for longer—we could have afforded to design the survey for eliciting more articulated answers from citizens.

In order to isolate the survey content as a study variable, we asked the same questions on both interfaces. As we ran the study at a university campus during school holidays, we targeted the survey to the university staff community, asking five questions about sustainability and physical activity around the campus:

1. Do you drive your car to work?
2. Do you turn off your computer when you go on lunch break?
3. Do you use a reusable coffee cup when you get coffee or tea?
4. Are you able to control the air condition or heating in your office?
5. Do you take public transport to get to work?

4.4 How: The Interface Configurations

To test the level of integration of the plug-in interfaces into the built environment, we deployed each of them in two configurations. The first one was intended to give the interface a seamless character, well blended into pre-existing elements of the urban landscape. We chose to use Velcro straps to attach the interfaces to *poles* on each environment next to where people walked: on the pedestrian crossing, we attached them to the electrical pole also hosting the button-driven crossing lights device (Fig. 5(2), (4)); in the thoroughfare, to a tree at the edge of the pathway (Fig. 5(6), (8)).

While the first configuration would have the devices mounted on existing street furniture, the second should, on the contrary, cause the interfaces to stand out prominently on their own among the other elements in the local built environment. This second configuration, therefore, involved having the interfaces mounted on a portable stand, placed near the electrical pole (in the pedestrian crossing, Fig. 5(1), (3)) or the tree (in the thoroughfare, Fig. 5(5), (7)), but as clearly separate visual entities.

4.5 Methodology and Results

We ran a total of eight field studies, testing all combinations of the above variables. Each study ran for one hour, during which we recorded two metrics: (a) total number of passers-by who approached the plug-in interface under observation and (b) number of passers-by who actively interacted with the interface. For the purposes of this study, we defined *approaching the interface* as the act of walking towards it while aware of its presence, which therefore entailed slightly different behaviour depending on the location. In the thoroughfare, we counted passers-by walking within a range of up to 3 m from the interface and who performed active movements indicating their awareness of it, such as changing their walking pace around the interface, turning their heads to it or walking towards it. In the pedestrian crossing, we counted all people walking from the side of the road the interface was deployed to and crossing towards the other side, therefore incidentally coming within close proximity with the interface. Figure 7 shows the breakdown of the total number of participants per setup. The definition of *actively interacting* with the interface was the same for all scenarios: the act of making explicit gestures in or around the interface in an attempt to explore it further and cast a vote.

From the two metrics described above, we derived the *conversion rate* for each field study (also displayed in Fig. 7) as the percentage of passers-by who, having become aware of the plug-in interface, actually interacted with it. Combining the numbers per design scenario, across all studies, we then derived the conversion rates for each of them, as shown in Fig. 9. Likewise, Fig. 8 shows the distribution of participants when each design scenario is looked at in isolation.

5 Discussion

Before we analyse the results obtained from our studies, it is important to acknowledge their limitations. We should point out that the research questions presented in the previous section, although informed by all three theoretical angles outlined in Table 1, pose a much greater focus on aesthetic aspects that could influence public interaction (TA3). When designing our field studies, we aimed to prototype scenarios that could exemplify typical grassroots urban interventions. To that end, we designed our plug-in interfaces to re-contextualise community engagement sessions from

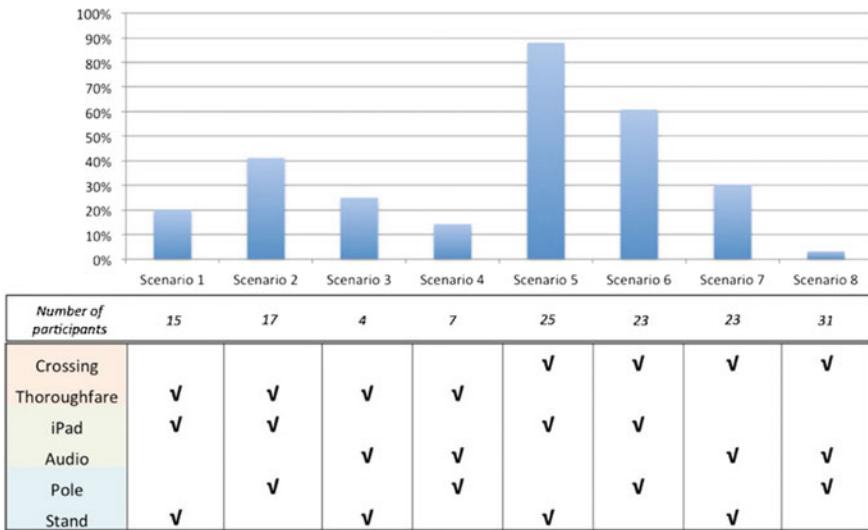


Fig. 7 Conversion rates per field study setup (tick marks indicate the features of each setup)

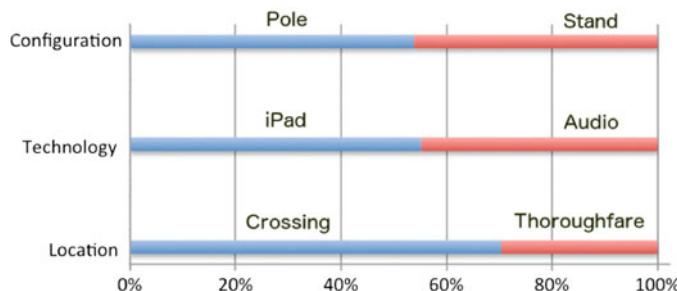


Fig. 8 Percentage of participants per design scenario

private to public spaces (TA1) and simultaneously avoid perceived accountability by government or administrative bodies (TA2). In addition to implying aesthetic decisions (as discussed below), such a departure point also assumed public spaces as test beds for our plug-in interfaces and a bottom-up approach to their deployment. That, in turn, got reflected in the “urban guerrilla” manner we designed our interventions, employing low-cost interfaces and running each session for a very limited amount of time: each study ran only for a short period (one hour) and, therefore, the total number of participants coming into contact with the interfaces was relatively low. Also, as Fig. 8 indicates, the percentage of total participants was somewhat unbalanced when location is considered in isolation, with more than two-thirds (70%) engaging in interaction with the interfaces at the pedestrian crossing. The distribution of participants across the other two contextual constraints—configuration and type of interface—was much more uniform: 54% pole versus 46% stand,

and 55% iPad versus 45% audio device, respectively. Given the reduced population sample, the studies can only offer preliminary impressions of the effectiveness of each design strategy regarding location, choice of interface or spatial configuration.

Despite those limitations, we believe the results obtained provide some important initial insights into motivational factors for impromptu interaction, intuitiveness of the interfaces and other relevant factors for consideration in the design of plug-in interfaces for community engagement, which we intend to explore further in upcoming studies. For example, from the metrics observed, the pedestrian crossing location seems to offer more favourable conditions for passers-by to learn and actively make use of the interfaces: not only the conversion rates across all setups (Fig. 7) were greater for the pedestrian crossing (43%) than for the thoroughfare (28%), but that was also the location for three out of the four setups with highest conversion rates (setups 5, 6 and 7, respectively), including the two at the very top (setups 5 and 6), as indicated in Fig. 7. This seems to validate the strategy of positioning the interface next to spots in the space where passers-by were already pre-conditioned to stop by (e.g. next to the button-driven crossing lights controlling device), therefore taking advantage of their natural behaviour in that space. We propose to refer to those spots within the public space where people would normally already stop by during their ordinary walk as *resting areas* and argue that they constitute a particular form of plug-in affordance. Waiting for the traffic light to turn green seems to offer people just enough time for noticing the plug-in interface, while the perspective to cross the street provides a suitable excuse for quickly trying it out before walking away. Since the normal routine of the pedestrian is not disrupted and requires little time commitment, participation becomes more likely.

Equally important, the context offered by resting areas is conducive to those kinds of quick interactions, unlike most other spots in a public space. As Aurigi (2013) pointed out:

In many cases, terminals have been designed and placed to respond to a simplistic conception of touch-and-go usage by an idealised model of busy, ‘always on the move’ connected citizen. They depend entirely on an idea of fast movement space, and quick and casual interactions. [...] They therefore end up being placed in entirely ‘public’ and over-exposed – and often rather uncomfortable – locations, forgetting that the nature of the interactions allowed by the terminal is rather personal and private. (Aurigi 2013)

The ubiquity of mobile technology and Web connectivity, however, have turned resting areas, even during ordinary circumstances, into spaces that offer people the opportunity to momentarily pause from other activities and engage in more personal, private and fleeting interactions with technology—in other words, into places for emergence of the augmented domesticity patterns of behaviour identified by Matsuda (2010). On those areas, and supported by digital technology, people would naturally start to feel able and comfortable to perform in public tasks previously reserved to the private home environment. For example, it is not uncommon to see people engaged with their mobile phones—e.g. making calls, checking their emails or quickly interacting with friends in social media—while waiting for the lights on a pedestrian crossing to turn green. The placement of plug-in interfaces for community engagement at or around resting areas encourages therefore situated participation by

leveraging directly on the local public space affordances, which are of both architectural and social nature.

This resulting *plug-in choreography*—which, importantly, also disappears from the public space once its corresponding plug-in interface is removed—has also found similar expressions in *Visualising Mill Road*, a study carried out by Koeman et al. (2015), who placed voting devices in a strategic location where people would already normally stop by: shop counters. While walking on the streets towards the shops, passers-by were gradually introduced to the community engagement campaign via the stencilled visualisations in front of the shops; upon entering a shop and stopping by the counter to pay for their goods, they would then have just enough time to engage with the voting interface without greater disruption to their normal routines, while all along feeling that they had contributed by participating in the civic event. *Vote With Your Feet* (Steinberger et al. 2014) also tapped into the local dynamics by having the foot-controlled voting interface deployed in a bus shelter—again, a location where people would otherwise have to stand idly anyway.

Even more significant, however, appears to be the effect of technology familiarity. As indicated in Fig. 7, all three setups with the highest conversion rates (setups 5, 6 and 2, respectively) employed the iPad interface. Across all setups, the iPad interface also resulted in a conversion rate more than 3.5 times higher than the one produced by the audio interface (57 and 15%, respectively, as indicated by Fig. 9). Those results strongly endorse the effectiveness of technology familiarity of the interfaces for participation. Despite the lack of explicit signage guiding the interaction, and the fact that neither interface constitutes a familiar feature in public spaces, passers-by still managed to swiftly make sense of the iPad-based setups and engage in interaction with that interface much more successfully than with the audio device. This is consistent with the literature on intuitive interaction, which argues that an interface will be perceived as intuitive if used in similar contexts as it is normally found at or, if used in a different context, it follows the same interactive rules as those on its original context (Blackler and Hurtienne 2007). A Web survey running on an iPad works the same way as it would be expected to run in any other context, hence passers-by making sense of it immediately. Our portable custom-made audio device, however, may not have presented sufficiently recognisable interaction mechanisms to allow for a swift uptake by passers-by in the community it was tested at.

Another important consideration relates to the utilisation of visual versus audio feedback for the interaction. Previous research (Hespanhol and Tomitsch 2015) has indicated that synchronous, immediate visual feedback—as the one provided by the iPad Web application, upon input from the user, is a relevant factor for conveying *identity*—i.e. for giving the individual interacting the sense that the interface is responding *directly to them*—and, therefore, forging a sense of *control*. Audio feedback, however, may easily become ambiguous: although our audio interface started playing upon identification of a person close-by, if the person walked away the device would continue to play; if a second individual then walked into the space, they would encounter the audio being played half way through, therefore losing the sense of being directly addressed by the interface. Likewise, if the surrounding

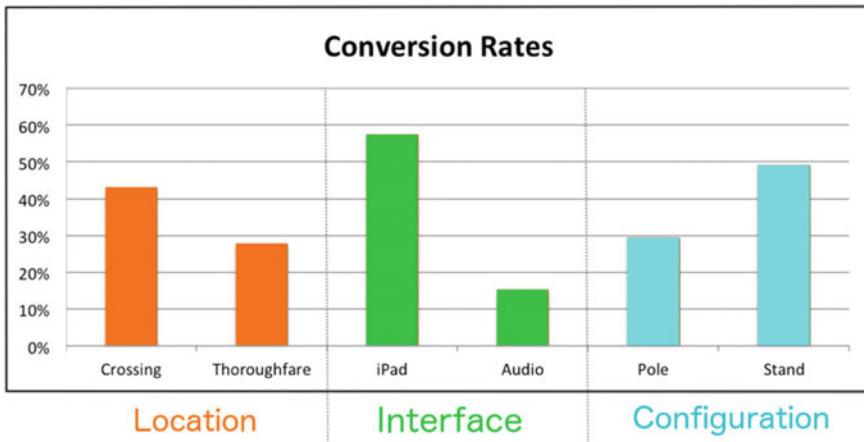


Fig. 9 Conversion rates per design scenario, across setups

environment became too noisy for the question to be heard, passers-by might not understand that the interface could be addressing them.

In regard to the mounting configurations, 3 out of 4 of the setups where the interfaces were mounted on a stand produced greater conversion rate than their counterparts where the interfaces were mounted on a pole (Fig. 7). Likewise, when looked at in isolation across the setups (Fig. 9), the stand configuration yielded a greater conversion rate than the pole configuration (49 and 29%, respectively). Such a result suggests that interfaces that are less integrated into the built environment are actually more effective in terms of attracting interactions from passers-by. Those results reflect some of the conclusions raised by similar grassroots city hacking deployments for community engagement. The design iterations reported in both *Visualising Mill Road* (Koeman et al. 2015) and *Vote With Your Feet* (Steinberger et al. 2014), for example, also pointed to the effectiveness of utilising elements that visually disrupted and stood out from the ordinary street aesthetics (chalk visualisations and extra signage, respectively). This strategy also corroborates the use of visual disruption in the urban space by other initiatives aimed at instigate civic engagement, such as the *London Is Changing* project (Ross 2015), which used billboards to display opinions about the city's affordability originally expressed online by members of the public. In all those scenarios, employing visual disruption in the urban space as a tool to attract the attention of passers-by to platforms aimed at civic discussions pose benefits that are twofold: in addition to the obvious increase in participation, it also presents citizens with views expressed by others, potentially in conflict with their own. In doing so, it counteracts one of the challenging factors to the public discussion of ideas in modern society: *filter bubbles* (Pariser 2011). A result of the automatic selection of news, topics and opinions by online search engines and social network based on a user profile, filter bubbles emerge by the algorithmic tracking of an individual's preferences, subsequently feeding an increasing presentation of materials related to

their own interests, thus reflecting their own world views in detriment of others in contrary. By employing visual disruption to persuade community members to pause in a public space where they can get acquainted with a wider range of views from their peers, plug-in interfaces can therefore strongly contribute to more balanced civic debates and increased agency and accountability (TA2) of the views shared by citizens (Hespanhol et al. 2015; Valkanova et al. 2014).

The considerations above, as well as observation from the literature, point to some clear strategies to be observed in the upcoming design of plug-in interfaces as lightweight tools for similar bottom-up initiatives:

Simple, clear and familiar interfaces, adaptable to the circumstances

As expected, walk-up-and-use interfaces that can be immediately understood, read and accessed lead to greater participation rates. However, care should be taken so that such clarity is kept despite of changes in the weather conditions, loudness or other distractions of the environment and demographics of the general public.

Quick interactions, placed in or around resting areas

As verified both in our pedestrian crossing scenario as well as in similar studies—like *Visualising Mill Road* (Koeman et al. 2015) and *Vote With Your Feet* (Steinberger et al. 2014)—the combination of quick interactions prompted in locations, where people would already stop by during their normal routines, creates a comfortable context that encourages engagement.

Low integration and distinctive aesthetics

Prominent features that cause interfaces to stand out from other urban elements result in greater participation, as verified by the greater conversion rates generally produced in our studies when the interfaces were mounted to a stand. The effectiveness of low integration and distinctive aesthetics has again also being verified in the recent related research by Koeman et al. (2015) and Steinberger et al. (2014).

Iterative prototyping via human-centred, participatory design

Participation levels can be increased by tailoring the interaction to the demographics and patterns of behaviour of the local community. Since those may vary overtime around the public spaces the interfaces are deployed to, multiple iterations of participatory design are required to uncover the patterns of behaviour and interaction of the local community members. By definition, plug-in interfaces must be lightweight enough to be deployed and pulled out multiple times.

Contextualisation of the interface

When designing our field studies, we were interested in comparing pairs of opposing design approaches (TA3) against specific contextual constraints, therefore testing the impact of each on participation. To address those objectives, we decided not to make use of any external signage explaining what the interfaces were for—a factor that potentially contributed to the low participation rates observed. As Koeman et al. (2015) pointed out, in addition to the attractive visual aesthetics of their voting

devices, factors found to significantly encourage community-wide engagement were the participating shopkeepers and the media. The involvement of shopkeepers, in particular, was relevant for providing unsolicited endorsement of the process by people perceived as peers within the community. Similarly, the *PosterVote* (Vlachokyriakos et al. 2014) sessions run by a community group were perceived as having higher degree of governance, therefore lending a more official atmosphere to the process.

As Taylor et al. (2012) pointed out, “if the results of a poll, the response posted or the device itself cannot be trusted or are not seen as legitimate, then this impacts the ability of the device to provide a sense of efficacy”. Based on our results and on the findings from the literature, we argue that the observation of the points above during the design of plug-in interfaces can increase its credibility and, consequently, the trustworthiness of the community engagement campaign.

6 Conclusion

In this chapter, we presented the concept of plug-in interfaces: portable interactive technology deployed directly to public spaces on a temporary basis and addressing pre-existing architectural and social affordances. We derived the concept from the observed increasing popularity of bottom-up activism initiatives and practices of “hacking” the city for situated, purpose-driven design interventions. Plug-in interfaces allow citizens to appropriate and subvert sections of the city for controlled and temporary manifestations of urban activism, reversible by nature and limited in duration. By bringing rapid prototyping and continuous improvement into the urban planning field, plug-in interfaces turn community engagement into city hacking, by promoting iterations of direct and situated consultations with the general public as well as with stakeholders.

After an overview of related research in the field, we presented a case study on the utilisation of plug-in interfaces for community engagement. In particular, we sought to gain further understanding about approaches to address three core contextual constraints recurrently faced by studies of this nature: (1) *technology familiarity* of the interface; (2) *level of integration* of the interface into the built environment; and (3) nature of *pedestrian activity* ordinarily unfolding in the urban precinct. We presented the eight setups ran in the studies as well as the metrics observed, from which we derived conversion rates per setup as well as cumulative by design scenario. We then discussed limitations of the studies as well as an analysis of the results, reflecting on motivational factors for impromptu interaction with, and intuitiveness of, the interfaces.

Our analysis points towards design aspects that should be favoured in the design of plug-in interfaces as lightweight tools for similar bottom-up initiatives. Aspects worth of consideration include: (a) use of simple, clear and familiar interfaces, adaptable to the circumstances; (b) quick interactions, placed on locations people would normally stop by (resting areas); (c) low integration and distinctive aesthetics; and (d) iterative prototyping via human-centred, participatory design. Furthermore, a

greater contextualisation of the interfaces regarding their purpose in the public environment might have helped to make them more trustworthy among members of the community and, consequently, increased participation.

We adopted the notion of plug-in interfaces from speculative design in architecture (Merin 2013; Sadler 2005) as well as from software design. In both instances, plugins are used to extend existing systems by adding new features that can be easily adapted and removed without compromising the core functionality of the hosting system itself. In software design, the development of plug-in interfaces is supported and encouraged through the provision of application programming interfaces (APIs). In comparison, cities do not yet offer similar frameworks that allow anyone to develop and deploy plug-in interfaces. The studies discussed in this article, including our own, attempted therefore to leverage on existing architectural affordances to design plug-in interfaces to appropriate the built environment for the purposes of community engagement. In that sense, the current state of plug-in interfaces is more akin to hacking, compared to the more established, formalised and supported development of plug-ins for software applications—in our study, for example, we “hacked” the environment by attaching polling devices to existing urban elements or deploying them into existing spaces. However, as the digital layer of cities develops and the concept of smart cities matures, it may indeed be possible to conceptualise cities as operating systems (Tomitsch 2016) with a more formalised API consisting of input and output channels—such as the number of people or vehicles passing through a space, for instance—that any citizen could build on.

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Rapid Street Game Design: Prototyping Laboratory for Urban Change



Viktor Bedö

Abstract Street games are predominantly physical games played in the streets, incorporating the built urban environment, spatial layout, social and political characteristics of urban sites into the gameplay. This paper outlines how rapid street game design and playing street games are means of knowledge generation for urban change. To develop the argument, it looks first at implicit aspects of design knowledge in an iterative design process. It then explores the role of explicit and implicit rules in game design as well as the concept of the magic circle that incorporates both the game design and the context of the actual urban site. Game design examples underpin the exploratory and prototyping aspects of street game design.

Keywords Street game · Implicit knowledge · Prototyping magic circle
Rapid game design

1 Introduction

Street games are predominantly physical games played in the streets, incorporating the built urban environment, spatial layout, social and political characteristics of urban sites into the gameplay. Since 2006, a small but constantly growing community of urban and street game designers emerged along with events and festivals for games and playful activities in the urban environment. These include Come out and Play, Weekender and Playpublik among many others (for an overview see Wood 2016). As the games featured by these festivals show designing street games can be a form of artistic expression, a cultural form for negotiating what is possible and what could be possible in the architectural, infrastructural, social and political context of urban spaces. This chapter will outline how rapid street game design can contribute to

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urban change as a prototyping tool or as an in situ laboratory-like tool for exploring city-related matters.

The use of prototyping goes beyond the areas of product or service design and is now widely adopted in the testing and exploring of proposals for social change on a smaller scale (Murray et al. 2010) or in the context of city-making (Mulder and Kun, Chap. 12 in this volume). Koskinen conceptualises models, scenarios, prototypes and sketches as *design things* that turn weak hunches into stronger claims (Koskinen et al. 2011, 125–140). Arguments from design theory and philosophy suggest that conceptualising thinking can include thinking in material artefacts just as much thinking in words or language. Ehn’s term *thinging* highlights how artefacts enable experts to gather, negotiate and think together in co-creation settings (see Koskinen et al. 2011, 125). Malafouris’s framing of *creative thinging* outlines an even more fundamental aspect of thinking in material artefacts, according to which shaping artefacts and our environment allows for constant exploration and re-exploration of the affordances of both mental and physical spaces (Malafouris 2014). Kristóf Nyíri highlights that a technology like the word processor allows for a faster and more flexible manipulation of language. He points out that the difference between the materiality of the thought that is spoken and the thought that is written down is only a gradual difference (Nyíri 1993). These arguments suggest that faster and more flexible means of manipulating prototypes decrease the gap between thinking with words and *thinging* with objects.

This chapter will outline how rapid street game design creates knowledge for urban change from the earliest moments of the design process. To develop the argument, the chapter first elaborates on the aspect of design knowledge that is employed in sketching and prototyping. Then, the paper discusses the closed or open nature of the game design concept ‘magic circle’ in the case of street games. The argument then will be contextualised with game design examples before concluding on the kind of prototyping rapid street game design is.

2 Enacting Design Knowledge

Iterative processes are characterised by frequent loops of prototyping, an increasing level of detail and context of the prototype, but also the possibility of failure and returning to earlier stages of the process. The earlier an idea is prototyped, the earlier it is possible to get feedback in context. Yet quick iterations are not just a mere trial-and-error strategy but build on and generate implicit knowledge. This knowledge is embodied in our patterns of interaction with our environment and in our feel for stuff which we are dealing with (Schön 1983, 49). Using an example borrowed from Schön’s *The Reflected Practitioner* (1983) as a point of departure, I would like to elaborate on the kind of implicit knowledge involved in iterative design processes. Schön describes the situation when an experienced architect looks at a sketch and changes it in order to create something better:

When looking at the drawing “[the architect] zeroes in immediately on fundamental schemes and decisions which quickly acquire the status of commitments. He compresses and perhaps masks the process by which designers learn from iterations of moves which lead them to reappreciate, reinvent, and redraw. (Schön 1983, 104)

The architect recognises similarities with designs from his repertoire he acquired in the past, and in the same moment, he has the implicit readiness to change something in the sketch. Then the sketch is changed and observed again. Schön calls these cycles reflection-in-action. Schön elaborates on how reflection-in-action is comparable to a scientific experiment (like exploratory testing, move testing or hypotheses testing) (Schön 1983, 147), and this resonates with approaches that emphasise the laboratory-like character of iterative design (Koskinen et al. 2011, 55–65).

In an empiricist approach, knowing something—or having a concept of something—means that past experiences are saved in some form and these experiences can be meaningfully recalled or reactivated (cf. Price 1953). Reactivating experiences means the ability to produce mental or physical manifestations that are similar to the objects and events that were experienced in the past. As a consequence, reactivating experiences also means that objects and events can be the content of thinking when they are not actually present to perception. According to Price, although we predominantly think in words and images:

We also think sometimes by means of physical replicas, such as diagrams, models and dumb show; sometimes by non-imitative gestures, as in using the deaf and dumb alphabet; and sometimes by means of the muscular sensations which accompany incipient actions, gestures or others, when then actions are not overtly performed. (Price 1953, 300)

Based on our fundamental ability to recognise similarity, we potentially can think in everything what we can produce and what bears some similarity to past experiences (Price 1953, 300). What is meant by the “muscular sensations which accompany incipient actions that are not overtly performed” though? The example of dancers’ practice of *marking* (Kirsch 2010) sheds light on how a slight muscular sensation displays similarity with—and thus can stand for—a fully carried out movement. Dancers don’t fully carry out a series of movement when rehearsing but enact movements with smaller—in some respect more abstract—movements. According to Kirsch, this enables dancers to go through a whole choreography not only in order to memorise it, but also to reflect on aspects like speed and rhythm or communicate with other dancers without having to fully carry all the whole phrase. Sometimes, the twitch of a muscle or even just the mental activation is sufficient.

Price calls the kind of readiness to activate or produce instances of what we know *dispositions*. However fully these instances are produced, they are always activated as parts of a network:

[T]he ‘activating’ of any mental disposition is a matter of degree. Between the two extremes – complete latency and complete actualization – there are many intermediate degrees of *sub-activation*. When the word ‘cat’ occurs, or a cat-like image, a whole series of concepts linked in one way or another with the concept Cat may be in some degree brought to mind. It is true of me at all times that I am capable of recognizing mice, bowls of milk, fur, tigers, mammals, hearth-rugs, at any rate so long as I retain a moderate standard of health and sanity. At all times I have memories of what all these diverse entities are like (in the dispositional

sense of the word ‘memory’). But if the word ‘cat’ occurs to my mind – or a cat-image or a physical cat-replica – then something comes to be true of me which is not true at all times. All these diverse memory-dispositions are in some degree excited or sub-activated. I am put into a state of *readiness* to recognize mice, bowls of milk, tigers, etc., if I should happen to perceive them; and also, in a state of readiness to talk of such entities or produce images of them. I am ready to do these things, even though I do not actually do any of them. (Price 1953, 317–318)

To come back to the example of the architect working with the sketch, it is clear that they not only recognise similarities and differences between the sketch and past sketches but also the similarities and differences of the sketch with past experiences of built architecture. They understand the built architecture that they see on the sketch. Noë’s theory of enactive perception, according to which spatial experience is transmodal, provides an explanation of how a sketch can display similarities to architecture (Noë 2004). Transmodality, in this context, means that visual experiences and tactile experiences—on an abstract level—are producing the same sensorimotor patterns. I argue elsewhere that transmodal re-enactment is also possible when touch and vision are on different scales: for example, when recognising visual patterns for the first time on digital maps visualising traces of street-level activities we have experienced before (Bedö 2011).

Based on past experiences in different modalities and scales, we have an understanding of what usually occurs together, and our respective concepts activate each other in case one is activated. Based on this implicit understanding of what is usually activated together, we may implicitly understand a disparity between the concept and what we see, even if not in the whole, at least in certain details. For example, if we draw a cat:

Sometimes I feel dissatisfied with my image; something is wrong with the ears, or the whiskers are missing. My (dispositional) knowledge or memory of what cats are like – in other words, my concept of Cat – is again currently manifested by this feeling of inadequacy; and sometimes by the production of a better image which has fewer defects than the first. (Price 1953, 338)

Also, in the case of Schön’s architect, this feeling of inadequacy is a symptom of the disposition to produce another detail that he implicitly knows should be produced along with the ones on the sketch.

With the above arguments, I wanted to outline how implicit embodied knowledge acquired through interaction with artefacts generally or more specifically with the urban environment is the driver of iterative prototyping processes. I will return to these arguments after exploring the way urban and street games set the frame for interacting with the urban environment.

3 The Rules of the Game

Street games are experiences embedded in urban space, constituted by the urban environment and the rules to which players commit for the duration of the game (see

also Salen and Zimmerman 2004, p. 96). The rules on which players explicitly agreed before the ‘Go!’ constitute only a part of the game experience. Salen and Zimmerman differentiate between three kinds of rules constituting a game: operational rules, constitutive rules and implicit rules (2004, 130). Operational rules are the only ones explicitly stated in the rule set.

Let me illustrate the difference based on the street game MySpace (also see in section MySpace game below). The game MySpace is played by six players: three Claimers and three Don’ts. The game is played on sidewalks with pedestrian traffic. For the initial set-up, the Claimers stand in a triangle two steps apart. Neither the Claimers nor the Don’ts are allowed to talk or use any conspicuous gestures. The Claimers just stand. The Don’ts walk around trying to block the paths of pedestrians in such a way that they are guided into the Claimers’ triangle. Every time a pedestrian crosses the triangle, the Claimers have to take two steps backs—opening up the triangle. Claimers are allowed to adjust their positions by rotating the triangle around the initial centre point. The Claimers win when less than four pedestrians cross the triangle in two minutes (times adjustable to concrete circumstances like the time of the day or crowdedness of the street). Otherwise, the Don’t team wins.

Now, this description of MySpace mostly includes the explicit rules of the game: the number of players, the number of steps Claimers has to go back when their triangle has been crossed and so on. Constitutive rules, on the other hand, are not explicitly stated in the rule set but constituted by the game materials used and the features of the playing field, which provide the framework for the possible interactions. For example, MySpace works best on sidewalks that are broad enough to open up the Claimers’ triangle. A narrow sidewalk would be a peculiar playing field of choice for this game as it would force players to step onto the street. Having to avoid cars would change the nature of the game completely. The width of the street is just one of several potential constitutive rules. Other examples for constitutive aspects in street games in general could be the density of street furniture shielding vision; corners allowing for hiding; even the density of pedestrians.

Implicit rules of the game are more related to social behaviour and patterns of everyday space use. These include everyday rules of living in a city: for example, that Don’t players should not physically push uninvolved pedestrians; that Claimers’ know how to stand around on the street inconspicuously and how far they can reasonably expect non-playing pedestrians to detour in order to walk around the Claimers’ triangle. I want to highlight that the border between constitutive and implicit rules is a rather fluid one. Norms, habits, rituals and the like—embodied in everyday choreographies—can determine what people can do or will decide to do at a site just as much as light, smell, Wi-fi coverage or the availability of benches. The explicit rules, the choice of playing field and playing time as well as the playing materials are elements that the street game designer introduces to the game. The affordance of the space, mindset of players and uninvolved pedestrians, for example, are factors the game designer makes a series of assumptions about. The explicit and implicit factors above constitute the players’ experience within the temporary boundaries of the game.

Huizinga emphasises that play creates an experience outside of the everyday and the ordinary when the more or less explicitly delineated sites of play are entered, such as the stage, the card table, the tennis court or the magic circle (of sumo fights) (Huizinga 1949, 10). Salen and Zimmerman borrow the term *magic circle* from Huizinga to describe the space that constitutes a frame outside real life, where the magic lies in exploring the game's own reality repeatedly and safely (Salen and Zimmerman 2004, 94–95). Salen and Zimmerman highlight the ways in which the magic circle has porous boundaries. What's more, they point out that games as systems can have different levels of openness and closedness. A closed game forms a self-contained world, and an open game allows interchange between the game and its real-life environment. Tic-Tac-Toe is an example of a closed game. The game MySpace is an example of an open one.

The genre of pervasive games challenges a narrower concept of the magic circle as such games are played for a longer time period and with no explicit boundaries of the playing field. The game often referred to as *Killer*,¹ for example, turns players into assassins who—besides living their everyday life—also invest days and weeks in hunting down a target assigned to them by the game masters and eliminating the person using, for example, a water pistol. Assassins are themselves targets for their players, meaning that they have to watch their back during the game at all times. The magic circle is expanded here as

[t]he game no longer takes place in certain times or certain places, and the participants are no longer certain. Pervasive games pervade, bend, and blur the traditional boundaries of game, bleeding from the domain of the game to the domain of the ordinary. (Montola et al. 2009, 12)

The praxis usually referred to as *gamification* is introducing an even thinner game layer (like the possibility to earn points or collectable tokens) onto ordinary life. People taking part in gamified activities mainly remain immersed in their everyday lives, not really entering something like a magic circle.

The strength of street games as discussed in this chapter, on the other hand, is exactly that players exit the realm of their everyday lives and commit to the rules and the narrative of the game for its duration. The collectively understood boundaries of the magic circle foster players' flow and serious engagement and create an experience in which the urban environment is as real as the game. At the same time, the magic circle is not entirely closed: although players of street games are invited to *enter* into the world of the game, the playing experience never entirely blinds out architectural, social or political settings of the urban environment. Drawing a parallel between locative games—a genre mostly driven by the rise of the positioning capacities of mobile technologies—and Situationist artistic practises, Flanagan points out that due to the embeddedness into the local, games played in the streets “cannot help but refer to, rework, or, conversely, avoid history, social relationships, and customs of a play site” (Flanagan 2009, p. 207). When blending the games and the city, the game designer decides on the extent to which the players' experiences are shaped by the

¹[https://en.wikipedia.org/wiki/Assassin_\(game\)](https://en.wikipedia.org/wiki/Assassin_(game)).

everyday features of the site or by the game. For the duration of the game, both the rules of everyday urban existence and the rules and narrative of the game are equally ‘real’ in the experience of the players.

In addition to their relative closedness, simplicity is another aspect of Huizinga’s magic circle that is relevant for street games. Huizinga’s depicts games an almost sacred physical or ideal space with a certain completeness temporarily carved out of the complex everyday world: “[Play] creates order, *is* order. Into an imperfect world and into the confusion of life it brings a temporary, a limited perfection” (Huizinga 1949, 10). Indeed, a game must be simple enough so that its rules are easy to comprehend and remember and players can immerse themselves in the flow of the game. Although the level of complexity may vary between game formats—simulation games dealing with complexity, for example—street games mostly only have a few rules that fit on a rule card. The game is a framework where the explicit rules have a limited complexity. This makes it easier for the players to achieve the state of flow: state challenging enough not to be boring and simple enough not to be frustrating. For the game designer, it means that particular focus can be given to one aspect. Even though the rules of the game are simple, it is played within a complex urban environment, which gives often unexpected responses to the gameplay.

The three game projects discussed below were chosen to illustrate some aspects of activating implicit dispositions of players who are interacting with urban space in the framework of a street game. The ‘MySpace’ game shows the permeability of the magic circle. Embedded in the pedestrian flow, the gameplay reveals how the implicit rules of being a pedestrian change depending on the broader urban context. The ‘Shelf’ project demonstrates rapid prototyping and iteration for exploration and hypothesis testing: the playing expert team changes the rules of the game in each round to match the playing experience with their implicit understanding of the question to be explored. The ‘Blackout’ game functions as a testing tool for a prototype solution which is employed in a hypothetical situation. In the playing experience, a hypothetical blackout is activated in the actual urban space through the game’s fiction, and the proposed solution is ready to be used in the game—although most of its functionality is simulated for the duration of the game.

4 ‘MySpace’ Game

The street game MySpace² is one of the results of a five-day workshop with students exploring and prototyping alternative uses of urban resources. The assignment was to scout urban resources that could be hacked in order to be used in a different way or redistributed and to create street games that prototype those alternative uses. The

²Created by master students of the Faculty of Arts in Design at the Zurich University of the Arts in the framework of the Resourcing Design workshop program. Student team: Marina Llopis, Diego Martinez, Simon Peter Pfaff, Philippe Stauffacher. Supervision: Nadine Kuhla von Bergmann and Viktor Bedö.

team who created MySpace returned from the research phase with material about urban citizens claiming some private retreat space in midst of the urban tumult. For example, an informal smokers corner with a chair at the back entrance of a shopping mall or three girls sitting in a circle on a park lawn reading. MySpace uses the mechanics of opening up a triangle on the sidewalk (see game rules above) to prototype temporarily claimed private spaces and test their resilience and fragility. Some pedestrians would not recognise the triangle; others would recognise it and walk around it; still others would recognise it and deliberately cross through it. Using gameplay, the team could test out pedestrians' awareness about certain choreographies of bodies forming a unity and implicit norms of allowing or denying spatial claims of this unity. Furthermore, the gameplay iteratively revealed the most successful spatial constellation of the triangle in terms of claiming private space on the sidewalk. The game functions like a probe in the context of a given site at a given time of day.

5 ‘Shelf’ Game Session

The ‘Shelf’ session was a cooperation between the Berlin-based architects Studio Schwitalla and Tacit Dimension in order to explore the types of contributions that street games can play in the studio’s design process. The studio was in the process of designing an urban shelf-like structure the size of a small neighbourhood, several levels high with inner yards. According to the architectural concept, the Shelf provides a basic urban infrastructure while allowing for a self-organising spread of residential, communal and commercial units within it.³ The structure existed on paper and in an architectural model. After preliminary discussions, we identified the following challenge for a game-based research and prototyping session: how to test the architects’ assumption that an open view of the inner yard from all levels of the shelf would foster ad hoc gatherings in the inner yard. Obviously, the paper plans and the architectural model did not allow for testing such affordances of the space.

I designed and play-tested a game to explore meeting and gathering dynamics in the shelf and set up a game session. In order to keep the explicit rules of the game simple and to delegate as much as possible to the constitutive factors of the urban environment, I was looking for a site that was a close enough analogy to the model of the Shelf regarding spatial layout. The playing field of choice was the Berlin Hauptbahnhof train station building. It has five levels made up of platforms and shopping areas and features agora-like sections and good visibility between the levels. The players were six members of the architecture studio. The plan was to play several rounds of the game and iterate the rules during the rounds in order to take away the best learning. According to the fiction of the Shelf game, players were inhabitants of the Shelf who are out to look for a fictional party crowd. The game had the following rules:

³<http://studioschwitalla.org/work/hashtag-urban-shelf>.

- As an initial set-up, all players are dispersed in the building. They find a ‘home’ that is a corner in a dead end where no other players are in sight.
- The goal was to meet with every other player at the ‘party’.
- The ‘party’ (for the first round) was defined as any gathering of at least five non-players with no more than two sittings.
- Players were allowed to make a single phone call not longer than one minute to one other player of their choice.
- Being a cooperative game, players win if all of them succeed in meeting at the party within 10 min.

During the first session, players adopted a combination of emergent strategies: random walking, tactical positioning to create a partial chain of eye contact between players, random calls to other players. The players succeeded in meeting at the ‘party’. In the second round, we decided to change the ‘party’ into a moving target: someone on the move, walking a dog. This decision reflected the architect players’ understanding of how real-life gatherings emerge in an area of the size of a small neighbourhood. We also limited the maximum calling time to half a minute so that the role of the visual chain was emphasised in the gameplay. In the second round, playing tactics did not change a lot, but with more elaborated tactics the interplay with visibility and architecture become more prominent.

Three months later, we reflected with the studio on how the experiences and learnings of the studio members contributed to the ongoing design process. According to the lead architect, the areas more or less explicitly impacted by the gameplay were the measures to allow or cover free view between the levels of the shelf (e.g. the distance of the railing from the edge changing the axis of vision). The session also triggered ideas about mirrored ceilings on some floors to increase visibility of the level from lower levels.

The methodological learning was that the street game format is an effective tool to explore relatively focused aspects in planning processes, like the effect of visibility conditions on finding other people in the case of the Shelf session. Street games are very effective tools for activating and generating *in situ* embodied knowledge that explicitly or implicitly can be built on in a design process. They can therefore be used to test a prototype in cases where the prototype’s critical function affects the scale of human interaction. Street games have limitations, however, in embracing the full complexity of urban planning, a scale for which moderated board games and playful co-design formats labelled as urban games or city games city games are more useful.⁴

6 ‘Blackout’ Game Session

Blackout is an example of a mini-street game in the context of prototype testing. It was created in the framework of the Energyhack 2015 hack day organised by

⁴For a collection of examples see <http://gamesforcities.com/database/>.

Open Knowledge Foundation Germany and the electricity utility provider Stromnetz Berlin.⁵ The hack day's topic was 'blackout', meaning spatially and temporally extended power outages with potentially catastrophic consequences. Teams attending the hack day were provided with energy consumption and energy network-related open data in order to work on solutions for a blackout. I cooperated with the SMS Gateway 3000 team⁶ by providing rapid street game design as a testing method for the team's prototype. The team was working on an automated SMS-based system that would set up meetings between those in need those who could help them, in a blackout scenario (e.g. connecting people who need blankets with people who have blankets they can offer). The concept was that both groups could send an SMS to an emergency number with what they need or what they can offer. A server with an intelligent matching system would connect the requests with the respective offers and send out a meeting place in the city for the matched users. The solution addressed the time window when the Internet was down while the GSM network was still functional: an uncertain time span of a maximum of 30 min, according to experts.

The street game-based testing took place in the afternoon. At that point, the SMS Gateway 3000 team had already implemented an SMS server that could receive and send out SMS messages. Due to the obvious constraints of the hack day, the intelligent matching functionality had yet to be implemented in the prototype. At this stage, we set up a mini-street game to test the proposal of the SMS Gateway 3000 team. The playing field was the neighbourhood around the site of the hack day. There were two players, a 'giver' and a 'receiver'. The two players start from two different positions in the neighbourhood with some distance from each other. The goal of the game was to succeed in meeting and to shake hands as a symbol of handing over the goods within 20 min. The—not yet implemented—matching algorithm was simulated by a non-playing character who read incoming messages through the SMS server terminal, matched messages manually and manually sent messages to players' phones. According to the fiction of the game, the blackout has just started with Internet already down, GSM network still functional for an uncertain duration. Everything else in the gameplay was carried by the fiction of a blackout (on which players had been educated by expert presentations in the morning of the hack day) and the actual urban environment.

When the game started, both players sent their messages to the emergency number. After some time, they both received an answer from the system (sent by the non-playing character using the terminal interface of the SMS server) giving them a meeting point defined by the intersection of two streets in the neighbourhood. To jump ahead, the players did not succeed in meeting in twenty minutes. What happened? Even though the streets that were used to specify the meeting points were not hidden, they were not very obvious either and the players did not know them by heart. Neither of the players checked a map application on the phone, as this would have been cheating after committing to the scenario that Internet is down. Asking not involved pedestrians did not prove useful either as it turned out that people hardly know the

⁵<http://energyhack.de/>.

⁶Team members: Mark Rentschler and Jakob Penka.

name of the streets they don't walk regularly. Players ran out of time while searching for the respective intersection.

One of the insights from this round was that more obvious and unmissable landmarks should be used as meeting points, even if getting there potentially involves a detour; intersections offering more choice of meeting points closer to the parties involved. Another unexpected design requirement for the emergency SMS system derived from the players' experience of waiting for the system to answer SMS. Due to some technical difficulties with the SMS server, the non-playing character was only able to answer several minutes later. Players knew that in a real-world blackout the GSM system could go down every minute, so while waiting for the SMS during gameplay they started to suspect that the non-playing character is simulating a breakdown of the GSM system. Even though that was not the case, the experience of the terrifying uncertainty about what the silence of the system means taught the SMS Gateway 3000 team that the next iteration the system should ping users from time to time as a vital sign. This experience also triggered the idea that the first thing the system should do in case of a blackout is to send out a message to every user giving them instructions for the time after the GSM is down.

The Blackout mini-street game was a very lightweight game, hardly more game-like than a conventional *in situ* prototype testing known from iterative design processes. Yet even this thin fictional layer and the defined space in which players had to act tactically arguably pointed to aspects of the blackout experience that plain prototype testing might not have revealed.

7 Street Games as Prototypes

Street games as prototypes enable us to test our assumptions about what works at concrete urban sites. The challenge of setting up a street game for this goal is to translate the problem we would like to explore or assumption we would like to validate into game mechanics. A very basic scheme for setting up the game is to define actions (e.g. stand in a formation, block pedestrians path, search for the 'party'), constraints (e.g. phone calls no longer than 30 s, navigate without a map), a goal (meet within 10 min) and a story or narrative for the game. In MySpace, the problem of claiming private space in the city was translated into the mechanics of forming and gradually opening a triangle on the sidewalk. In the Shelf session, the assumption that open visual fields between levels of a building would enhance the occurrence of ad hoc gatherings was translated into the mechanic of keeping visual contact and the goal of meeting at an unknown moving target. The game designer defines the operational rules, chooses the constitutional rules and makes assumptions about the implicit rules.

Once the rules are set up and the game is running, both the explicit and the implicit rules of the game as well as the explicit and implicit characteristics of the urban site are equally *real*. What players know about the city (knowledge acquired through their involvement in everyday urban life) and what they know about the game (the

fiction and rules they have committed to) trigger interactions and activate tactics in a completely equal manner. The magic circle of the street game incorporates the game design and the actual urban context into the gameplay experience. Players of the Blackout game are prone to fear the eventual breakdown of the GSM network just as much as they are ready to ask pedestrians about street names (both of which can be seen as *dispositions*, in accordance with Price).

For the duration of the game, things that are not present at an urban site outside the game become present in the fiction of the game and thus in players' experience. The game temporarily modifies the affordance of the respective urban site, and players can explore this modified urban experience through gameplay. The temporarily modified urban experience, the circle, is provided and set up by the game designer, but when the game starts players step in and explore the world of the game autonomously. This is the sometimes tiny yet significant difference between conventional, more or less moderated prototype testing in an iterative design process and using street games to test ideas and explore questions about street life. It is this that creates the laboratory-like condition of a balance between a controlled set-up and the potential for emergent tactics and interaction with the urban environment.

Street games that are set up to test proposals in context will also reveal if the proposal (translated into game mechanics) does not resonate with the urban site. This might manifest itself in players' slight feeling of the inadequacy of certain interactions analogously to Price's above example of changing the drawing of a cat. For example, players of the Shelf session decided to change the meeting point (the 'party') into a moving target (a dog walking person) as this resonated more with their understanding of the dynamics they were envisioning in the structure they were planning. Insights, new tactics or new questions emerging from gameplay can, in turn, be iteratively translated into new rules. In subsequent iterations, the rules or the game set-up can be easily modified or the game rules can be complicated if necessary.

It needs to be noted that changes to the rules might be applied by players within a game session too: known as cheating. Even if players do not cheat, the feeling of inadequacy might manifest itself in an exploitation of the rules, bending them to the limit of what is allowed, not explicitly violating the explicit rules but violating the implicit rules dictated by common sense. From the perspective of generating knowledge through prototyping, both practices can be insightful.

Experience shows that the number and complexity of rules of street games should be constrained to a set of rules that a player can remember at once. For unmoderated games, this allows players to be in a state of flow, not overwhelmed by the effort to remember the rules. Also, in order to create a coherent game experience, obedience to game design principles sometimes results in a slight distortion of the matters to be tested as they are translated into game mechanics: a circumstance designers have to be aware of. Due to the constrained complexity of rapid street game designs (as described above), the game designer has to decide on the specific aspect or function that the street game ought to explore. Before choosing the core game mechanics, the core of the idea to be explored or the critical function of the proposal tested has to be clarified. This makes street games as a format a good probe that can be implemented

in the complexity of an urban site. Through the permeability of the magic circle, the responses of the complex environment become part of the experience.

8 Conclusion

Street games can be quick sketches, rough prototypes or full-blown balanced set-ups. If built with the purpose of exploring or prototyping, they function as *in situ* laboratories. Considering the duration and invested resources, rapid street game design as a prototyping tool can be positioned sketching at the drawing table and instant architecture⁷ that is installed at urban sites using lightweight materials. Analogously to the toolset of tactical urbanism,⁸ street games hack into the experience of everyday urban life to set a precedent, test the ground and seed new urban forms. Elsewhere in this volume, Mulder and Kun (2018) emphasise the effect of cross-pollination at ‘pressure cooker events’ (like hackatons) and are pointing at the strategic impact of knowledge developed in such frameworks when prototypes spark more sustained and dedicated actions if stakeholders taking part in such an event turn into change agents. Considering the ‘fuzzy front end’ of city-making, as described by Mulder and Kun in this volume, rapid street game design can be positioned at the proposal and prototype phase in the life cycle from small-scale experimentation to societal change.

As the magic circle of the game by design introduces a conceivably simple order into the complexity of urban life, it invites a deep immersive involvement which allows for the creation of make-believe strategies. It also renders some aspects of urban interaction controllable while leaving space for emergent phenomena or interactions. Therefore, street games have leverage as a laboratory on a street and neighbourhood scale, exploring embodied aspects of interacting with the given and possible urban environments. At the same time, it is challenging for street games to embrace higher levels of complexity of the kind more easily addressed in moderated board games and playful co-design formats labelled as urban games or city games. A further design challenge would be laying down how to plug street games into moderated board game like urban games that embrace the higher complexity of multistakeholder urban planning and city-making processes.

With some experience, street games can be set up easily and are a relatively accessible tool for a wider circle than professional or trained game designers. The speed and flexibility with which a game can be changed and adopted with every session or even round indicates how much closer rapid street game design gets to the concept of *thinging* about what is possible at urban sites than just seeing this in the dichotomy of acting and reflecting. As new technologies and techniques have the potential to change how we think (like in the case of the word processor), rapid

⁷For an example of instant architecture, see the project series 72 h Interactions, <http://72hourinteractions.com/> or Construct Lab <http://www.constructlab.net/>.

⁸For an overview of the approach and projects, see <http://tacticalurbanismguide.com/>.

street game design has the potential to become a more widespread tool of thinking about the city.

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The City as Perpetual Beta: Fostering Systemic Urban Acupuncture



Joel Fredericks, Glenda Amayo Caldwell, Marcus Foth and Martin Tomitsch

Abstract Applying the concept of perpetual beta to cities proposes a continual and never complete process of city-making. Building on this notion, this chapter employs a conceptual framework of *urban acupuncture* for conducting and analysing localised small-scale community engagement activities through situated pop-up interventions. Pop-up interventions ‘hack’ public space by temporarily changing the feel of a place to promote awareness around civic issues. We argue that the use of situated pop-up interventions has the potential to provide more inclusive forms of community engagement by combining digital and physical media. The proposed framework employs pop-up activism to facilitate a middle-out approach that encourages citizens to actively identify topics for discussion. Two pop-up interventions in different locations in Australia are discussed in the chapter to assess in what way a systemic level of impact can arise from different processes of city hacking that are facilitated through a distributed, decentralised, yet concerted and regular local approach. We argue that a concerted process of implementing small urban interventions can contribute to an ongoing commitment to participatory city-making. Further work will show how each local intervention can contribute to translating the notion of perpetual beta into systemic change beyond the boundaries of their individual locale and—taken together—across different urban environments of the city.

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Middle-out design · Pop-up interventions · Systemic change · Australia

1 Introduction

Humanity faces many challenges in both the natural and the built environment. Cities struggle with increased pressure on urban infrastructures and housing caused by population growth, lack of public transport options and more frequent natural disasters triggered by climate change. At the same time, citizens have more opportunities than ever to be involved in the planning, design and decision-making process of city-making. Often seen as only a formality, local governments undertake community engagement processes to ask citizens about policy change and proposed infrastructure developments. This top-down approach generally ‘informs’ citizens only rather than to ‘engage’ people in the decision-making process. As a result of this, grassroots movements, such as urban guerrilla (Hou 2010) and DIY/DIWO¹ (Caldwell and Foth 2014, 2017) movements, have encouraged bottom-up community engagement through localised urban interventions. These approaches empower citizens to identify topics and issues that need to be addressed within local communities.

Through our research on situated community engagement, we have found that drawing on the collective knowledge of all actors has a greater opportunity to enable a more collaborative city-making process. This can be achieved by employing a ‘middle-out’ engagement process (Costa and Ferrão 2010; Fredericks et al. 2016a) that integrates the needs and interests from the decision-makers at the ‘top’ (e.g. policy-makers) with those of the everyday people from the ‘bottom’ (e.g. local citizens), which are met somewhere in the ‘middle’. Depending on the situation or issues being addressed, this part in the middle (between the top and the bottom) refers to the policy-making process, the community engagement procedure, the social context or the organisational structure. Another critical aspect of ‘middle-out’ engagement is acknowledging that the city is in a state of perpetual beta, which indicates that the processes of city-making and urban renewal are never complete. These processes are cyclical, occurring in different parts of the city at different times, and need to respond to a range of shifting issues from social to political, environmental to economic.

Community engagement activities range from paper-based interactions to those that are supplemented by digital and physical applications providing new means and interfaces for the formation of ‘urban publics’ (de Waal 2014). Such novel and complementary approaches to community engagement, aiming to address the shortcomings of traditional processes, are being investigated through the fields of digital placemaking (Fredericks et al. 2016b), urban interaction design (Brynskov et al. 2014), urban HCI (Fischer and Hornecker 2012), urban informatics (Foth et al. 2011), urban computing (Kindberg et al. 2007) and ubiquitous computing (Weiser 1993). This range of novel community engagement approaches and city-making

¹Do It Yourself/Do It With Others.

concepts are helping to improve the use of existing urban infrastructure to provide new opportunities for connecting citizens with their city (Shepard and Simeti 2013; Tomitsch 2014).

To focus on a particular approach that can create novel prospects, pop-up interventions ‘hack’ public space by appropriating new purposes and temporarily changing the nature and feel of a place. In doing so, they surprise people, stimulate their imagination and create public awareness in citizens (Fredericks et al. 2015). In this chapter, we discuss how situated pop-ups can offer both built environment professionals and local citizens an alternative option for community engagement to ultimately inform and improve the city-making processes. Between 2014 and 2016, we have conducted and investigated a range of situated community engagement activities through the deployment of pop-up interventions in Sydney and Brisbane, Australia.

From our research, we have found that pop-up interventions serve to: (a) raise awareness of the engagement process; (b) encourage community discussion around urban planning, design and architecture topics; (c) involve greater cross sections of the community (e.g. time, poor citizens, younger demographics and culturally and linguistically diverse people); and (d) allow citizens to submit their responses on the spot. Based on our research findings and to facilitate a more collaborative and middle-out engagement approach, this chapter presents an urban acupuncture (Lerner 2014) framework for undertaking localised small-scale community engagement activities through pop-up interventions. We discuss two case studies that deployed pop-up interventions in Australia, as different tactics that attempt to give the community a say in the transformation of their city. The framework is intended to encourage citizens to actively identify topics that they would like to see community discussion around. Designers and policy-makers can also apply the framework to guide their city-making strategies. In our approach and through the use of the framework, systemic change in city-making is fostered by accumulating many voices, actors, devices and technologies.

2 Context

Local governments are no longer seen as the sole caretakers of cities that have to respond to the needs of their inhabitants. Conventional community engagement processes are still central to the renewal cycle of city improvement; however, it is a difficult task challenged by citizens who are hard to reach and communicate with using archaic engagement mechanisms. We refer to Foth and Brynskov (2016a) who examine civic media and technologies to indicate that “in order to provide meaningful civic engagement, the city must provide appropriate interfaces” (564).

We are interested in exploring what Brynskov et al. (2014) describe as a shift from city management to city-making through urban interaction design. Urban interaction design is the making of urban interfaces to provide a means of citizen engagement (Foth and Brynskov 2016b). These views on the co-creation of cities are in line with the work of de Waal (2014) who examines the city as an interface, and we can

Table 1 Evolving relationship between cities and citizens (Foth and Brynskov 2017)

	City government	People
City 4.0	Collaborator	Co-creators
City 3.0	Facilitator	Participants
City 2.0	Service provider	Consumers
City 1.0	Administrator	Residents

conclude that both sets of arguments are applicable and compatible with each other. Interfaces in both instances similarly refer to the setting that fosters the adaptation of different systems to one another, such as citizens adapting to the practices of their local community or city (de Waal 2014). Synthesising these thoughts, Foth and Brynskov introduce four stages in the evolution of the relationship between local governments and city residents (Table 1) (Foth and Brynskov 2017). The city operates on multiple scales and can be approached from many angles, but in this chapter we are particularly concerned with the ways in which people leverage technologies for their own purposes to pioneer new community engagement tactics and ultimately bring about a participatory and collaborative approach to city-making.

To support our research and novel approaches to community engagement, we layout the foundations for these evolving relationships between cities and citizens as we strive to go from City 1.0 to reach City 4.0. To better understand the theoretical principals that guide our work, in this chapter we first discuss the concept of perpetual beta and how it applies to the city. We position the perpetual beta concept as a platform that supports the need for situated pop-up interventions as key instigators of change. Second, we discuss the urban acupuncture framework as a guide to inform the development of pop-up urban interventions, such as the two Australian examples discussed. We conclude with a series of questions that explore the potential of cities to move from a state of perpetual beta through a series of accounts and sites to the possibility of producing systemic change.

2.1 The City as Perpetual Beta

The twenty-first-century city will never be complete as governments around the world continuously realign strategies to address a myriad of political, social, economic and environmental challenges that engender contemporary society. This unfinished state of cities is not anything new to anyone; however, embracing this unresolved aspect of contemporary cities can be leveraged for the benefit of citizens.

Originally used in the context of software development, the open-source advocate O'Reilly (2015) states, “*The open source dictum, ‘release early and release often,’ in fact has morphed into an even more radical position, ‘the perpetual beta,’ in which the product is developed in the open, with new features slipstreamed in on a monthly, weekly, or even daily basis*”. O'Reilly (2015) argues that the ‘perpetual beta’

concept harnesses collective intelligence by acknowledging users as co-developers. Applying this concept to contemporary cities, '*the city as perpetual beta*' provides a theoretical lens for city makers and citizens to understand their collective roles in a state of perpetual beta where all users of the city are co-developers of the city.

The concept of perpetual beta has also been applied to other areas outside of software development, such as in business, knowledge management (Levy 2009) and entrepreneurship. In 2010, Pierce (2010) ran a Kickstarter campaign to raise funds in support of the documentary film *Life in Perpetual Beta* about the influence that technology has on how we consider business and our lives. Perpetual beta in these instances commonly refers to the process of continual improvement, where a finished product would never be good enough. The foundations of the perpetual beta concept connected to technological developments and an open-source approach led us to apply the 'unfinished concept' to that of city-making.

Sassen (2015) refers to this notion of the city as perpetual beta when describing "...an understanding of the city as a combination of incompleteness and complexity: it is this mix that has enabled cities to outlive enterprises, kingdoms, nation-states, and, yes, Cisco Systems" (Sassen 2015, 1). The city, as a concept, is one that is continuously changing, evolving—it shrinks and grows, ebbs and flows, with multiple layers of complexity in both physical forms (buildings, roads, people, trees, etc.) and digital forms (electricity, telecommunications, Internet, etc.). We recognise that the management and administration of a city can be smart, for example, by using technology for controlling traffic patterns, lighting up, sensing weather, managing waste. People can be smart, too, in that they use mobile technology to plan meetings, communicate with anyone, anywhere, record videos, access and create information, seamlessly and simultaneously (Hemment and Townsend 2013). How do these smart citizens who live in smart cities tap into the digital layers of the city's communication flows to inform the creation of the environments in which they live, work and play? If these cities are so smart, how do they use this acquired intelligence of the many to keep getting better and tackling the big social and environmental challenges facing our society and our planet (Foth and Brynskov 2016b)?

2.2 *Urban Acupuncture*

Helping us zoom from the bird's eye view of the city administrator to the pedestrian, that is, local view of the smart citizen, is the notion of urban acupuncture. This concept was originally conceived by the Barcelonian architect and urbanist, Manuel de Sola Morales. The concept aims to use localised small-scale socio-technical interventions to transform the larger urban context (Houghton et al. 2015; Tomitsch et al. 2015). Locations are selected through a comprehensive analysis of social, economic and ecological factors that involves dialogue between designers and communities. Urban acupuncture embraces the city as a living organism (Iaconesi and Persico 2014; Lerner 2014) and identifies areas within cities that require urban renewal. Lerner (2014) describes the essence of urban acupuncture as

...sometimes, a simple, focused intervention can create new energy, demonstrating the possibilities of a space in a way that motivates others to engage with their community. It can even contribute to the planning process. This gets to the essence of true urban acupuncture—it needs to be precise and quick, that's the secret. (Lerner 2014, 4)

Our research and case studies presented in this chapter are based on this notion of urban acupuncture, each a temporary intervention in an urban space purposefully deployed precisely and quickly to provide people an opportunity to share their ideas or voice their concerns. Building on these principals of urban acupuncture, we focus on how these short-term or ‘pop-up’ interventions facilitate participation, collaboration and knowledge sharing to ultimately inspire forms or degrees of change.

The urban acupuncture framework we propose draws on the literature from three key areas: (1) existing community engagement within the built environment; (2) digital technologies and their influence on the approach to community engagement; and (3) from top-down to bottom-up to middle-out engagement concepts.

3 Existing Community Engagement Within the Built Environment

Community engagement is undertaken by Local Government Authorities (LGAs) around the world to obtain public feedback on the development of infrastructure within the built environment. Through collaboration with communities, businesses and government organisations (Foth and Adkins 2006), community engagement should guide urban planning decisions based on the outcomes of the engagement undertaken (Fredericks et al. 2015). LGAs, as the level of government closest to the people, undertake community engagement, generally as a legislative requirement, to inform communities on the creation of policies and infrastructure developments within the built environment. However, relationships between local communities and LGAs have traditionally played a consultative role, with the level of engagement reduced to informing communities only. As a consequence, the engagement process and the level of community input are controlled by LGAs and are often attributed to political agendas of elected representatives, political party practices and bureaucratic power brokers (Cuthill 2003).

Current methods of community engagement, such as face-to-face workshops, community forums, public hearings and online forms, only reach certain demographics of the population. As a result of this, opinions of community members classified as ‘hard to reach’ are not reflected in the overall engagement process. Innes and Booher (2004) argue that legally required methods of community engagement in government decision-making rarely achieve genuine engagement outcomes; create dissatisfaction amongst citizens who feel they are not being heard; do not significantly improve the decisions of government agencies; and do not incorporate a broad spectrum of the community. It has been further argued that some traditional engagement practises suffer from a lack of integration between governments and

the public, and has been shown to have inadequate representation of age groups and demographics (Fredericks et al. 2015; Hosio et al. 2014; Schroeter 2012). Sarkissian et al. (2009) developed the following eight points that identify the underpinnings of successful collaborative community engagement rather than top-down approaches employed by government agencies:

1. People know more than they realise.
2. People cannot participate satisfactorily unless they can understand the language being used.
3. People often fear giving opinions, especially in their local community.
4. People's involvement improves the quality of local government.
5. Synergy is more likely to occur when people collaborate.
6. Specific skills are required.
7. Relevant professionals should be involved from the start.
8. There is community value in sharing participatory experiences.

The eight points place the focus on people not on the policy. The essence of a middle-out approach arises from the needs and will of people to take action for themselves. It is in this spirit that the interventions we discuss in this chapter are directed towards providing a voice for more people.

3.1 Digital Technologies and Community Engagement

Within the last decade, information and communication technology (ICT) has evolved from the workplace and integrated into all aspects of daily life (Tomitsch 2014). Moreover, human-computer interaction (HCI) technologies are increasingly being designed for urban environments, such as smartphones and web 2.0 applications. Tomitsch (2014) explains how the ICT industry is in the early stages of exploring the variety of possibilities that new digital technologies offer to make more efficient use of existing infrastructure within the built environment.

Gordon and Manosevitch (2010) introduce the concept of augmented deliberation as a design solution to address challenges where community engagement is complicated by external factors. Augmented deliberation is intended to address a range of social challenges, including language barriers, demographic variations and professional discourse. The intention is to enhance community engagement by incorporating appropriate technologies, for example combining traditional planning practice and public deliberation into a digital environment (Gordon and Manosevitch 2010).

Fredericks and Foth (2013) investigated how social media and web 2.0 applications could be incorporated as additional tools and techniques for community engagement in urban planning. They examined this approach as a way of supplementing traditional methods of community engagement that had a general preference for participants attending an organised consultation event. Additionally, the research explored how community engagement can include a broader cross section of society through the adoption of digital tools. The study concluded that traditional and digital



Fig. 1 Screenshot of the urban screen used during the *Vote As You Go* study

methods of community engagement could be used as a hybrid approach. Furthermore, the research identified that the integration of digital tools presented opportunities to capture a wider audience, attract younger participants and provide communities with the ability to be actively involved in the urban planning process (Fredericks and Foth 2013).

Schroeter and Foth (2009) created *Discussions In Space* (DIS) as a design experiment to facilitate a locally situated discussion and opinion forum around urban planning topics, issues and questions, which were displayed on a large public screen. Members of the community were able to submit questions directly to the screen using their mobile phone's SMS, Twitter or web capabilities. The messages displayed on the screen in real time provide citizens an additional platform for collective expression and public discourse. Schroeter and Houghton (2011) discuss how community engagement is usually resource and time intensive and how this challenge can be addressed by capturing the attention of digitally savvy community members. They call on LGAs to go with the times by adopting some of the digital channels already well established by corporate entities for the purpose of sales and marketing.

Hespanhol et al. (2015) undertook a research study that deployed two situated *Vote As You Go* polling interfaces on a public urban screen for community engagement. Engagement questions were posted on the urban screen to obtain community feedback via a polling system (Fig. 1).

The first scenario used a tablet device mounted on a stand that participants could interact with, by simply answering yes or no on the application. The second scenario incorporated a playful full-body interaction application where an outline of

participants playing with the interface would be visible on the screen. They could then indicate yes or no by using gestures such as moving their hands. The different scenarios allowed the researchers to compare data on participant experiences and the effectiveness of the interface's visibility within an urban space. The study concluded that using these types of interfaces in urban spaces could be an effective strategy for attracting the attention of the general public and converting them into active participants (Hespanhol et al. 2015).

The *Smart Citizen Sentiment Dashboard* (Behrens et al. 2014) took the form of a media architecture interface, which connected users in public spaces to media façades. Participants were able to activate the media façade of a building by using RFID cards to respond to civic issues pertaining to topics such as safety, transport, housing and public spaces (Behrens et al. 2014). Responses were aggregated and displayed through mood-indicating colours and animations on the screen to represent the overall sentiment of city dwellers. This project is a valuable example of how existing infrastructure, such as a media façade, can be 'hacked' as a type of DIY or DIWO (Caldwell and Foth 2014, 2017). Without dedicated interaction mechanisms (here the RFID interface), city dwellers have no way of interacting with or informing the content displayed on large-scale urban interfaces, such as media façades or urban screens.

Each of these cases exemplifies alternative approaches to community engagement, which rely on different forms of technology to expand the reach and extent of participation from users. Similarly, our projects discussed in this chapter continue to develop a broader understanding for the ways in which different media types (digital, physical and social) can be implemented within the design and deployment of urban interventions. We expand on this research by examining how the different stakeholders' needs and interests are met and responded to and what impact for them and the city at large they may have. The purpose of each example is to increase the levels and depths of community engagement by creatively hacking into public space.

3.2 *City Hacking: From Top-Down to Bottom-Up to Middle-Out Engagement*

Since the early twentieth century cities around the world have established and implemented a variety of urban development paradigms that have shaped the urban fabric within local communities. Government decision-makers have taken a centralised top-down approach in the design and implementation of city-making. For example, Ebenezer Howard conceived the 'Garden Cities of Tomorrow' as a solution to decentralise from congested and unhealthy cities into groupings of 30,000 people along an agricultural green belt (Richert and Lamping 1998). Le Corbusier (1967) created the *Radiant City*, which has influenced the design of large building blocks through 'brutalism architecture' (Shonfield 2000). This was a top-down and highly controversial solution to address public housing needs across cities in Europe, America and

Australia. Present-day paradigms such as transit-oriented developments aim to foster economic and residential development around public transport routes and master-planned communities that incorporate civic services, residential housing and public amenities. Although these top-down initiatives have varying degrees of success in creating urban environments, many citizens across the world continue to feel disempowered or unheard when it comes to urban development. Traditional approaches still employed by LGAs are outdated, have the ability to fragment communities and exclude certain demographics of society (Fredericks et al. 2015; Sarkissian et al. 2009; Schroeter 2012).

As a result, many people are taking matters into their own hands with growing evidence of bottom-up approaches to city-making. Community members have taken it upon themselves to test the needs, wants and aspirations of civic spaces in modern society. This contemporary approach has led to bottom-up localised urban interventions in the form of pop-ups—referred to as pop-up urbanism (Fredericks et al. 2015), tactical urbanism (Lydon et al. 2014), guerrilla urbanism (Caldwell et al. 2015; Hou 2010), DIY/DIWO urbanism (Caldwell and Foth 2014; Douglas 2014; Iveson 2013) and urban acupuncture (Houghton et al. 2015; Iaconesi and Persico 2014; Lerner 2014; Tomitsch et al. 2015). Pop-up interventions ‘hack’ public space by appropriating new purposes and temporarily changing the nature and feel of a place. These approaches can be used as temporary installations that are either set up for a few hours or for an extended period of time.

The Better Block project ('Better Block' 2016), which is being implemented in many cities throughout the USA, is an example of rapid urban revitalisation or otherwise known as guerrilla urbanism (Caldwell et al. 2015; Hou 2010). Being a community-driven initiative, the Better Block project aims to revive underutilised city blocks by retrofitting these spaces to promote pedestrian and cyclist activity through temporary interventions, such as pop-up shops, positioning of trees and painting bike lanes onto the road. The project thus utilises existing community resources to create multi-modal transportation that takes the focus away from private vehicle-dominated roads. These temporary interventions enable communities to experience the potential of underutilised spaces and how they can be repurposed as usable civic space.

Attempts to employ more collaborative engagement approaches have seen partnerships established between LGAs and local communities to create a middle-out approach for community engagement. The concept of middle-out was coined by Kinchla and Wolfe (1979) as a collaborative process that draws on the knowledge from higher (top-down) and lower (bottom-up) information channels that come together and meet in the middle. An example of this is the *PopUp MANGo* temporary street festival where local citizens could interact with proposed urban design and roadway changes through a collaborative design process.² The pop-up intervention included temporary traffic calming devices, a parklet with plants and seating, live entertainment, food trucks and activities for children. The event was organised as a partnership between the LGA, an urban planning and design consultancy, and

²PopUpMANGo https://www.smgov.net/uploadedFiles/Departments/PCD/Plans/Streetscapes/Michigan-Ave-Greenway/PopUpMANGo_Summary_Sheet.pdf.

local community groups. This approach provided all stakeholders with an opportunity to evaluate the proposal within the space and be involved in the planning process through a practical hands-on approach. As a result of this community engagement event, a concept plan was created based on the feedback of all stakeholders.

Pop-up town halls are another example of informal and collaborative community engagement that provides opportunities to involve a variety of top-down and bottom-up stakeholders. These types of pop-up interventions are located in public space that is easily accessible to community members in comparison with traditional events held within specific time frames and locations (e.g. charrettes, town hall events, public workshops). They can utilise unused civic spaces and empty shop fronts; however, for maximum impact they should be located in an area of high pedestrian activity and be held in parallel with other public events, such as festivals, exhibitions and conferences.

Pop-up interventions have the potential to hack into the collective knowledge of all stakeholders within local communities. This provides opportunities to encourage a more rich and open civic discussion, enable collaboration between a variety of top-down and bottom-up stakeholders and inspire the exchange of ideas (Fredericks et al. 2016a; Lydon et al. 2014). We will further expand on these examples through our field studies below by demonstrating a middle-out (Costa and Ferrão 2010; Fredericks et al. 2016a; Janda and Parag 2013) engagement approach that aims to integrate the needs and interests from LGAs (top-down) with those of the everyday people (bottom-up).

4 Urban Acupuncture Framework

Linking our research to the previous examples from HCI, media architecture and urban planning, we discuss two pop-up interventions in this chapter that were concerned with community engagement in two different Australian cities. Reflecting on the design process leading to the interventions and the result from their deployment evaluations, we have developed an urban acupuncture framework (Fig. 2), which also highlights the decision-making process for implementing pop-up interventions *in-the-wild*. The concept of conducting research *in-the-wild* refers to the testing of prototypes in public space to see how they are adapted and used in everyday life (Chamberlain et al. 2012). Evaluation *in-the-wild* can include the recording and observation of how people interact with, adapt and use the prototype providing a different approach than testing in controlled laboratory environments (Chamberlain et al. 2012). Many researchers in the HCI field have incorporated *in-the-wild* approaches to their research and design development, whereas in urban studies research is constantly tested in the built environment and has always been

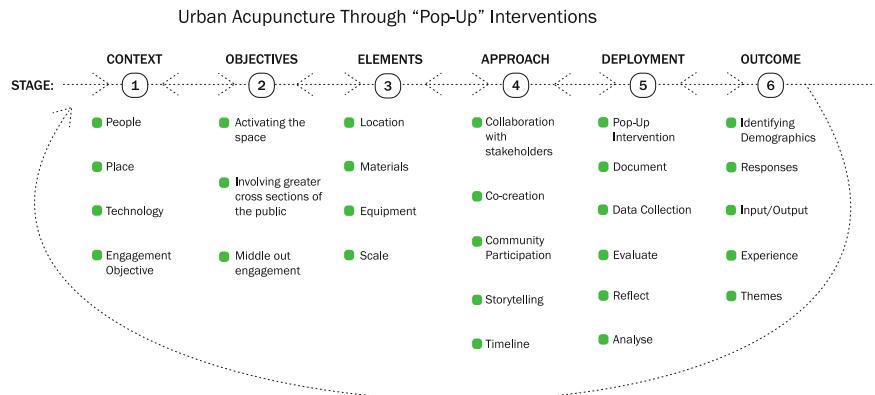


Fig. 2 Urban acupuncture framework using pop-up interventions. *Source Authors*

in-the-wild.³ Recent research pertaining to media architecture and urban interfaces has also relied on *in-the-wild* research (Fatah gen Schieck et al. 2014; Hoggenmüller and Wiethoff 2014).

Our urban acupuncture framework applies a participatory action research methodology (Foth and Brynskov 2016a; Hearn et al. 2009) with the intention to include local stakeholders in the different planning stages of the interventions. The urban acupuncture framework draws together the previously reviewed concepts of, the city as perpetual beta and middle-out community engagement. The framework is intended to be used as part of an iterative process within an engagement strategy where the pop-up intervention would be deployed in different locations across the city responding to different issues. Due to their agile nature, the pop-ups can respond in each step or iteration to the needs of the context and people involved in the deployments. The framework does not provide an answer or a mechanism towards the completion of a city; it is a process that assists citizens to in-act their role as co-developers in a perpetual beta city. The urban acupuncture framework can be used by individuals, within groups or across groups of people as a vehicle for communication and idea generation across the different stakeholders from the top, the bottom and the middle.

The framework consists of six stages: context, objectives, elements, approach, deployment and outcome. Each stage is made up of different concepts that require consideration when creating and deploying a pop-up intervention.

1. **Context**—The first stage is to examine and understand the local context including the people who create the places within it. The use and type of technology that will be utilised and the needs to be considered in line with the engagement objectives.

³We acknowledge that there is a trend to the opposite where urban science is pushing for more ‘modelling’ using big data analytics, so the focus of that part of the research community is going back into the ‘laboratory’.

² For example, see these websites: civicmediaproject.org, beautifultrouble.org, citystudiovan-couver.com.

2. **Objectives**—The second stage focuses on the objectives of the intervention including how to activate the public space by involving a greater cross section of the public through a variety of tools or approaches within the pop-up, informing local communities about the engagement activity to promote collaboration and interaction with the intervention. Stage one and two often inform each other and do not necessarily occur in a linear manner, and they can be developed in parallel.
3. **Elements**—The third stage takes into consideration certain design elements of the pop-up, such as the location, timing and duration, in addition to the materials and equipment required to construct it. The size and scale of the pop-up are also important factors to consider when addressing the context of the site.
4. **Approach**—The fourth stage addresses the approach undertaken for implementing the pop-up intervention, including collaboration with top-down (LGAs, private enterprise) and bottom-up (local citizens, community groups) stakeholders to co-create the engagement process.
5. **Deployment**—The fifth stage considers the actual deployment of pop-up interventions in public spaces. This includes the mechanisms to document and collected data and how it can be evaluated and analysed.
6. **Outcome**—The sixth and final stage identifies the results of installing the pop-up intervention, including the identification of engagement themes and a deeper understanding of local demographics needs, wants and aspirations. The responses collected through the intervention in both their input and output formats can be analysed to discover recurring themes arising from the contributions of the participants.

The following field studies are the basis on which the framework was developed. The case studies as discussed in the following sections demonstrate how this framework can be implemented using situated pop-up interventions in two different Australian cities: Sydney and Brisbane. Both studies formed part of two existing community engagement programmes with official stakeholders deciding the engagement objectives prior to the pop-up deployment. However, we employed a transdisciplinary approach in the design and development of the engagement activities, which included informal meetings with local stakeholders and co-design workshops.

The two case studies were developed and deployed in parallel and independent of each other; however, the design concept and engagement approaches informed one another. Through our collaborative approach between the Design Lab (University of Sydney) and the Urban Informatics Research Lab (Queensland University of Technology), we have come together to review our learning from the research within the different contexts of Sydney and Brisbane. We acknowledge that addressing broad theoretical concepts such as the city as perpetual beta, urban acupuncture and middle-out engagement approaches requires input from multiple perspectives and contexts. Therefore, this chapter and the framework we have collaboratively developed are a first step towards addressing these much larger questions regarding participatory methods for city hacking.

4.1 Study I: Digital Pop-Up

Context

Digital Pop-Up was implemented in collaboration with an LGA in Sydney, Australia. It is a result of a multidisciplinary research team from the Design Lab, University of Sydney, involving an urban planner, interaction designer, visual designer and creative technologist. The findings of this study were published by Fredericks et al. (2015). We deployed three variations of our pop-up intervention over three separate days within a busy public square consisting of: (1) a stand-alone tablet device on a stand with a customised voting web interface juxtaposed with an existing urban screen, during a regular workday; (2) an unstaffed pop-up during a cultural festival using a tablet device, an adapted web interface that allowed text responses, the urban screen, market umbrella, synthetic turf and barstools; and (3) a staffed pop-up during a regular workday utilising the same tablet device with web interface, the urban screen, gazebo structure, synthetic grass, ottoman seating, plants and ‘call-to-action’ signage, which was displayed on the urban screen and on physical posters at the pop-up.

Objectives

The objective of this study was to obtain community feedback on how to promote healthy lifestyles and improve recreational needs within the community. Specifically, our intention was to engage with a variety of demographics, including local office workers, business owners and people who are culturally and linguistically diverse. In addition to that, we wanted to deploy a pop-up intervention that included the engagement objectives of the LGA, but was able to openly capture the needs, wants and aspirations of local citizens without any interference from other actors.

Elements

The civic space in which this study was conducted is used by local residents, office workers and as a pedestrian thoroughfare. The location is surrounded by an entertainment quarter, restaurants, a public library and is within close proximity to a large shopping precinct and public transport interchange. The civic space also features an existing urban screen used for delivering a variety of entertainment content and a grassed open space used as a meeting point and for social gatherings. The first iteration of this study was deployed for a total of two hours and incorporated a stand-alone tablet device on a stand that was used in conjunction with the existing urban screen. The tablet device was situated diametrically opposite the urban screen, which was located on the intersection of two walkways exposed to continuous pedestrian movement. The second iteration was deployed for a total of two hours within the same civic space, incorporating the tablet device on a stand, and market umbrella and seating. The third iteration was also deployed for a total of two hours; however, a gazebo structure was used and call-to-action signage was introduced on the urban screen and surrounding the pop-up to draw attention to the engagement activities.



Fig. 3 Study 1 pop-up design

Approaches

We held informal meetings with a representative from the LGA (top-down decision-maker) to discuss the engagement objectives, including the contextual information, engagement questions and types of demographics they wanted to capture. In addition to this, we employed a transdisciplinary research team for the design and development of our pop-up interventions. Over a 3-month period, we evaluated and tested our designs, which we continuously refined based on observations and participant feedback during the deployments. For the purpose of this study, the bottom-up component incorporated the community interactions during the three deployments and the feedback received from participants regarding the pop-up set-up and functionality.

Deployment

Our overall goals for this study were (1) to draw attention to the engagement activity; (2) to create discussion around healthy built environment; and (3) to provide a space for participants to interact within the civic space. Each of the studies utilised the existing urban screen, which was used as the output channel to display the community engagement questions and participant responses in conjunction with a tablet device with a customised web interface that served as the input channel for participant responses (Figs. 3 and 4).



Fig. 4 Study 2 pop-up design

Outcome

Data collected from the three iterations produced valid responses in regard to LGA services and healthy lifestyles with a total of 27 responses received. In addition to this, we undertook 13 semi-structured interviews with willing participants. All participants expressed positive feedback regarding *Digital Pop-Up*, reflecting that this approach to community engagement works well in contemporary society and is not something that is not normally located in a civic space. Representatives from the LGA highlighted that *Digital Pop-Up* is an effective approach to complement existing community engagement approaches and has a greater potential to attract a younger demographic. Our case study showed how this approach deployed within a civic space provides citizens the option to participate on the spot, with little effort in comparison with attending an organised engagement event during a specific time frame. Our study further demonstrated how existing digital technologies, such as tablets and urban screens, can be easily appropriated to engage citizens in a pop-up environment within a civic space.

4.2 Study II: *InstaBooth*

Context

The *InstaBooth* is a telephone booth inspired portable flat-packed structure that has been designed and fabricated to enable an alternative approach to community engagement (Johnstone et al. 2015; Caldwell et al. 2016). The *InstaBooth* incorporates a combination of interactive modules with different types of physical and digital media to ask questions of its users and gather feedback. It is the result of a transdisciplinary research project led by researchers from the Urban Informatics Research Lab, Queensland University of Technology, that consists of team members from the disciplines of architecture, urban planning, interior design, interaction and visual design, computer science, business and urban informatics. In collaboration with the U.R{BNE} Collective (urbne.com), an independent group of urban planners, architects, designers and artists, the *InstaBooth* (Figs. 5 and 6) was deployed in April 2015 during the U.R{BNE} Festival. The festival is an annual event held within the Brisbane central business district with the purpose of bringing together a range of artistic, design and social interventions to inspire people to question the future of the city of Brisbane.

Objectives

The nature of the deployment and the types of questions asked through the *InstaBooth* during the U.R.{BNE} Festival were discussed and elaborated based on collaboration with the festival-organising committee and the *InstaBooth* team. The questions and interaction modules were designed to gather insight into the community on their needs for better infrastructure to promote healthy and active lifestyles including better food



Fig. 5 InstaBooth design



Fig. 6 InstaBooth activities

options. This approach was in line with the overarching theme of the festival which focused on creating a vision of a better future for Brisbane. The *InstaBooth* was viewed by the festival committee as an opportunity to trial an alternative approach to traditional community engagement. The combination of digital and physical media and design of the questions as part of the engagement strategy was purposefully designed to attract the engagement of more people from diverse backgrounds, cultural and age groups.

Elements

During the U.R{BNE} Festival, the *InstaBooth* was installed in two distinct locations in the Brisbane central business district over the course of 5 days. In the first location, the *InstaBooth* was set up for a Friday evening at the location of the main event of the festival, a park in inner-city Brisbane. During this event, the local city council conducted a formal community consultation on development ideas for that precinct. In addition, there were food trucks, live music, art installations and projection art as part of the festival. The second location was on the edge of the Queensland University of Technology (QUT) campus and next to a busy pedestrian and cycle bridge linking the Brisbane central business district with the cultural precinct across the river. The *InstaBooth* was set up for 4 days and evenings. There were no other events as part of the festival occurring at this location. During this deployment at the two locations, the compilation of interaction modules and the questions asked through them remained the same. The *InstaBooth* had a range of interactive modules including paper-based questions, iPads with photograph sharing and voting options, an overhead projector and Discussions in Space (Schroeter and Foth 2009) a screen-based consultation tool that promotes a question, and responses are collected through Twitter or SMS. The data collected was concerned with three aspects of the *InstaBooth* project; (1) the

experience of the user with the *InstaBooth*; (2) the comments and drawings created by the users in response to set questions; and (3) observations.

Approaches

The composition of the interaction modules included a range of paper and tangible media to allow for a greater range of participation and interaction to occur regardless of a user's ability to use specific technology or ability to write. The bespoke design of the *InstaBooth* including the open and anonymous nature of the interaction modules stimulated playful yet authentic forms of dialogue to occur within the commentary and drawings collected through the *InstaBooth* during U.R.{BNE}. The level of engagement within the *InstaBooth* was controlled by the participants which helped to foster a sense of empowerment. This process allowed for users to co-create the media content within the *InstaBooth* (Caldwell and Foth 2017).

Deployment

To evaluate the experience that users had with the *InstaBooth*, 27 participant interviews were conducted. The responses collected from the people through the interaction modules increased over the days of deployment perhaps indicating a level of growing comfort or increased curiosity of the *InstaBooth*. The overall sentiment was generally positive. In total, 138 notes and drawings were collected through the paper-based interactions, and 6 text and Twitter messages were recorded through the digital module.

Outcome

A thematic analysis (Braun and Clarke 2006) was conducted on the comments (paper and digital) and drawings that were captured through the *InstaBooth*. The findings indicated that participants tended to seek more playful physical infrastructure, greater variety of healthy food options and diversity of cultural and social events to promote better health within the city of Brisbane. During its deployment at the festival and through the different interaction modules and media types, the *InstaBooth* created a temporary place for voicing concerns, sharing ideas and learning from others that was open and accessible to anyone. The observations and experience from this initial deployment of the *InstaBooth* informed design changes to some of the interactive modules, mainly to improve their ease of use for future deployments of the *InstaBooth*. Following the U.R.{BNE} Festival, the *InstaBooth* to date has been involved in 15 communities and public events throughout Brisbane and southeast Queensland since 2015. The *InstaBooth* has shown how an urban intervention such as a 'pop-up' structure can 'hack' into parts of the city to transform them from public spaces to places that generate discussion, learning and different forms or levels of community engagement to occur.

4.3 Contribution to City Hacking

Applying the notion of the city as perpetual beta where all users are co-developers is fundamental to situated pop-up interventions. The field studies were designed based on participatory and co-design methodologies as a form of DIY/DIWO media architecture (Caldwell and Foth 2014, 2017). This approach is characterised by its temporary, pop-up nature as urban acupuncture by capturing the pulse of its users. Its combination of playful materials and media not only stimulates the interaction and engagement of its users but also inspires them to think, reflect, share and act. Situated pop-up interventions can perform on multiple levels to reach across the people from the bottom, to the top, acting as a middle-out approach to community engagement. Our two field studies were partnered with LGAs, government agencies and private entities (people at the top of the decision-making process) who were seeking a communication channel with everyday people (at the bottom). Developing the engagement strategy with the stakeholders is a crucial aspect of its success as the media through which the questions are asked have to be designed and tailored to suit the context and place of intervention. This collaborative approach involves the stakeholders in part of the design process, thereby extending the value and appreciation they have towards the engagement strategy. Similarly, the creative process through which users respond to different interactive modules and questions empowers them to be a part of the engagement strategy. It is within this strategy and the space provided by these situated pop-ups that the people meet in the middle.

By providing a small temporary space for questioning, reflecting, learning, expression and fun, within the larger city domain, these interventions not only hack into the city infrastructure *but hack into the city-making process*. Embracing the middle-out approach where people at the bottom and the top feel empowered, the outcomes of *Digital Pop-Up* and *InstaBooth* as a means to city hacking is strategic in deepening its impact towards a more open and inclusive form of city-making.

5 Implementing Systemic Change

Everyone knows that planning is a process. Yet no matter how good it may be, a plan by itself cannot bring about immediate transformation. Almost always, it is a spark that sets off a current that begins to spread. This is what I call good acupuncture – true urban acupuncture. (Lerner 2014, 3)

In this contribution, we have proposed an urban acupuncture framework to assist in creating urban interventions that are based on the community engagement objectives, location of the activity and duration for pop-up interventions. To exemplify how the framework can be implemented, we presented two middle-out (Costa and Ferrão 2010; Fredericks et al. 2016a) city hacking activities through pop-up interventions that were undertaken at two different locations in Australia. We argue that city hacking through pop-up interventions can contribute to systemic change in both

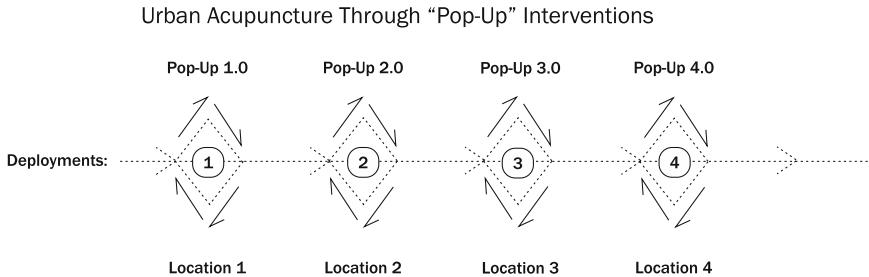


Fig. 7 Pop-up deployments in different locations to foster systemic change

local communities and across entire metropolitan areas, fostered by the accumulation of many voices, actors, devices and technologies. Figure 7 conceptualises a series of pop-up interventions that individually address the locations in which they are situated; however, it is the evolution and series of pop-ups building on each other that will assist in creating systemic change.

An example of systemic change created through city hacking is PARK(ing) Day ('PARK(ing) Day' 2016). This DIY urbanism concept or 'hacktivism' has evolved from an unauthorised reclaim of public space into 'parklets'. The parklet concept is an example of systemic change through the support gained by elected representatives, government agencies and communities throughout the USA, Europe and Australia and has become an acceptable reclaim of public space beyond a 'one day a year' intervention (Mustafa et al. 2014). We point out similarities to the concept of 'perpetual beta', in the context of the built environment, where a city is continually changing, evolving and growing. The pop-up approach is particularly promising for addressing increased pressures on infrastructure within the built environment, such as population growth, housing densities and public transport. Perhaps, our cities do not need more infrastructure, and instead we should use what we already have in a better way? Similarly, the notion of 'infrastructure' could extend to the entire city (Ratti 2015) and also consider the city's 'infostructure' (Tomitsch and Haeusler 2015) as a way of making better use of existing resources.

Although parallels can be drawn between urban acupuncture through localised small-scale interventions, such as the *Digital Pop-up* and *InstaBooth* case studies discussed in this chapter, results informing city-making, however, depend on the community engagement methods used. For example, employing a participatory action research methodology (Foth and Brynskov 2016a; Hearn et al. 2009) by involving LGAs, community groups, organisations and relevant stakeholders from the outset of the engagement activity is promoted in order to create a middle-out approach. It should be highlighted that LGAs undertake engagement with the intention of obtaining community feedback as a legislative requirement (Innes and Booher 2004); however, the decision-making process and power still lie with the LGA and not the community. Traditionally, urban acupuncture has been used to create a dialogue

between designers and communities around architecture projects located in areas that had been identified as needing repair. We propose to extend this definition to include city hacking through pop-up interventions for community engagement, to obtain public feedback on infrastructure within the built environment. Through this attitude, we encourage LGAs to explore the idea of opening their cities to hacking in order to create an open-source city. This can be achieved by lowering regulations and restrictions for the deployment of pop-up interventions, hosting hack-a-thons, providing hackable spaces and sharing data and resources to encourage citizens to question and provide solutions to city-making. Additionally, this approach can be used for both locally based (e.g. urban renewal in a local community) and citywide projects (e.g. improvements to city pedestrian and cycle paths).

We have shown that implementing the urban acupuncture framework has encouraged a middle-out approach to community engagement by drawing on the collective knowledge of top-down and bottom-up stakeholders. This concept further explores how the final outcomes of each local intervention can contribute to systemic change past the individual locale and—taken together—across different urban environments. We propose the urban acupuncture framework as a dynamic, continuously evolving tool, to be adopted, further expanded and developed by practitioners of community engagement, urban planners, designers, architects, academics and community members who contribute to the engagement process.

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Part II

Changing Roles

Transforming Cities by Designing with Communities



Rosie Webb, Gabriela Avram, Javier Burón García and Aisling Joyce

Abstract The Adaptive Governance Lab at the School of Architecture at University of Limerick has been working collaboratively with local government officials and community activists on action research projects co-designing with communities in neighbourhoods, villages and city districts in various locations in Ireland since 2010. The collaboration model developed is a genuine example of 'hackable city-making', where the local communities are involved in designing specific solutions for improving liveability in their areas, with the involvement and support of local government. A 'Designing with Communities' framework has emerged from the process in the 5 years of practice this chapter refers to. This has led to the need to refine the characterisation of the time frame, the methodologies, the commitments required from participants, the financial costs associated with the process, the advantages and disadvantages of engagement as well as the replicability of the process across cultures and governmental systems. Our chapter documents that ongoing process, defines the emerging structure of the framework, reflects on the value and risks of the process that has been carried out to date in terms of its usefulness as an urban management tool and active learning tool and proposes ways in which the framework can be adapted to fit into the developing community engagement structures of both academia and local government in Ireland.

Keywords Co-design · Community engagement · City-making
Tactical urbanism

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1 Introduction

Since the autumn of 2010, the Adaptive Governance Lab (AGL) at the School of Architecture at University of Limerick (SAUL) has been working in close cooperation with local government officials and community activists on action research projects, co-designing with communities in neighbourhoods, villages and city districts in various locations in Ireland.

The goal of these projects was to involve the local communities in designing and adapting specific solutions for improving liveability in their areas, with the support of local government collaborators. The current chapter focuses on the ‘Imaginative Community Woodquay’ project, undertaken in Galway, Ireland, between 2013 and 2015.

To achieve this goal, the AGL has developed a framework that can assist local government in supporting changes in the fabric of communities and in the natural and built environment of these places, using methodologies that have been modified to suit the objective of aligning bottom-up initiatives with top-down planning. The ‘Designing with Communities’ framework was developed and then improved through the experience gained working directly with community groups using innovative collaboration tools and processes.

The current chapter documents the methodology that has been developed and refined in five years of practice. We describe a framework for our interventions, connecting design-driven, bottom-up actions to top-down sustainable development initiatives, in a way that impacts not only the immediate outcomes of built environment projects, but the systems of governance themselves. Within this framework, we define parameters such as the time frame, the commitments required from stakeholders and the methodology associated with the process. In addition, we want to reflect on its advantages and disadvantages—the value and risks of the process that has been carried out to date—in terms of its usefulness as an urban management and active learning tool, and propose ways in which the framework can be replicated and adapted to fit into the developing community engagement structures of both local government and academia in Ireland.

Taken together, it is our ambition to identify the appropriate means for supporting government to become adaptive, through the incorporation of a process that aligns local creativity and experimentation with government processes, through iterative feedback loops.

Our approach combines a number of broader developments. From a top-down perspective, governments have become more interested in finding new, more inclusive ways for public consultation. Public consultation is a mechanism built into the fabric of democratic governance. Such consultations are usually organised by local authorities to explore the opinions and positions of the citizens whose lives are to be affected by future decisions related to the built environment, transport, local resources, etc. Typically, they involve the passive participation of the public once most of the detailed design decisions have been made on a project.

In order to increase the efficacy of public consultations, local authorities are exploring new modalities of reaching out to communities and neighbourhoods, using social technologies such as forums, mailing lists, Facebook groups and pages, Twitter and others. However, these tools are there mainly for supporting coordination and awareness, and for facilitating face-to-face meetings and decision-making. At the same time, local authorities are also interested in employing tools and strategies inspired by the smart city concept (Nam and Pardo 2011) to provide better public services and more efficient governmental systems. They are becoming more adept at using digital technologies to crowdsource information related to local problems that need interventions and at using Internet-of-Things devices to target services more efficiently.

In Ireland, local government policy encourages early public engagement in identifying local needs, involving citizens directly in decision-making and data collection, to back up decision-making with evidence. Amongst Irish local authorities, a few have adopted an innovative perspective and encourage the so-called beta approaches to solving complex urban problems, relating, e.g., to the environment, to safety and street hassles, to public realm, street art (DCC Beta Projects 2013).

From a bottom-up perspective, particularly in the wake of the recent global financial crisis, citizens in many countries have been organising themselves around tactical urbanism initiatives. *Tactical urbanism interventions* are short-term, low-cost interventions, initiated by a range of actors including governments, businesses, citizen groups, artists, non-profit organisations or communities, and involve actively designing, building and implementing small, incremental changes to the built environment, rather than just discussing long-term strategic plans. They attempt to solve complex problems that confront the city population by creating quick and easily implemented solutions through micro-level project opportunities. Some of these interventions are sanctioned by the public authorities; some others are unsanctioned and happen in a more DIY, guerrilla manner. Saitta (2009) refers to these as ‘tactical urbanism’ and, respectively, informal interventions.

In the planning process itself, we have also noted a rising interest in *co-creation sessions between planners and residents*, involving local authorities and citizens working together to design and implement the most desirable solutions. While consultation asks people what they think about possible solutions, co-creation involves an imaginative exercise of thinking about and describing (or even building) prototypes of what could exist in the future.

Taken together, the formation of strong communities and of strong networks between public officials and members of these communities is meant to create a base for opening the city for changes, entrusting local communities to bring to life new initiatives. In their Hackable Cities Manifesto, Ampatzidou et al. (2015) speak about this kind of initiatives as ‘making the city hackable’. Such initiatives encourage various stakeholders, often using digital technologies, to initiate changes that incrementally make the city more resilient and more liveable through the direct involvement of local communities.

There has been a rise in practices in which the public is involved or involves itself directly in urban planning/city-making worldwide. Various practices (from community mapping and social media campaigns to events designed to support capacity building) assume different levels of public involvement, ranging from consultation to co-creation. The AGL acted as a facilitator for a specific local community interested in city-making to collaborate with Galway City Council and enact collective (hacking) practices. It is worthwhile noting that the local authority could not be considered an open institution before this project, and its appetite to collaborate with citizens developed during the process. With our work at the AGL, we aimed to create a framework to support these co-creation processes between local authority officials and residents that builds on the tactical urbanism interventions repertoire. This repertoire offered inspiration and encouragement to the members of the local community, who adapted some of these interventions to the local conditions.

Increasingly, innovative local government managers are encouraging tactical urbanism interventions they see as instruments for achieving sustainable urban development while working in an environment of increasingly complex regulatory and statutory systems for city-making.

The AGL sees its role as a change agent, enabling, but also challenging governmental systems to become more responsive. It supports local input that could influence the direction of action and policy. Our approach is an alternate approach to master planning, which envisages a unique outcome and tries to find a direct route to achieve that end. This alternative approach allows a number of possible futures to emerge. It can be seen as an overarching framework for experimentation and action in which similar organisations can engage, in a coordinated way, in order to make an impact on the direction of urban development and to feed back findings to assist collaborative decision-making (or governance).

The AGL is a service organisation, a civic, public interest design workshop facilitator, embracing the open-source principles—rather than having the intent of creating a product or business, although industry actors can be involved in the prototyping activities. It has a role in the cross-fertilisation of teaching and research. From a teaching perspective, it engages in training professional designers in facilitating community input into the use, design and operation of public spaces and services. In the development of new urban space solutions, innovation forms an important constituent element of the community engagement framework. Research into the collection, analysis and visualisation of local data forms another key element. Good local governance and the forging of strategic partnerships with public, private and not-for-profit agencies are at the heart of AGL's mission. From a governance perspective, the AGL works to embed design thinking and methodologies in civic governance.

In 2013, the AGL was invited to work in Galway, a city on the west coast of Ireland, with the Woodquay business and residents association and Galway City Council. The partnership developed between Galway City Council, the University of Limerick (represented by the Adaptive Governance Lab, the Interaction Design Centre and Fab Lab Limerick) and an assemblage of local actors in Woodquay, Galway, coming from various backgrounds, such as residents and business people,

artists and craftspeople, and others connected to the area, has given us the opportunity to distil lessons learned that we share.

2 Background

The Adaptive Governance Lab approach was informed and inspired by the role of urban designer as ‘network weaver’ (Webb 2010), the tactical urbanism movement and co-creation methods that use participatory design approaches involving communities. Each of these influences is discussed below.

2.1 The Role of the Urban Designer as ‘Network Weaver’ to Enable the Democratic Right to the City

In the context of the complex systems of conflicting interests that contemporary cities are, the role of the urban designer necessarily includes that of ‘network weaver’ (Holley and Krebs 2002)—seen as facilitator, enabler and animator of both the built form and cultural manifestations of places. The urban designer is becoming a connector between innovators, local residents, research institutions and local governments, as well as outside partners (Webb 2010).

Holley and Krebs (2002) refer to smart communities and, in this context, to their findings concerning the building of robust, intelligent community networks. They put the emphasis on the phenomenon commonly referred to as emergence, in which local interactions lead to global patterns. Smart networks require active management, and when left unmanaged, networks result in small dense clusters with little or no diversity. These clusters are characterised by the fact that ‘everyone knows what everyone else knows in the cluster and no one knows what’s going on in other clusters. The lack of outside information, and dense cohesion within the network removes all possibility for new ideas and innovation’ (Holley and Krebs 2002).

Most communities start as small emergent clusters organised around common interests or goals, usually isolated from each other. Without active leaders (‘network weavers’) who take responsibility for building a network, spontaneous connections between groups emerge very slowly or not at all. Network weaving involves: (1) relationship building across traditional divides, so that people have access to innovation and important information and (2) learning how to facilitate collaborations for mutual benefit. The culture of collaboration triggers a state of emergence, where the outcome is more than the sum of the various collaborations (Holley and Krebs 2002).

Urban designers working within local authorities must become network weavers in order to support the creation of smart community networks—as advocated in the principles of sustainable development. Unless this happens, small, common interest

cluster organisations will fail to grow into the robust, smart community networks they have the potential to become.

In an age of declining local authority resources, universities, in their aspirations to connect developing knowledge with real-world problems and community initiatives, can play an active role in supporting the workings of government through engagement in action research projects.

2.2 *Tactical Urbanism*

Tactical urbanism is an approach to neighbourhood building and activation using short-term, low-cost and scalable interventions and policies (Lydon et al. 2012a). The term ‘tactical urbanism’ was inspired by a blog post describing the temporary pedestrianisation of Times Square by the New York City Department of Transport (Lydon et al. 2012b), referring to ‘low-cost, un-, semi- and fully sanctioned interventions’ in the built environment as ‘tactical’. The first two volumes on this topic—‘tactical urbanism’ 1 and 2 (Lydon et al. 2012a, b) contributed to the dissemination of information on the agents and the practices used in this type of hackable city-making, reaching wide categories of public.

Tactical urbanism initiatives make use of open and iterative development processes, put an emphasis on the efficient use of resources and rely on the creative potential unleashed by social interaction.

Urban planning has tried to create social order and growth by organising and disciplining the ‘unruly and seductive’ city (Cuff and Shermann 2011, cited by Fabian and Samson 2015). More and more, this top-down approach to urban planning is being questioned, and there’s an opening amongst planners, architects and politicians to learn from and incorporate DIY urbanism and bottom-up approaches into urban planning processes (Fabian and Samson 2015). According to Fabian and Samson (*ibid*), bottom-up urban DIY design contributions aim at re-appropriating public space by listening to real-time and real-space constraints and to the different needs and hopes of the involved citizens and communities. Modern planning is largely focused on developing a symbiotic relationship between private market forces (e.g. developers or entrepreneurs) and the public sector, with planners performing mostly creative, diplomatic and exhortative roles as shepherds of the public interest (Myers and Banerjee 2005).

Finn (2014), speaking about the rights and responsibilities of the public as they relate to public space, also considers tactical urbanism from a DIY perspective. In an era when public resources are limited and participation is a compulsory requirement of effective practice in municipal planning, DIY approaches represent a viable alternative (Finn 2014).

Regarding the kind of interventions included under this umbrella term, a noteworthy example is the ‘Spontaneous Interventions’ exhibition of the US Pavilion at the 13th International Venice Biennale (Bureau of Educational and Cultural Affairs of the US Department of State 2012) that included interventions described as ‘pro-

visional, improvisational, guerrilla, unsolicited, tactical, temporary, informal, DIY, unplanned, participatory, open source'.

The AGL has taken inspiration from tactical urbanism approaches that focus on reclaiming shared public space for the use of people and for improving the environment. These solutions re-appropriate space that has gradually been converted from space available to people to space devoted to the movement or storage of cars, or that has become unused or unsafe due to dereliction and neglect. Interim solutions that instigate an incremental re-balancing to accommodate human activity and/or environmental diversity have been of particular interest to the AGL. Various tactical urbanism approaches and projects such as Open Street initiatives, Parklets, Intersection Repair, Better Block, Urban Farms, PopUp Gardens, Play Streets, Mobile Vendors, Imagination Playgrounds and DePaving (Lydon and Garcia 2015) have all featured as proposals in the AGL 'Designing with Communities' framework. As well as increasing the liveability, vitality and attractiveness of an area, the collaborative design and creation of these urban installations have assisted the AGL in identifying the creative agents, environmental stewards and public space caretakers who can ensure that the changes to the public space are locally informed and locally appropriated.

One of the interventions that inspired the participants brought together by AGL was *Park(ing) Day*, a public participatory art project, started in San Francisco in 2005 by a group of artists and urban interventionists. *Park(ing) Day* immediately became a worldwide viral phenomenon which has been helping people all over the world to re-envision the parking spot as a space for human use. One of the innovations that came out of *Park(ing) Day* was the *parklet*. A parklet is a sidewalk extension that provides more space and amenities for people using the street. The parklet programme, realised through a partnership between business and neighbourhood groups benefitting from rapid facilitation by local government officials, has spread to other cities in the USA and has been replicated in neighbourhoods around the world.

According to Lydon et al. (2012a), tactical urbanism is not the same as informal interventions like pop-up or guerrilla urbanism, which just appropriate a space. The goal of the tactic is to actually 'prove' to strategic decision-making levels that the temporary intervention/'hack' should lead to more permanent change in the direction of the intervention (Lydon et al. 2012a). The experience of the City of San Francisco, involved in the creation of a licensing programme for the tactical urbanism initiative dubbed '*Parklets*', demonstrates how the local government was able to employ community design processes—incorporating tactical urbanism interventions—to learn, respond and adjust its mechanisms to better achieve the aims of sustainable city development. The San Francisco Parklet Manual v2.2 clearly outlines the rules for proposing, designing, building and placing a parklet, including all the stakeholders of the process, addressing transport and health and safety regulations and outlining the approval workflow (City of San Francisco 2015).

This scaling up of the process and its adoption by the bureaucratic and commercial interests has led to questions about how hacking public space can scale:

But why did scaling up a good idea have to mean ruining it?

There is a fervent debate happening at the moment about tactical urbanism and its relationship to social equity. As a veteran practitioner of tactics, I'm also curious about their potential to catalyse long-term urban transformation and institutional change. (Bela 2015)

Bela calls the early activation process, which can seed culture, commerce, recreation and play on a site or neighbourhood prior to permanent construction, 'iterative placemaking', and he sees the process gaining traction as a tool for instituting organisational change in government systems. The method mirrors the prototyping of interfaces and devices in interaction design. (*Ibid.*) Looking into the future, he claims:

As the tactics of guerrilla artists become adopted into the operating procedures of city government, this draws a new frontier for further tactical action. Today's tacticians must push beyond the pop-up and the temporary and seek to hack the DNA of organisational structures themselves. (Bela 2015)

The approach of small experimental prototyping instigated by Park(ing) Day has been adopted as a strategy by city hackers and has manifested itself in a number of recent Urban Prototyping Festivals. In Singapore in June and July 2012, UP Singapore held a series of events in conjunction with the World Cities Summit. The Science Gallery at Trinity College Dublin curated an events week and exhibition 'Hack the City, Take Control' in June 2012. In San Francisco, the Grey Area Foundation for the Arts held an 'UP Festival' in October 2012, to identify replicable, affordable ideas at the intersection of public space and technology.

Since those events, 'civic hackathons' or 'coLABs' have formed and continued to prosper and their output has addressed themes ranging from health and ageing to green issues and energy efficiency to industry sectors like tourism as well as cultural, artistic and social concerns. Thousands of passionate citizens and experts from a diverse range of professional fields and industries have contributed to experimental projects to make the places they live more liveable, competitive, sustainable and just more fun.

Tactical urbanism interventions are important processes to enable the transformation of public space with maximum bottom-up input. This is because they fill the gap between the temporary, short-term programming of public space in daylong or weeklong events/festivals, and the permanency of public realm improvement projects that are usually associated with urban renewal or sustainable travel initiatives. Festivals are almost exclusively instigated by 'creatives' working in public space and are usually driven by community interest, local tradition or a deeply felt need for community. Public realm improvements, on the other hand, generally derive from a top-down governmental drive and involve limited opportunity for local engagement in the change process. This is particularly the case if they have strict time constraints and a raft of statutory and regulatory mechanisms to fulfil. In a temporal sense, urban tactics allow local actors to understand the implications of change in public space in a more substantial way than a short-term event allows and yet without the commitment required for a permanent project. In short, medium-term installations in public space allow for experimentation and feedback, both activities that are required for a system to achieve adaptivity.

3 Designing with Communities—The Woodquay Project

As we have seen, co-creation projects can help to create connections between urban planning, local governance and community development. These initiatives focus on the co-creation of common urban space, on re-thinking communal and public services, as well as on creating new digital or hybrid tools for citizen participation (Saad-Sulonen and Horelli 2010). Such tools can empower people to get involved in solving urban issues. De Lange and De Waal (2013) discuss digital media technologies as a co-creation enabler, which can support peer-to-peer citizen engagement as an alternative to the institutionalised top-down or local bottom-up ways.

Inspired by the development of these three visions of city-making, the AGL has designed a framework for participatory action research projects, as an attempt to set up a process to actively manage co-design and collaboration in urban development. This process endeavours to facilitate learning and communication through flow of local information from within and introduction to diverse ideas from without, in an effort to allow innovative solutions to emerge and to prevent stagnation. We will now move on to discuss how this was applied in one of our projects in more detail.

‘Imaginative Neighbourhood Woodquay’ was a community design process which leads by the Adaptive Governance Lab (AGL) at the School of Architecture at University of Limerick, working together with the Woodquay Business and Residents Association and Galway City Council from 2013 till 2015.

The initiative belonged to the Woodquay Business and Residents Association, who approached the local authority (Galway City Council). The combined residents and business group were concerned about the declining residential population and the increasing incidents of antisocial behaviour. They advanced a request to revive a market in their public space on a periodic basis, with the belief that providing a better balance to the use of the public space, (almost entirely being used for vehicular traffic and parking at the time), would make the area safer, livelier and more attractive.

The Council invited the Adaptive Governance Lab—an academic research laboratory—to engage with the community and to discuss options, also involving officials working in various functional areas of the Council. Thus, the initiator was the residents and business association, who had a possible solution in mind. The Council took advantage of this opportunity to open a dialogue, and invited a third party, known for its interest in urban development and co-design facilitation skills, to lead the process.

3.1 *Evolution of the Process*

The process started in the autumn of 2013, with two weeks dedicated to a ‘Designing with Communities’ exercise, held in a pop-up shop in Woodquay in September and October. Rather than supporting the revival of the weekly market, the AGL



Fig. 1 Community learning day; pop-up shop; field visit

suggested a wider process, where the different stakeholders would establish a common understanding of the issues confronting the community.

Each of the two weeks consisted of community learning days—during which information was gathered from both local and official sources, and the audience (formed of locals, students, academics and representatives of the local government) heard presentations from people experienced in collaborative local planning. Community workshops and field visits were initially organised for the Woodquay Business and Residents Group and extended (by publicising them openly) to a wider public audience. These allowed the participants to listen and gain an understanding of the needs of local collaborators. Design ideas were presented at an open critique session (held as an event during European Culture Night) in Galway, to test the appetite for proposals and to get feedback. Culture Night provided a perfect format to extend the discussion beyond the local community to include those engaged on a wider scale in the social and cultural life of the city (Fig. 1).

During the first week, students from the School of Architecture at the University of Limerick (SAUL) collected data and produced strategic maps for the area, describing what existed already in Woodquay and then what could exist, making proposals for short-term interventions/temporary uses that could be executed immediately and inexpensively to catalyse the community towards fulfilling broader long-term objectives for the area. During the second week, the students designed a ‘Toolkit for Streets’, including street furnishing for their tactical urbanism interventions, street layouts to support them and an event programme to develop and promote emerging themes (Fig. 2).

In the spring of 2014, the Woodquay Residents and Business Association, who were an informal organisation of local home-owners and locally owned and run businesses, formed an alliance with a local Men’s Sheds organisation to apply for funding from a youth and community fund. The partnership was facilitated by the City Council and was necessary as the Woodquay Business and Residents Association lacked formal articles of association to apply for funding. The group used the documentation produced during the previous AGL sessions to form the basis of the application. The funding was granted, and it was used to facilitate four events in the public space of Woodquay during 2014. These events took place in conjunction with national holidays and aimed to draw attention to the potential of the particular public space. They included a dance demonstration, a Teddy bear picnic, a street critique

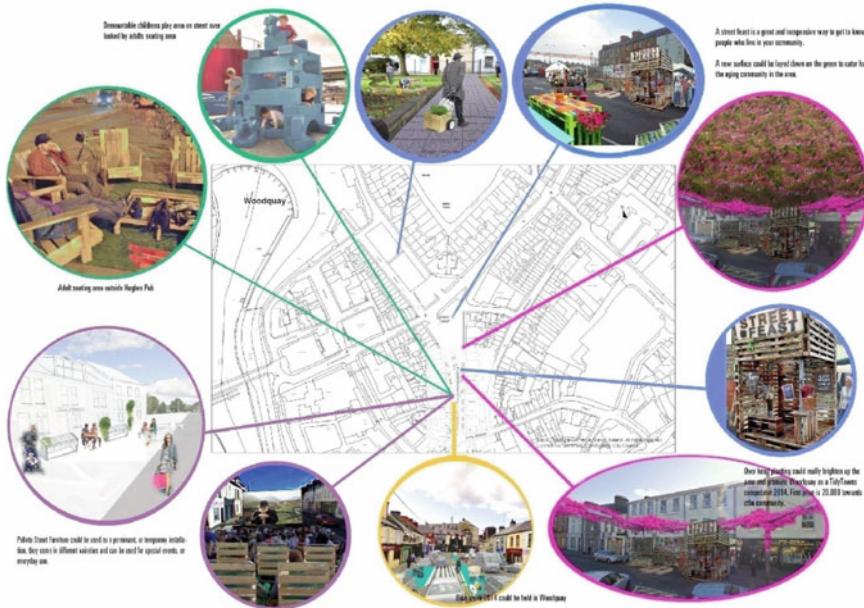


Fig. 2 Short-term interventions and temporary use layout by Luke Benson, Eimear Egan, Jennifer Hogan, Laura Pembroke, Lauren Quinn McDonagh and Orla Punch, AGL, Fall 2013

and a Christmas tree lighting event. Organising these events gave the association the chance to attract people to Woodquay and to showcase the potential of the public space.

In the fall of 2014, the AGL held two more ‘Designing with Communities’ weeks, involving a new cohort of students. The collaboration included a direct collaboration with Bernadette Divilly,¹ a local choreographer running a participatory art project called ‘Walking Wisdom Woodquay’. The project was a result of the choreographer’s participation in the previous Designing with Communities weeks. Bernadette Divilly’s response was informed by discussions about the research of the AGL, which revealed a predominance of older women living in the area. The students participated in investigative walks as a way of learning about how people move and engage with their public space in the area using the methodologies of the dance artist. There was a particular emphasis on the needs of the elderly female residents.

At a public critique session held at the local theatre in November, the students presented proposals for interactive street furnishings that could ‘instigate the cultural and economic performance’ of the place. The potential incorporation of measurement platforms (sensors, counters) into the fabric of the urban realm was an issue raised by the participants. From the perspective of the local authorities and of research groups from the local university, such interventions could assist decision-making by making

¹<http://BernadetteDivilly.com>.

the city more responsive to its citizens and enabling local actors to influence how their shared spaces develop.

The opportunity to imagine specific changes to public spaces collaboratively with community groups is a luxury few city officials can afford. One of the factors that mitigates against the practice is the fear of raising expectations of improvements that cannot be delivered due to a lack of funding. Funding for long-term improvements often comes with strict time frames for completion, which, once the statutory planning permissions and regulatory procurement procedures are adhered to, leave minimal time for public consultation. The year-long process of design thinking and community coalition building described above would need to be substantially compressed. Even with the most dedicated participants, most communities suffer from consultation fatigue when such a high level of commitment is required. Notwithstanding this issue, the cost of **not** engaging with community groups in the design and creation of public space forms a much greater risk to the success of public realm projects which may suffer from lack of distinctive local character and lack of local ownership of the space in terms of both its future adoption and local caretaking.

The second factor that inhibits Council officials who wish to engage in this process is the perceived role of the officials. These are often reluctant to express a personal opinion that may be at odds with an official position of which they may or may not be aware. They are also often expected by the community to solve issues that may not be within their remit. Local authorities that can have projects progressed to a point of ‘shovel readiness’ are best placed to avail of funding when it is announced. Asking for long-term public engagement requires a high level of trust, and no guarantee can be provided that the effort will have a direct impact on improving life in the area. That level of trust can often accumulate where local authority design professionals are engaged at local level as ‘town architects’, but such a role is rare in today’s local governance structures. Occasionally funds become available for short-term consultancy contracts for ‘artists in the community’ or ‘community design facilitators’ through arts and cultural funding mechanisms, but these are limited in scope and duration by their nature, and not supported as long-term initiatives. The trust must be connected to the ongoing build-up of intelligence about places and the visibility of that information, analysis and consensus building, rather than being personality driven or connected to any one individual within or without the governance organisations.

In Woodquay, after the extended collaboration period, it was important for the co-design process to lead to a quick, visible and substantial intervention in the area. The decision was made in the spring of 2015, together with the community, to implement one of the student-envisioned interventions. The stakeholders chose a parklet as the most appropriate temporary intervention for Woodquay. The parklet was designed and built by summer bursary students in 2015.

The AGL teamed up with the Fab Lab Limerick and the Interaction Design Centre at the University of Limerick to design and fabricate the parklet over a 6-week period during the summer for a demonstration project in the autumn of 2015. The plan was to have the parklet in place for a trial period, to allow the community to engage directly in the design of their public space and to provide feedback in real time. It was intended that the information gathered and the lessons learned from the

demonstrations would influence future permanent changes in making Woodquay a more liveable place and assist the community and local authority in collaboratively identifying funding opportunities from public and semi-public sources, as well as alerting potential industry and commercial partners to worthwhile projects.

Some of the ideas for interactive installations discussed with the stakeholders were: sensitive ‘musical’ plants included in the parklet that would react to movement/proximity, sensitive light installation triggered only by the presence of more than one person, a hyperlocal website and newspaper, a dedicated radio/podcast station. Other ideas discussed were: collecting oral histories from locals during dedicated events or through a temporary audio booth, providing free Wi-Fi and having a landing page dedicated to the project, having a geocache hidden in the parklet, the creation of an Ingress portal, a foursquare venue, etc.

The summer project engaged the stakeholders in the co-design, fabrication and installation of the parklet installation in the public space of Woodquay. Through the ‘Designing with Communities’ process, and in particular, through the presentation of emerging design proposals at weekly public critique sessions held alternatively in the local theatre in Galway and in the Fab Lab in Limerick City, the installation’s shape, size and functionality were debated and negotiated with local actors, its location and placement were agreed and facilitated by Council officials and nearby business owners and residents, its design was supported, developed and refined by industry partners, maker community collaborators and university researchers, its operational and maintenance protocols were clarified, assigned and accepted by willing participants, as well as being rejected by those more reserved in their engagement.

A team of potential collaborators, including Bernadette Divilly, the choreographer who ran the participatory art project and Ed Devane,² sound artist, declared their availability to run and curate events around the parklet installation. The design project and the participatory design process allowed to connect the aspirations of the community, to the imagination and innovation spirit of these socially engaged artists and makers. Industry partners, including the DIY department of a local building supply merchant, supported the project by donating materials and expertise. An international lighting company offered interactive lighting and sound installation elements. Academic collaborators from Galway and Dublin engaged in the project to provide research assistance in scoping pre- and post-occupancy measurement and monitoring tools and performance parameters. All this interest was in line with the AGL intention of making the parklet structure open and ‘hackable’, allowing the addition of new uses and functionalities.

In the autumn of 2015, AGL ran two more ‘Designing with Communities’ weeks in Woodquay, where new streets layouts and installations were imagined, discussed and proposed. The first week was timed to coincide with the European Culture Night and Global Park(ing) Day in September and addressed the theme of ‘Street Culture’ in Woodquay. The second demonstration week was held in October during Social Inclusion Week and fed into a Universal Design workshop week facilitated by the City Council.

²<http://EdDevane.com>.



Fig. 3 Parklet in place and open critique in Woodquay

The parklet was installed in Woodquay, reclaiming a space previously used by cars for people (see Fig. 3). The plan was to go through a further iteration of the hackable parklet installation during those demonstration weeks, to discuss the need for developing a parklet licensing procedure and to develop a new urban prototype aimed at enabling accessibility to premises in the area.

However, due to the lack of a project champion at senior management level within the local authority as the director who commissioned the work had moved on and following the job transfer of the person who initially coordinated the AGL involvement, these intentions did not materialise. After these events, the parklet was dismantled and put in storage. Nevertheless, the social capital created during the 3-year span of the project remains. The Woodquay residents and business owners, as well as the wider community got a glimpse of what is possible and how can it be achieved. Business owners state that the footfall in the area has risen, students of the local university often choose the area as site for their projects, and the locals' sense of pride appears to have been restored. The conditions are now ripe for other interventions (tactical urbanism or others) in the near future.

It is worth noting that the chair of the AGL straddled the academic and local authority project champion roles, holding simultaneously a position in the City Council and teaching at the University. During the process, this situation was perceived as both an advantage and a challenge. The privilege of access to information and understanding of the structures of local government were often outweighed by the responsibility of continually reiterating the position from which one was operating.

This demonstrates that while the individual hacker attitude and the collective practices remain with the community, the 'hackability' of the institutions was temporary and depended on the presence of specific actors. The future years will hopefully bring more openness and appetite for collaboration, as communities start putting pressure on the local authorities bottom-up, and the top-down legislation encouraging co-creation emerges at national level.

3.2 The ‘Designing with Communities’ Framework

An analysis of the work undertaken with the business and residents group in Woodquay, the local authority officials in Galway City and with the various communities of interest and local businesses who engaged in ‘Imaginative Neighbourhood Woodquay’ project, has led to this presentation in context of the Designing with Communities framework. Here, we will try to abstract and distil the essence of this framework, making it available for further appropriation and adaptation. These are the main characteristics of the framework:

The Time Frame

The Designing with Communities framework is conceived as a meaningful medium-to long-term (9–18 months) intervention as part of a continuous, cyclic engagement process. Based on our experience, targeted community engagement weeks lasting 3–5 days should occur 4–6 times per year, while tactical urbanism interventions should be in place for 3 months to 1 year. Feedback should be collected, analysed and changes implemented continuously during this time.

The Actors

- The ‘network weaver’: the process has to be led by urban design leadership (a person, an organisation, an academic research group) with good connections with and authority within the local institutions, connected with businesses and local communities; the network weaver has to be there for an extended period of time, so that he/she/they can gain the trust of the community.
- Local authority official engagement to develop and coordinate licensing/permitting approvals processes if required.
- Local community groups working together (Tidy Towns, heritage preservation groups, environmental protection groups, community gardeners, etc.).
- Education institutions—universities, technical institutes, schools, primary and secondary.
- Communities of interest, interested in DIY (such as Fab Labs, makerspaces, Men’s sheds), arts and performance (socially engaged artists, radical empathy groups, etc.), special interest groups (Access for All, Smart Aging Groups, Friends of the local Park, etc.).
- Professionals (possibly as a pro-bono exercise, or as continuing professional development).
- Urban innovators (from local industry or local small and medium enterprise companies, start-ups, etc.) (Fig. 4).

The Methods and Techniques

- During Community Engagement Weeks, we found the following formats to be working well.
- Learning Days—using formats like PechaKucha style lighting talks from local actors, civic conversations with presentations and panel discussions with ‘experts’ and strategic and operational policy makers.

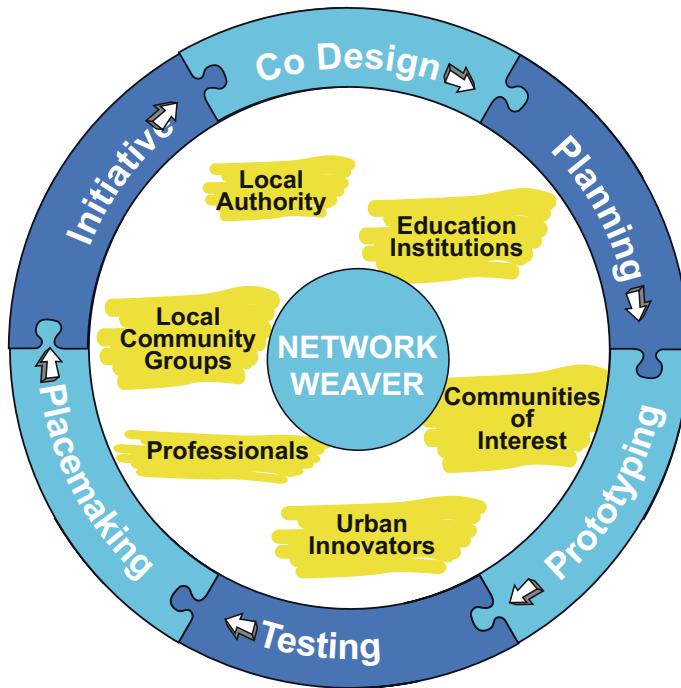


Fig. 4 Time frame and actors

- Field days and tours—led by local interest groups and officials.
- Community mapping and auditing events—crowdsourcing local and less known information, visions, aspirations, things that people treasure and things that they dislike.
- Community design workshops—exploring specific proposals, ideally with diverse and intergenerational groups (hands-on and interactive, ideally involving physical and digital modelling, drawing and narrative development). These could work with proposals for the area or specific proposals for interventions.
- Open design critique sessions—bringing together analysis of information collected about what exists currently and making proposals for tactical urbanism interventions about what could exist, to address the needed change to the built and/or natural environment in the area.

From the point of view of local government, it is increasingly difficult to find a structure within which urban designers/network weavers can operate. The lack of time and bureaucratic constraints are making long-term collaborations with local communities a difficult challenge.

One of the challenges to placemaking today is the absence of a coordinating framework for design activity. That absence is felt both at the top and from the bottom. Top-down, it is increasingly difficult to find a place for urban design professionals

within local government structures. Simultaneously, local, amateur and professional amateur input (bottom-up contribution) are being disabled, due to increasingly onerous statutory and regulatory systems.

The Designing with Communities framework described in this chapter attempts to improve both of those situations, by defining the role of designers within a new process, which could parallel or even align with statutory local planning processes. It proposes a co-design process in which professionals and local designers can both engage. Lastly, it aims to connect these actors to each other through digital media and tools.

The Designing with Communities framework focuses on community engagement events (no comma) and the design of tactical urbanism interventions which can be imagined, refined and realised within a relatively short time period (3–6 months), with little funding (under 5,000 euro) and which, (comma added) crucially, are (not is) flexible enough to be hackable, programmable and open to be curated by others who engage in the process.

This design work must be supported by a participatory platform that would include learning days, workshops and importantly, community open critiques, which have to happen locally and, ideally, within the public space they address. The platform involves both face-to-face meetings and digital- and social media-mediated resources and conversations. The changes or design options being considered have the aim of improving the shared public spaces, safety and liveability of the area, but neither their physical nor their operational aspects can be predetermined. Therefore, flexibility is required in developing the options as they emerge. In a truly participatory approach to design, solutions must be allowed to evolve with local input and with an explicit agenda to facilitate change.

Advantages and Disadvantages

There are obvious advantages resulting from the application of the framework. A main advantage of the process that has been carried out to date has been its capacity to move public consultation from a broadcast mode to a genuine conversation about the design of shared public spaces. Through the period of engagement in the co-design process, the conversation in Woodquay changed from ‘Reasons why a public bench will adversely affect locals by attracting antisocial behaviour’ to ‘Where can we place a public bench to get the most benefit for all and how should it be designed to make the place more attractive, provide for the most vulnerable users and to attract pro-social behaviour?’.

The process created a valuable platform to allow socially engaged actors to emerge and to have a voice regarding the use of public spaces. Co-creation provided opportunities for cooperative direct action. The incremental change facilitated by the ‘Designing with Communities’ process makes the actors feel more comfortable with the environmental changes, due to their perceived reversibility, and to accumulation of an evidence base to either reject or support the interventions for the future.

There is also a potential risk of using the process as an urban management tool: if consensus cannot be reached, there is a danger of leaving public realm improvements in a perpetual temporary state. Another risk is that the co-design process produces a

poor-quality outcome, as a result of ‘design by committee’. Sound design leadership should mitigate against these risks.

Replicability

For the ‘Designing with Communities’ framework to fit into the developing community participation structures of both academia and local government, there is a need for cross-institutional governance structures, detailed time frames and multi-annual funding mechanisms. The citizen innovation and urban prototyping exercises need to engage directly with local small and medium enterprises for the products and services imagined to develop real value for the community.

The process is outgrowing its current format, which is situated within the academic term schedule and allows for only two of these design weeks with the same group of junior designers. It is expanding both in terms of the time commitment to encompass year-long participation, and in terms of the skill base of the participants, opening out to related disciplines (interaction design, digital fabrication, applied electronics).

The AGL is increasingly committed to making, as well as designing, and is working intimately with digital fabrication experts and interaction designers in the areas of digital local manufacturing, digital platform design, digital mapping processes and environmental sensors. The AGL is finding a lot of common interest in Living Labs networks dedicated to co-design and citizen innovation and is positioning itself in this field of expertise. We are now working towards finding ways in which the framework we have developed could be adapted to fit into the developing community engagement structures of local government in Ireland. We hope that by doing this, a strong link between community planning and official governmental planning processes can be created.

4 Implications and Recommendations on Conditions for Governance

Flexibility is the aspect that makes the process so difficult to fit into governmental and political systems in particular, as far as capital works programmes are concerned. The process is continuous and iterative, involving a 1½–3-year cycle to make proposals, develop strategies and enable their realisation. This time frame, in a context of capital funding regimes which, to a large extent, happen within a one-year time frame, requires an extended commitment from all those involved on a provisional basis, where no guarantee can be given for the availability of funding mechanisms as consensus develops on agreed areas for development. The fact that funds for projects and for making physical alterations are available only to the local authority operational teams through sectoral/departmental funding mechanisms (i.e. roads, housing, access, parks), rather than being allocated on a place-based approach, is also an obstacle to coordinated cross-departmental commitment. Alternate funding sources for interventions can come from other types of projects, donations and even bottom-up crowdfunding.

The local authority itself must be comfortable with exposing the current operational systems and solutions to public critique. Citizens and communities must also be willing to operate in a climate in which the results of their time and energies investment cannot be predetermined, nor can outcomes be guaranteed. The involvement of universities is also constrained by the structure of the academic year, and any type of activities involving students as junior urban designers has to be carefully planned and executed.

An approach to solving complex urban problems centred on facilitating, enabling and supporting smart citizenship involves primarily an investment in time and human resources over monetary investment. In fact, the biggest dangers to participatory design processes are the imperative to spend money quickly, without sufficient time to allow co-design solutions to emerge, and the underinvestment in supporting dedicated ‘network weavers’ to facilitate and coordinate community involvement.

Just setting up a co-design framework or programme to facilitate bottom-up input is not enough. This needs to be matched to institutional processes and managed by designers working from within the structures of government, forming relationships at a local level directly with local residents, businesses, artists, craftspeople, activists, as well as with academia and representatives of other public services and bodies.

The co-design process is primarily concerned with facilitating democratic decision-making. Although focused on the design of temporary installations, it equally and significantly involves supporting meaningful interactions with places in general, and the street furnishings in particular as an integral element of the design. Such interactions are situated in the overlapping areas of concern for people, place and technology and are the object of study for urban informatics (Foth et al. 2011) and Urban Interaction Design (Smyth et al. 2013).

The devised process involves a concerted attempt to attract and engage local artistic and creative expression, from Urban Prototypers to socially engaged artists, from Craftivists to Community Cultivators. During the process, designers draw upon already established networks of their own, as well as reaching out to established and emerging groups in the local area. Through the design of the installations, the coordination and curation of the programme and content for their use, the identification of partners and the producing of the events associated with their collaborative design, fabrication and installation, the projects provide the opportunity to advance a public discussion about the participatory design and making of public space, and its potential to promote social capital, social cohesion and social equity. The co-design process is centred on the goal of making the urban management structures, and in particular the allocation and treatment of the public realm, more transparent, participatory, more inclusive and as a result, more democratic and equitable.

5 Conclusion

The case presented in this chapter emphasised the value of design processes in facilitating, managing and enabling systemic change. Also, our ‘Designing with Commu-

nities' framework proposes one specific type of intervention as a means of initiating place-based networks. The interdisciplinary nature of development and the increasingly bottom-up functioning of democracy has brought about a new model for urban management which involves, at its heart, cooperative design methodologies to guide the shift from the institutional to the collaborative model of decision-making and to facilitate the cooperative development of the built environment of places.

The value of small experimental prototyping as an operational tool for city management is well reflected in the process we followed. The most important outcome, we believe, are the networks and trust that were built through this process, allowing local authorities' representatives, urban designers, representatives of the residents and businesses in the area to have an extended public conversation about the future of the area. The conversation was also open to civic activists, artists, makers, industry partners and anyone interested. The 'Designing with Communities' participatory design process acted as a framework to connect the aspirations of the community to the imagination and innovation of these other local actors. It offered a concrete example of making the city hackable, where top-down and bottom-up were combined through 'network weaving', facilitation and animation, linking the needs of the community to high-level, official objectives.

The AGL played an important role in the process, scheduling events, inviting people, involving everyone in the conversation. As mentioned before, the chair of the AGL straddled the academic and local authority project champion roles, situation that gave her access to people, information and resources and allowed her to act as an authentic network weaver. Through this process, local residents, business owners, artists and hackers came together and began collaborating, building what Holley and Krebs (2002) call smart communities—interconnected, emergent, dynamic and long-term. This also created the conditions for the emergence of peer-to-peer distributed networks (De Lange and De Waal 2013), e.g. via mailing lists, Facebook groups and Twitter. Fundamentally, the co-design process is about enabling a shift in decision-making from hierarchical institutions to these smart, self-organised, cooperative communities.

Our conclusions on the processes carried out to date and the unexpected continuing length and commitment of that engagement aligns with the observations regarding Participatory Action Research as expressed by Foth and Brynskov:

This leads us to a first conclusion about urban interaction design of civic technologies: They need time and resources to develop and mature in a specific cultural context. They cannot be developed and figured out in a vacuum, they need to be grown, as it were. Organicity is impossible to plan. We have known for a long time that community development is about 'human horticulture' rather than social engineering. (Foth et al. 2015)

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Economic Resilience Through Community-Driven (Real Estate) Development in Amsterdam-Noord



Matthijs Bouw and Despo Thoma

Abstract Shifts in the perception of risks and precedents of unsuccessful urban planning efforts in the twenty-first century highlight the conflicting nature of ‘control’ and ‘flexibility’ in modern urban practices. This essay argues that urban planning can be revisited today through the lens of the ‘commons’. The notion of commons can be seen as the key to approach top-down and bottom-up initiatives in a systematic way. In this contribution, we argue that collective self-building in Amsterdam-Noord is a type of commons-based urban planning that occupies a unique territory in between state-led and market-led practices, and private efforts of urban development. By correlating the evolving definitions of the commons with the omnipresent dilemmas of urban planning, this essay intends to draw a link between the two, arguing for a more resilient form of city-making. We argue that commons-based urban planning offers a resilient alternative to the master plan, as one of its key strengths lies in the economic and social models it is based on. Finally, this essay attempts to examine the ways new technologies allow us today to revisit and reform the understanding of self-initiation and shared resources in urban environments.

Keywords Economic resilience · Commons · Community-driven planning
Public–private partnerships · Urban planning · Urbanism · Resilient design
Bottom-up · Top-down · City-making · One Architecture

In the fall of 2015, on an improvised camping ground in Amsterdam-Noord, more than a hundred caravans and tents were set up, and their owners were willing to camp out for more than three weeks in order to sign up for a plot of land in the area, called Buiksloterham, on which they could build their own house or with a group of like-minded people, a small apartment building. While in line, the campers talked enthusiastically with each other about their individual dreams and speculated about the communal efforts that might be undertaken to lower costs or to increase

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sustainability. Quite a few on the camping site were local architects who had, from 2008, during the prolonged real estate crisis that was just ending, been leading small development efforts in what had always been an unloved industrial area. They had built houses for themselves and for friends, nicely lined up in one unorthodox street, brought groups together and designed small apartment buildings for them, and experimented with soil remediation, sustainability, and circular economies (Reimerink 2016). These pioneers had made Buiksloterham an exemplary case of urban resilience in face of a real estate crisis.

In this contribution, we argue that collective self-building in Amsterdam-Noord is a type of commons-based urban planning that occupies a unique territory in between state-led and market-led practices and private efforts of urban development. We argue that commons-based urban planning offers a resilient alternative to the master plan, as one of its key strengths lies in the economic and social models it is based on. Our analysis of this phenomenon in this chapter will start with framing traditional urban practices in opposition to resilient systems, address the role of social systems and shared resources (the commons) therein and work toward a generally applicable model for such a commons-based economically resilient urban planning that utilizes new technologies and digital tools.

Over the course of the last decades, urban planning has been formed by the need to accommodate pressures for development while avoiding chaotic accumulations and conditions that had led to the rise of the ‘master plan’, often considered as a blueprint for the future city or neighborhood. In light of establishing basic rules for accessibility and sanitation, master plans have evolved into hyper-detailed recipes for city development that seem to operate under the understanding that social systems are predictable, simple, and controllable (Moroni 2010). As such, planning strategies include a set of concrete and directional rules that often lack the flexibility and adaptability more organic and resilient systems appear to have. To counterbalance the rigidity of the master plan, self-organized activities are nowadays welcomed by planners (Savini et al. 2015) for their ability to engage with a variety of uses, scales, and audiences, allowing room for creativity and innovation. However, these bottom-up city-making initiatives are still understood as activities of individuals that need to be controlled by the ‘master’ city-maker, and by themselves are not enough to foster resilient urban growth.

We would like to define resilience here as ‘the ability to deal with shocks and stresses, and the ability to transform itself within critical thresholds’ (Martin-Breen and Andries 2011). Urban development models that are based on the idea of the master plan often fail to account for potential shocks and stresses and exacerbate initial triggers due to their inherent rigidness in scale and time. During periods of economic distress, large urban projects are often halted or permanently cancelled in the face of an increased risk, leading to a decline in urban development. When projects have halted, we can observe the rise of more resilient social and economic systems, indicative of new modes of urban thinking. In a ‘risk society’ (Beck 2006), an antidote of the master plan can be found in the field of resilience, which arises as a focal point and an indicator of systematic, iterative urban thinking. In times where risk is omnipresent in some capacity and failure starts to be embraced as

a possible outcome, engaging the ever-changing nature of systems and allowing flexibility become a new direction for urban planning.

The district of Buiksloterham, in Amsterdam-Noord, can be seen as exemplary for this new approach to planning. In a development process driven mostly by individuals and groups of individuals, rather than professional developers, simple financial models fostered bottom-up urban development and have pointed to a new more resilient mode of city-making. After the 2008 economic crash, it became clear that the Dutch real estate sector was not very resilient. Bloated and uncompetitive after decades of ever-increasing liquidity because of tax policies and easily available mortgages, housing prices collapsed (Scanlon and Elsinga 2014). This led to an extended economic downturn. Projects were cancelled, and no new projects were undertaken, leading to a radical decline of the construction industry (CBS 2015) and the virtual disappearance to the real estate developer (Hentenaar 2015), who was unmasked to be not much more than a ‘mister ten percent’ in the real estate value chain.

In Buiksloterham, as in a few other areas in the country, such as Almere (Feeary 2015) and Deventer (Welovethecity.eu 2015), citizen-driven real estate development proved to be an alternative economic model. Unlike the traditional development initiated by cities, developers, and housing corporations, in which integral and ambitious plans were proposed (only to be either cancelled or value engineered at a later stage), this development was based on simple urban plans in which individuals, or groups of individuals, could build their own houses or apartment buildings. The reason this type of development continued on pace during the prolonged real estate crisis was perhaps because of the simplicity of the development model, and as a result of the simple financing model, which bypassed to a large extent, project finance loans, risk management committees, credit board reviews, and other manifestations of financialization. We earlier described this as ‘real people building real houses for their families with real money’, sometimes with help from family or from the local architects (Hill 2016).

While the traditional real estate sector proved largely unable to deal with the shock of the crisis, this more organic mode of development has proven to be much more resilient. In fact, it can even be argued that this way of development has—what the former Rockefeller Foundation president Judith Rodin calls—a clear ‘resilience dividend’, in which communities become stronger, more prosperous and more connected in the process of building resilience (ResilienceDividend.org 2016). The neighborhoods are much more diverse than those that have been developed by ‘professionals’ with regard to the variation of housing types. A study assessing the first self-developed apartment buildings in Buiksloterham demonstrated that for instance, the quality of the architecture is higher, with higher quality materials, higher ceilings, and more outside space, in part because a large part of the total investment sum is actually spent ‘in stone’. Also, the energetic performance of the buildings is better, probably because a period for earning back an investment of more than 10 years is still considered worthwhile. The projects were innovative in their use of new technology to achieve this and had floor plans that are more flexible. The communities have organized themselves around the ‘circular economy’, with the reuse of local resources, understanding that natural and cultural resources can be shared and be collectively

owned. People felt more involved in the development process and in the community, which results in more loved neighborhoods (Van de Klundert 2017).

Many of the characteristics of the Buiksloterham brownfield transformation in Amsterdam-Noord, which is the most prominent of these organic developments in the Netherlands, can be understood in terms of resilience. Resilience proposes to engage complex systems, such as a city, or the city-making process, through multi-functionality, redundancy and modularization, embracing (bio and social) diversity, and by connecting multi-scale networks in such a way that the systems becomes adaptive (Ahern 2011). Adaptability in systems implies a responsive and observant mode of governance. Understanding that rules of governance for shared urban resources appear to be more flexible when they arise as a collective effort from the community allows innovation in the way urban development is enabled and controlled. Although it has become priority for urban planners to include methods of co-creation with the community, the tension between the need to establish future goals and the necessity to allow physical and cultural flexibility remains in most planning processes (Savini et al. 2015). In Buiksloterham, planning methods indicate a shift from a set of permanent and fixed rules to a process that fosters and advocates for the creation of community-tailored guidelines and appreciates the value of shared natural and cultural resources.

The notion of the commons has resurfaced as a lens to understand social, economic, and political developments of this century. The commons were addressed in the last century by Garrett Hardin in 1968 in his paper the ‘Tragedy of the Commons’ (Hardin 1968). Commons were defined as social systems in which resources are shared by a community of users and producers. This community also defines the rules of production, distribution, and circulation through democratic and horizontal forms of governance. Hardin believed that individuals inevitably end up overexploiting and degrading common resources. Based on this paradigm, it is no surprise that policy makers have since interpreted individuals and their interests as potential threats to the resources that communities share. The conflicting interests between the individual and the collective have led to the establishment of new rules for social and economic behavior during the past century, to allow private growth and mitigate its collective effects. The commons, and more specifically their relationship with the individual, are influencing social and economic activities (De Angelis and Harvie 2014), and as such are essential in urban transformations.

Elinor Ostrom in her study ‘Governing the Commons’ (Ostrom 1990) attempts to refute Hardin’s basic assumption that individuals are incapable of self-governing their resources. She puts forward the idea that current private and governmental modes of regulating are based on generalizations and as such are blind to the capabilities of individuals. Ostrom argues that communities can create their own institutions, rules, and enforcement mechanisms which ensure the sustainable use of their resources. As she states, if certain conditions are met, there is no need for top-down regulations. Ostrom summarized the conditions in the form of eight core design principles: (1) clearly defined boundaries; (2) proportional equivalence between benefits and costs; (3) collective-choice arrangements; (4) monitoring; (5) graduated sanctions; (6) fast and fair conflict resolution; (7) local autonomy; (8) appropriate relations with other

tiers of rule-making authority (polycentric governance) (Ostrom 1990, 90). Understanding the co-relation between the sense of collectiveness and the empowerment of the individual becomes a critical viewpoint of urban thinking. It is at this point where Ostrom's basic principles can be revisited and reiterated to be applicable to urban commons (Foster 2017) in order to resolve the tension between 'governing urban shared resources' and 'allowing flexible urban transformation'. Contra Hardin and in line with Ostrom, we argue that self-organized collective commons-based self-building may indeed constitute a very resilient form of urban planning.

The scale of development in Buiksloterham is small. Each project is principally driven by each own logic. There is little need for coordination. When one project stalls, the development of the neighborhood can just continue. There is a focus on flexibility in program and space, especially since the building groups realize that group processes are inherently dynamic. And, through this piecemeal development, builders learn from each other and connect to each other to see if things can be shared, such as a heat pump or the drilling of the piles. As such, the social fabric of the future community continues to strengthen, knowledge and resources are shared, and common values are adapted. The self-builder who constructs his houses from building material auctioned off from bankrupt contractors has much in common with the young architects who experiment with cleaning up contaminated soil with the use of plants (Reimerink 2016).

Out of these initially individual experimental projects slowly an ethos or a culture has emerged, in which early collaborations solidified themselves over time, and institutional actors became part of this ecology. A manifesto for a 'Circular Buiksloterham' was signed by some 20 different stakeholders, from self-builders to housing corporations to utilities. The architects who have worked with the 'building groups' jointly promote the area and themselves under the title 'Beleef Buiksloterham', Experience Buiksloterham (Buiksloterham.nl 2015). And One Architecture has teamed with the research group The Mobile City and three universities (University of Amsterdam, the Amsterdam University of Applied Sciences, and Utrecht University) in an action-based research project 'Buiksloterham Hackable City', with the goal of exploring how digital technology can facilitate commons-based collective self-building as a kind of resilient hacking of the city, and how this becomes more accessible for individuals and collectives (Savini and Dembski 2016).

Slowly, the institutional actors started to develop projects with a distinctly Buiksloterham vibe. Housing corporation 'De Alliantie' is developing 'Cityplot' as a diverse, mixed-use area with room for self-development and a high, circular ambition (Cityplot-buiksloterham.nl 2015). Waternet, the water utility company, is working on a 'biorefinery', a decentralized waste management system (Waternet.nl 2017). And the architects have united in order to explore collectively if the lessons learned in Buiksloterham can be repeated at a larger scale, with potential future Buiksloterhammers, in a way that value can be re-invested locally.

If building resilience necessitates adaptive planning and design, the continuous prototyping of solutions makes city-making at Buiksloterham an iterative process. And while there is no master plan and no master planner, local designers such as Studioninedots, Delva Landscape, and One Architecture 'lead from behind' by orga-

nizing the collective efforts such that new prototypes and projects more advanced and often at a larger scale than earlier iterations, can be developed. Taken together, these different efforts combine into a networked model of area development, in which government is not so much leading the process but merely an actor in it.

One Architecture, for example, was first involved as architects and codevelopers with a few building groups in Buiksloterham, which are now also Waternet's consultant on the biorefinery. In addition, the 'Hackable City' (Thehackablecity.nl 2017) research project (that they are part of) explores and utilizes digital tools in order to organize individual actors in learning collectives, and to advocate in favor of institutional change through collective action. Subprojects of the 'Hackable City' include a system for sharing information and experiences by the individual self-builders (such that the valuable knowledge they develop in the process is a common resource and can be used by others), a 'water game' that generates community awareness of and solutions for water issues, a decision-making system that defines when to approach infrastructure development decentrally, and when centrally, a monitoring system for the performance of the built environment such that the metrics can be used to argue for institutional change, and a version of 'Play the City', a 'serious game' for engaging the various stakeholders. While developing tools for city-making and with that researching the possibility for 'hackable' city-making processes, the project also makes a strong case for Buiksloterham as a continuous 'living lab', in which 'lessons learned' can be applied to future projects, and knowledge is appreciated as a common resource that, contrary to other common resources, is not scarce and actually profits from being abundantly circulated. These learning processes help strengthen this resilient way of city-making.

In that sense, the prolonged real estate crisis, in which Amsterdam was bypassed by global capital and in which the traditional actors have been passive or absent, has given rise to a unique new way of city-making; Buiksloterham has had enough time to develop a building culture and community that now makes it one of the most attractive and desirable Amsterdam neighborhoods.

Now that the local real estate market is bouncing back rapidly, and global real estate capital has landed in Amsterdam too, the Buiksloterhammers have a huge challenge ahead. The Amsterdam municipality is inclined to ride the wave and go back to the ways of old, selling the area in large plots to big developers and, in the process, reducing sustainability requirements, with the argument that houses need to be build fast to follow demand (and with the added benefit of generating revenue for the municipality) (Vastgoedmarkt.nl 2017). Now the local actors have to show that the organic way of development can adapt to booms, claim their continuous role in Buiksloterham, and argue that their way of 'hackable', 'circular', and 'commons-based' city-making is an essential ingredient of a resilient city because it brings more resilience dividends than Amsterdam's strategy of filling their coffers in order to withstand another crisis.

If Buiksloterhammers manage this new reality and find ways to establish their way of city-making, it will not only provide Amsterdam with the instruments to deal with the inevitable bust, it will also establish a powerful way of city-making that can not only deal with real estate cycles, but can be especially useful for those mid-size

cities or real estate markets that are bypassed by global capital in the first place. It is often there that the activation of local (social) capital through ‘hackable’ city-making is crucial to liveability and economic development.

Through the example of Buiksloterham, economic and social resilience escapes the level of abstract ideas and transforms into an implementable set of guidelines to allow commons to revive in a new form in the twenty-first century. The role of new technologies in the formation and long-term sustainability of the neighborhood can be seen as evidence of the potential of new platforms of communication. The necessity to foster the growth of small local investments and to empower individuals within their communities arises as a prominent aspect of urban thinking. Buiksloterhammers can be seen as potential citizens of the future city, able to invest and help sustain social and economic growth in their neighborhoods, and by extent, allowing urban planning to move from a totalitarian practice to a practice of enabling and fostering in search of the commons.

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This Is Our City! Urban Communities Re-appropriating Their City



Gabriela Avram

Abstract In this chapter, the author examines a citizen-driven intervention regarded as “city hacking”; the initiative empowered citizens to organize themselves around a communal issue and enact urban interventions at economic, social, environmental, and cultural levels. Using a formula created for a TV show that provided scaffolding and brought the community together in a very short interval of time as starting point, during the development the formula was hacked and appropriated in a convenient way, shifting from the expected support of broadcast media to an assemblage of social media tools fit for the purpose. The lived experience and the concrete results demonstrated to the local authorities the value of openness, collaboration with local communities of volunteers, and social media usage. This development provides an example of top-down curation of bottom-up city-making initiatives, opening the way toward hackable institutions. Scaffolding community initiatives through creating flexible formulas anchored in social media channels that are easy to appropriate and adapt are presented as a promising avenue to investigate further.

Keywords Civic technologies · Digital media · Hybrid communities · Hacking · Hackable · Scaffolding

1 Introduction

The extensive presence and availability of digital technologies that underline the smart city concept (omnipresent Wi-Fi and Bluetooth connectivity, various sensors connecting data, actuators for implementing changes in real time) have, at the same time, underpinned changes in the way citizens perceive, navigate, and act in the city and have increased the opportunities for people with similar interests to congregate.

Urban communities worldwide make use of technology to solve local problems and become more resilient, complementing the work of local authorities. Many of

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these communities emerge online, through social media, before meeting face to face and moving to action out in the city. The digital platforms made available in various domains have led to the rise of the “platform society,” where, according to Ampatzidou et al. (2015), “it may become easier to ‘hack’ the existing fabric of our cities and appropriate it for our own uses.” Some of these platforms, built by activists, entrepreneurs, and civic hackers, create mechanisms for data sharing and assemble collaborative networks, creating “interfaces for people to see, touch, and feel the city in completely new ways” (Townsend 2013).

The urban communities I refer to here are communities of interest that are at the same time physically colocated in a particular geography and enabled/supported by digital technology that come together to address a perceived need of their city. This case presents a specific urban community that emerged in the aftermath of the recession in Ireland, following an example promoted by a TV show on national television.

Various communities with global reach, formed around specific activities or interests—like maker spaces, Transition Cities, OpenCoffee, CoderDojo—have spread worldwide via the Internet and social media. These communities make use of global resources to innovate, hacking the original models and finding solutions to local problems.

Here, I will focus on a particular aspect of active, collective civic engagement: participation in a community-based organization. I am primarily interested in how the existence and free availability of a template (or model/example) for a specific type of association/community facilitated the rapid creation and establishment of the organization in this case study (a mechanism I will label as “scaffolding”). By scaffolding in this context, I refer to building on an existing, known, available organization model, adopting its modes of interaction, roles, tools and functions, ideas and values. Thus, scaffolding has the advantage to provide a shortcut and introduce shared success criteria that are understood and adopted by all the active community members as part of the initial model. Here, scaffolding facilitates adapting solutions that have worked elsewhere to hack the design of the city, where hacking takes the meaning of using digital media platforms to mobilize citizens and share information, allowing them to contribute to the restoration of the city’s social fabric and resilience at a moment in time when the economic situation appeared desperate and the municipality was seen as inactive.

The model for Hackable city-making proposed by de Lange (2016) includes three levels: an *individual hacker attitude*, characterized by a “do-it-yourself ethics and professional amateurism,” a *collective set of hacking practices* (open innovation, collaboration, and sharing of knowledge and resources), and the *hackability of institutions*, (defined as “the structural affordances at the level of organizations and public governance to be open to systemic change from within or outside”).

In this case, the individual hacker attitude and the collective set of practices are easily recognizable; however, the institution perceived as hackable was not a local organization, but an existing TV show, the template of which was reused and adapted for attempting to change the city’s current situation while bypassing existing mechanisms and institutions.

Our case of “city hacking” from a medium-sized city in the west of Ireland goes beyond short-term interventions and shows how citizens can step to contribute their time and skills to provide alternative solutions to problems cities are confronted with. As phrased by Hill, “in the face of institutional collapse, active citizens are knitting together their own smart city, albeit not one envisaged by the systems integrators and technology corporations” (Hill 2013).

The case study involves an urban community from Limerick, Ireland. It takes its name—*Limerick Local Heroes*—from a TV show titled *Local Heroes*. The community initially came together in the autumn of 2011 through an online conversation facilitated by a Twitter hashtag, with the purpose to do something to reverse the downward economic and social trend caused by the recession affecting the city. An initiative group of 10 people was joined by approximately 50 others in the course of 2 months. At the outset, the general level of morale was low, since the local authority was stripped of resources in a country struggling to reduce public expenditure. Building upon an already established formula known to the general public via public television, the initiative tapped into an existing pool of local expertise, creativity, and solidarity. The campaign aimed at bringing people together to turn the situation of their city around. Everyone involved considered it a success, and it served as inspiration to a wide array of citizens. For many years before that, national media had promoted a negative image of the city, focusing on crime and unemployment and turning a blind eye to any positive stories. This bias generated a lot of grief locally. The Local Heroes initiative was seen as an opportunity to show the world the “true face” of the city—especially if they were to appear on national TV. A detailed description of the emergence of Limerick Local Heroes community and its evolution are given in the third part of this chapter.

The author joined the initiative group in early December 2011 as a volunteer. As a scholar with an interest in civic engagement and social media, she volunteered to support the group during the preparation and execution of the planned public events. The author’s approach was to build technology around the community requirements and to support its IT and communication needs to suit the digital skills level of the members.

In parallel with the design, implementation, and adoption of off-the-shelf tools and applications that members were already familiar with, the author undertook ethnographic observation and informal interviews, as well as documenting the developments as they took place.

The current chapter sets to present this case of civic activism, discussing the role of digital media in its development—with an emphasis on social media channels. Of special interest is the role of existing models, templates, guidelines, and principles that are available to urban communities to appropriate and use to scaffold their immediate civic action, like, in the case of maker spaces. Adopting such a model combines innovation (the model has to be adapted to local conditions) with becoming part of a global (or national) community. Inspiration and lessons learned are widely shared on social media, triggering conversations and connections between similar communities worldwide.

2 Background

2.1 Augmented Cities and Hybrid Communities

The setting of this study is the city—traditionally seen as “a dense ecology of impersonal social interactions occurring within recognizably public spaces” (Williams et al. 2009). Drawing on contemporary urban scholarship, Williams et al. (2009) advocate a perspective that is based on the users’ experience, rather than on the spatial view of the city. In this view, “users become actors embedded in global networks of mobile people, goods, and information, positioned in a fundamentally heterogeneous and splintered milieu” (*ibid*). People get involved in local communities that are connected to global communities via digital media platforms.

With the emergence of location-based media, a new dimension has been added to the physical city. The citizens’ movements and interaction with urban spaces are nowadays augmented with an “additional digital overlay” (Ciolfi et al. 2008) that has become part of the city canvas. The physical routes and their representation in the digital realm are intricately interwoven, and the “perceptions of and social behaviors in urban spaces” (Gómez de Llarena 2013) are altered by digitally mediated conversations.

The new urban infrastructure almost implicitly assumes an “Internet infrastructure overlaid onto the city” (Hill 2013). The connection between online social networks and the physical world is made seamlessly following the shift from static to mobile computing, and new layers of information are added to our surrounding spaces, reshaping them (Pucci and Mulder 2013). Rather than a new, separate layer, this represents an augmentation of spaces and interactions with information, forming a hybrid type of urban space. The urban social networks “borrow the dynamics, modes, and functionality of social media” without necessarily relying on them and prefer “a form of public, physical engagement with urban fabric” (Hill 2013).

Bringing into discussion the overlap of communities of place and communities of interest, Pucci and Mulder (2013) use the concept of “hybrid communities,” referring to the landscape of new social aggregations made possible by social and mobile technologies “appearing in the blur between physical and digital spaces, between online and offline interactions, as well as between global and local communities.”

2.2 “*Hacking the City*” Initiatives and What Makes a City Hackable

In a world where the top-down smart city discourse is still dominating mainstream media, the emphasis is on efficiency and effectiveness and citizens are seen mainly as producers of data and beneficiaries of the improved efficiency. The alternative approach argued for, among others, by Gurstein (2014) favors a “focus on social inclusion, enabling citizens, supporting communities”—what he calls “a community

informatics model.” Putting the emphasis on “smart communities” rather than on “smart cities” would “enable and empower citizens and support their individual and communal quests for well-being” (Gurstein 2014). The focus on citizen initiatives and potential tools that can support their attempts to improve city livability, rather than on technology, is characteristic for research coming from a variety of disciplines: community informatics (Carroll 2012), CSCW (Ciolfi et al. 2008), participatory design (Bødker and Zander 2015), urban informatics (Foth et al. 2011a, b), and urban interaction design (Smyth et al. 2013), to name just a few that inspired this work.

“Hacking the city” initiatives are often characterized by punctual and short-lived alterations brought to existing urban practices and places. It usually means doing things differently, in a clever manner, with less resources and making things work. Some of these initiatives fully rely on digital technologies, while others are using these solely to look for information and inspiration or to communicate with peers. Individuals, groups, networks, and communities are nowadays experimenting with digital technologies, enabling urban interventions of varied nature and coverage.

The Hackable City Manifesto by Ampatzidou et al. (2015) suggests a classification of these initiatives in three categories. The first category of projects is aimed at a more sustainable management of resources. In the Irish context, a whole range of such projects are concentrating on growing one’s own food (GIY—Grow It Yourself network), urban beekeeping, using the energy of the wind or waves, personal weather stations, and so on.

The second category of projects aims to improve social cohesion by bringing people together and encouraging them to interact. In the Irish context, community gardens, maker spaces, and cultural heritage community initiatives involving exhibitions and performances—to name but a few—would all fit under this category. However, citizen initiatives like Transition Cities and CoderDojo that focus on bringing people together to better manage existing resources (from energy to knowledge) are a crossover between the first and second categories.

A third category of projects seeks to improve the livability of specific locations in the city (Ampatzidou et al 2015). Tactical urbanism interventions are “intentional actions changing their places” (Saitta 2014), where technology often plays a significant role. According to Saitta, sometimes intangible interventions (intangible because they often work with data and projections—rather than bricks and mortar) can create new affordances in the city. City games, augmented reality used as “functional graffiti,” mapping initiatives, media facades, and a wide range of public events can “relieve social pressure, draw attention or change how people see problems” (Saitta 2014). Material interventions in space like Park(ing) Day, pop-up parks, yarn bombing, food markets have the purpose to introduce temporary changes. While most of these initiatives are approved by the local authorities, unauthorized interventions like guerilla gardening, guerilla grafting, and seed bombing are also gaining momentum. The organization of hackathons is an attempt to bring volunteers with design and coding skills together with representatives of local authorities in order to build new software applications and platforms that could address city problems by making use of Open Data (Haan and Höffken 2015). Hackathon events inspire the creation of

new digital tools (e.g., the HitTheRoad¹ application that used Open Data to build the first aggregated metropolitan transport live schedule for Dublin) or can serve to design and build material interventions in place.

Many of these interventions are short lived and not part of a wider strategy. They allow citizens to get involved in city-making in a punctual, short-term way, to try things out.

In their *Hackable Cities Manifesto*, Ampatzidou et al. (2015) introduce the idea of opening the city for and encouraging changes, in other words, making the city “hackable.” Such a strategy would allow for successive incremental changes initiated by various stakeholders, aimed at making the city more resilient and more livable, with the direct involvement of its citizens. Using digital technologies, citizens would “open up urban institutions and infrastructures to systemic change in the public interest. It combines top-down smart-city tech-nologies with bottom-up ‘smart citizen’ initiatives” (*ibidem*).

As mentioned earlier, this would involve the presence of individuals interested in city-making, of collective “hacking” practices (that can range from contributing to crowdsourced data on potholes to building street furniture), and open institutions, willing to share data and collaborate with other stakeholders (de Lange 2016).

3 Inhabiting the Augmented City

3.1 Global and Local Communities

Limerick is a city with over 100,000 inhabitants in the west of Ireland. The city, situated on the banks of the River Shannon, has a great natural position, a rich historical past, and a good reputation for gastronomy, sports, and culture. Between 2009 and 2013, Limerick was severely affected by business closures—especially by that of a Dell factory that was at the center of a whole ecosystem of local small companies. The region suffered acutely from the lack of jobs, unemployment reaching higher rates than in other parts of the country.

The wide availability of the Internet connectivity, mobile devices, and social media applications made it possible for several local hybrid communities to emerge—sometimes inspired by other national or global movements. I will introduce a few here, in order to provide more local context to the central topic of this chapter.

The local maker space, *miLKlabs* (made in LimericK labs), was inspired by similar groups worldwide. It came into being in 2010, following the creation of a mailing list for gauging interest, that progressed to face-to-face meetings after a couple of months. The central Web site Hackerspaces.org, containing a list of worldwide hackerspaces and advice on how to start and run them, as well as support received from similar groups in Dublin and Galway, provided the necessary inspiration. The group worked

¹<https://hittheroad.ie/about>.

on a series of projects organized workshops and tutorials and maintained a public-facing Facebook page, Google Group, and own Web site. The activity ceased in 2014, the year when a Fab lab opened in the city and paying for maintaining an own space became less attractive.

The *Limerick OpenCoffee Club* started to organize monthly meet ups in 2007; the @LOCC Twitter account and the #LOCC hashtag provided the main communication channel. The community was inspired by the global OpenCoffee model, offering a face-to-face meeting place for entrepreneurs, developers, and investors. The community formed around a specific venue—the lobby of a local hotel—and a fixed day—the first Thursday of the month. A Facebook page, a YouTube channel, and a Google Community were added one by one later. In 2013, the community migrated to a different venue and moved to an evening meeting time, rebranding as Start-up Limerick.

CoderDojo,² a global network of free, volunteer-led, independent, community-based programming clubs for young people, was initiated in June 2011 in Cork. The movement was consequently open-sourced. The Limerick-based Midwest Coder-Dojo group started in September 2011; it uses Twitter, Facebook, and a mailing list and has its own Web site. Parents register their kids for various programming workshops taking place almost every Saturday via the Web site. The community around these weekly events continues to grow, and the movement has spread worldwide. This is the only community still in existence and flourishing at the date when this chapter was written.

There are a few characteristics that these groups held in common: (a) a regular meeting place in the city, (b) regular dates and times, and (c) one or more digital media communication channels that allow them to coordinate and keep in touch and also to attract new members. Membership of such groups is usually loose—people show up if they are available and interested, and newcomers are always welcome.

The digital media platforms they use (Facebook, Twitter, Google Plus, WordPress) were all readily available, free to use, low threshold. In the case of OpenCoffee, for more than a year, the only platform used was Twitter, with conversations revolving around the #LOCC hashtag. In the case of miLKlabs, an individual interested in the creation of a local maker space created a Google Group, and people interested in this conversation joined and got involved. The initiator of the list left the city before the face-to-face meetings even started, but due to the nature of the platform, this did not affect the group. CoderDojo Midwest started with a Google Calendar, solely signaling the dates when meetings were going to happen. This way, troubleshooting and maintenance were kept to a minimum. The people who initiated these groups chose the tools they were familiar with, and whoever was interested had to flock to that channel. In time, the groups developed a more elaborated media presence (Twitter, Facebook pages or groups, WordPress Web sites)—when it was deemed necessary, and when specific members volunteered to take care of this.

For the majority of them, several administrators/moderators were appointed, to allow the community to grow and function whenever the initiators were not available.

²<https://coderdojo.com>.



Fig. 1 Backchannel Twitter conversation during Local Heroes TV show broadcast

The digital media platforms employed emphasized the openness of these groups to new people and new initiatives. As these were highly informal structures, they allowed for a lot of flexibility and made specific things happen, only to disappear when a more formal organization appeared to fill that need, or the need simply ceased to exist. All these local examples demonstrate how digital media is used by different groups to appropriate (“hack”) the city and its infrastructure.

Having described the context, I am now moving to presenting the case study that constitutes the focus of this chapter.

3.2 *Limerick Local Heroes*

In 2011, RTÉ, the Irish national radio and television broadcaster, created the *Local Heroes* show, in order to encourage local initiative (at national level) in “fighting back against the recession.” The first series, broadcasted in the autumn of 2011, focused on Drogheda, a town in the Boyne Valley (Fig. 1).

While the show was being broadcasted in November 2011, a number of individuals based in Limerick triggered a conversation on Twitter about starting a similar initiative in Limerick. A hashtag (#limerickurmylady) was spontaneously chosen for the conversation, inspired by a local anthem by Denis Allen titled “Limerick, You’re a Lady!”³.

The idea of the television show was to empower local communities to take their fate in their own hands, reinvent themselves, and create jobs. The RTÉ Web site offered a set of step-by-step instructions meant to help any community to replicate the actions seen happening in Drogheda: setting up a Town Hall meeting, finding hub, creating a team, running an Ideas Summit, creating a jobs buddy scheme, and a mentoring program for start-ups.⁴

³[http://en.wikipedia.org/wiki/Denis_Allen_\(singer\)](http://en.wikipedia.org/wiki/Denis_Allen_(singer)).

⁴<http://www.rte.ie/localheroes/>.

The Limerick group came together inspired by this shared goal: encouraging the locals to think outside the box and bring changes to the almost desperate situation by mobilizing local volunteers. These were people who shared the belief that complaining and blaming the local authorities and the central government were not going to lead to any positive change in the economic and social situation of the city. They had every intention to do it themselves.

While taking the successive steps recommended by the RTÉ guidelines, the group expected to gain national visibility by being the next city profiled in the show in 2012. However, as it took RTÉ time to find a new sponsor for the show, a call for new groups was only issued in December 2012, when the Limerick group was already in full swing, had hacked the template provided by creatively adjusting it to local conditions, and had created its own flavor of “local heroism.”

3.2.1 The Preparatory Phase

A small initiative group first met face to face in October, after having conversed on Twitter during the TV show. They continued to meet every Tuesday in a public city center venue. In the space of a few weeks, the group grew from 10 to more than 60 members. A date—30 January 2012—was set for the Town Hall meeting, recommended by the RTÉ guidelines as a first step for going public and getting the citizens’ support.

The group contacted RTÉ staff working on the show, inviting them to get involved in filming or broadcasting the Limerick Town Hall meeting. The answer was encouraging, but funding and show planning matters led to the suggestion to approach the issue in a DIY manner. The local group then invited the same film crew involved in the filming and production of the RTÉ series “Local Heroes—A Town Fights Back” in Drogheda, hoping that the footage could be broadcasted later on. RTÉ contacts committed to publish the video online on the RTÉ Local Heroes Web page and promote it through the show’s Facebook page and Twitter account. A local media company also volunteered to record the meeting and shared the edited footage on YouTube⁵ after the meeting, facilitating transparency and public awareness.

Four working groups (Logistics, PR & Marketing, Event Management and Networking) were formed, to focus on detailing responsibilities and assigning punctual tasks. Through their personal and social media networks, the members spread the word, inviting more locals to join the organizing team.

In a press release issued in preparation for the Town Hall meeting, the spokesperson for the Limerick Local Heroes Steering Group explained the motivations and goals of the group:

“Limerick Local Heroes was born out of a frustration amongst genuine Limerick people drawn from the arts, business, sporting & community sectors who believed their voices haven’t been heard in developing a future vision for Limerick, particularly in terms of job

⁵http://youtu.be/GN9Bl_PC84o.

creation.” Press release, *Public Meeting to kick start Limerick Local Heroes Initiative*, 20 Jan 2012⁶

The Town Hall meeting was intensely promoted through local media channels, digital media platforms, and through volunteers who distributed flyers in popular weekend venues throughout the city. Rather than trying to hack existing structures, the group used the template provided by the TV show to build a new, open structure, making extensive use of digital platforms, but also targeting directly those who, for a reason or another, are not active on such platforms.

3.2.2 The Public Events

The preparation of the public events presented here was the focus of the Limerick Local Heroes initiative group ever since its emergence. The fourth section of this chapter will present in detail the role of digital media in the organization and running of these events. The initiative group followed a ready-made template that involved specific steps and events that proved successful somewhere else. This systematic approach was never questioned, and although the group added a local flavor and roles to the approach, the steps were strictly followed.

The Town Hall meeting took place on January 30, 2012, in a city center hotel that provided the facilities for free. The Eventbrite platform was used for registration, in order to keep a count of the tickets, but a lot of people just showed up on the day. The number of attendees exceeded 400. Short opening speeches were followed by interventions from the floor. The meeting facilitator, a well-known TV personality, made sure that the interventions were short and to the point. According to the brief he received, he welcomed any ideas for improving the current situation of the city, but emphasized that the proposers should be ready to assume responsibility for working toward them. Complaining about the current state of things was simply not on the agenda (Figs. 2 and 3).

More than 60 ideas were recorded during the night. Attendees who wanted to share ideas but did not manage to present them at the meeting were encouraged to submit them via the Web site. The open list of ideas was published online in the form of a spreadsheet.⁷ The ideas ranged from down-to-earth organization of festivals and major cleanup initiatives to more adventurous ones—like creating a boat bus line or building a monorail to connect the city with the university.

The date of a second meeting, titled The Ideas Summit, set for 2 weeks later was announced at the Town Hall meeting. During the following week, the echoes generated by the meeting and the positive reactions in the city led to an offer of a vacant shop unit in a central shopping center, to serve as hub for the Limerick Local Heroes, the offer that was accepted immediately. The hub was refurbished and brought to a high standard (modern lights, furniture, separated in three multifunctional spaces) with the help of a wide range of volunteers. Two weeks later, more than 300 people

⁶<http://limericklocalheroes.ie/publicmeeting/>.

⁷<http://tinyurl.com/LmkLHIdeas>.



Fig. 2 Preparing the Town Hall meeting

attended the Ideas Summit. The Summit was “designed to gather together a diverse group of people with a shared interest in Limerick’s future. The process aims to create a climate of possibility, a forum to help participants converse, think well together, share points of view and develop new ideas with a view to creating unifying and very realistic solutions” (excerpt from the Limerick Local Heroes blog post⁸).

The venue chosen for this meeting was Thomond Park Stadium, an iconic venue for Limerick. A well-known public personality accepted to be the event’s main facilitator, while 30 other local facilitators, coordinated by a Local Heroes local professional facilitator, took the responsibility of moderating the discussions at each table and communicating the ideas that came out of the discussion to the plenary. The attendees were seated at tables, in groups of 10. The 2 hours of intense discussions lead to some great ideas being put forward, most of them aiming to bring positive changes in Limerick.

Notes were taken on the sheets of paper that covered the tables. The content of these sheets was later harvested, and the new ideas were added to the already existing list available online by the 30 facilitators (Figs. 4 and 5).

⁸<http://limericklocalheroes.com/> register-for-the-idea-summit/.



Fig. 3 Town Hall meeting

3.2.3 The Long-Term Run

For the following month, the efforts were focused on opening the central hub to the public and working with the citizens. The local business association found resources for financing a full-time project manager position for a year, to ensure that the hub would have dedicated staff. Four working groups called “pillars” were formed: Retail, Tourism, 3Es (Enterprise, Employment, and Education), and Community. These pillars coordinated the initiatives in each field and liaised with each other (Figs. 6 and 7).

During the previous phase, the regular weekly meetings in a local hotel were extremely important for coordination. After the launch of the hub, the activity of the group shifted to networking mode—members were available when needed and still met regularly, but coordination was delegated to the project manager. Two journalism students joined as interns for the summer, promoting and recording events organized with the support of the Limerick Local Heroes group. The role of the hub was to help people with initiative to access adequate support and find other volunteers who could make things happen.

A whole series of initiatives that were first brought up at the above-mentioned meetings developed and contributed—if not to an economic revival, to a sense of empowerment, hope, and confidence in the ability to change things through city-



Fig. 4 Ideas Forum

wide collaboration. To mention only a few, an annual film festival dedicated to Limerick-born actor Richard Harris, a series of lunchtime theater performances, and the participation in a national Tidy Towns competition were made to happen by the wide network formed around the Local Heroes group.

The successes of the Limerick group were the object of a RTÉ1 “Local Heroes Christmas Special” TV show in December 2012. The announcement of a new series of Local Heroes on RTÉ was made on that occasion. At this point, the Limerick initiative had taken a course of its own—maybe less telegenic, but more attuned to the realities of the city.

Between 2012 and 2013, the hub provided a meeting point for various groups and initiatives in Limerick city. Career counseling and CV writing sessions for the unemployed citizens were organized, job seekers were put in touch with local employers, and various initiative groups used the hub for their meetings.

After the funding made available for the project manager and the rental agreement for the hub ran out, the hub had to close its doors. The digital channels (Web site, Facebook page, and Twitter account) owned by the group, however, were active for another year, preserving the same ethos—supporting positive change in Limerick. In September 2015, the Facebook page had over 2,000 likes and the number of fans was still growing. The Web site went offline in 2014, and the Twitter account was rebranded in 2014 as @limerickcity.



Fig. 5 Drafting ideas

4 Digital Technologies for Civic Action

Various digital technology platforms were adopted ad hoc by the *Limerick Local Heroes* initiative. The *#limerickurmylady* Twitter hashtag played a major role in the formation of the group. It provided transparency and awareness, sharing the information about meetings and objectives with the group members and with the public at large, and proved to be an excellent coordination mechanism for the first steps.

Once the group started meeting weekly in November 2011, email exchange among the members of the group became the second major communication channel. A list of emails kept on evolving—for sharing details about the upcoming meetings and events, and the minutes of the meetings. The mechanism was not ideal, but it was favored as it allowed each member to select the recipients according to the subject of her message. Occasionally, some addresses were accidentally left out from messages intended for the whole group, creating coordination problems. The decision to use email was natural. An attendance list was circulated at every meeting, and one person took responsibility for adding every newcomer’s address to the existing list of emails.

A Facebook page was created immediately after the first meeting. A Twitter account representing Limerick Local Heroes was set up by one of the members



Fig. 6 Getting the hub ready

(@LMKLocalHeroes), as well as a self-hosted WordPress Web site.⁹ Besides the three community members working in IT (the author included) and volunteering their time and services, several other members of the group volunteered to act as content editors once the channels were set up. The login details for the Twitter account were widely shared with the group, and all the members were encouraged to use it and to interact with it from their personal accounts using the dedicated hashtag, #limerickurmylady. All the members of the group who requested this were given administrator rights for the Facebook page, so that they could post promptly and answer to comments.

Eventbrite was used for free registration for both the Town Hall meeting in January and the Ideas Forum in February 2012, as preregistration allowed to capture participants' details. A newsletter was initiated in January 2012 and sent to all the members of the public who came to either of the public meetings and indicated they wanted to be kept up to date by leaving their email address or signed up for it later on the Web site. The digital media channels were complemented with announcements in the local press and radio broadcasts, posters and flyers, in order to reach out to the member of the public who were not online. A group of volunteers was present every Saturday in January and February at the Milk Market, one of the busiest spots in the city, offering leaflets and engaging in conversations with citizens.

⁹<http://limericklocalheroes.com> (gone offline in September 2014).



Fig. 7 Meeting with volunteers

An innovative touch was entering the ideas contributed during the Town Hall meeting into a Google spreadsheet and making it accessible from the Web site, for awareness and coordination purposes. At the Ideas Forum, some of these ideas were discussed at tables and new ones were added to the list and posted to the Web site via the spreadsheet. Starting with May 2012, the project manager and the two interns took responsibility for maintaining the Web site and the social media channels conversation, as well as the newsletter. Contributions from other members were always welcomed.

Reflecting on the choice of digital media tools, they were each suggested by members and accepted without resistance by the community. Each choice was discussed in plenary meetings, and because the majority of the members were well versed in using Facebook and Twitter, no training was needed. The face-to-face meetings insured that everybody was up to date with the short- and long-term objectives of the group, and taking turns using the Twitter account and posting to the Facebook page presented a consistent image to the outside world. On some occasions, a few members confessed that they refrained from posting when they were not sure they were striking the right note and passed the messages to the chairperson instead.

The previous experience of some of the members and the free availability of these digital platforms allowed the group to quickly set up a presence on several digital media platforms and to maintain the dialogue with the general public. Although this might not look like “hacking,” the fact that no approvals were needed, nobody had

to be hired, and all the platforms were set up in 1 week demonstrates the affordances of digital media platforms for civic engagement. However, this would not have been possible without the associated colocated practices and without the backing of media organizations involved.

These digital platforms served as an enabler for organizing the public events and, later on, the activity in the hub. They gave visibility to the initiative, allowed the group to ensure transparency for its activities, and supported open and flexible membership.

The use of these platforms also magnified the collective effort, keeping the initiative in the public attention.

Public awareness and support were important, so lurkers were always welcomed. These uninvolved spectators were made aware that if, at any point in time, they felt able to contribute something to the initiative, their contribution will be welcomed. The variety of media channels used allowed the group to reach a significant part of the local population. Multiple social tools were combined: a dedicated Web site/blog, Twitter, Facebook, a Tumblr blog from a complementary perspective, as well as being accompanied by a mailing list, a newsletter and print media. Although some content was shared across all channels, most of the times content was purposely created for each channel. The social media channels complemented each other and allowed the group to reach its target audience. In the economy of the project, specific “digital objects” (Crivellaro et al. 2014) like the *#limerickurmylady* hashtag, photographs from events¹⁰, and the list of ideas shared online played a very important role: They were used in online conversations, shared extensively across different channels, and in a way allowed those who were only marginally interested to witness what was going on.

Decisions for specific matters to be made public or kept inside the coordination group were made by the plenary. The members maintained close awareness of each other’s actions via email, Twitter, or phone, and all activities were well coordinated through the member’s self-organization efforts and without a formal hierarchy.

As the members of the initial group were coming from all paths of life and were motivated by the idea of changing things in their own city, they brought in their family members, friends, colleagues, and acquaintances and the enthusiasm of doing something instead of passively waiting for things to change touched many locals. The public events and the further developments captured the attention of local journalists, bloggers, artists, and so on. The following comment is an excerpt from a post by a very popular local blogger after the Town Hall meeting:

Ideas are not only good, but necessary. Without ideas, we’re nothing, but ideas in turn are nothing without a guiding framework and that’s something we desperately need to do before we go any further. We need vision. We need to identify the top-level issues and work from there. If we don’t do that we’ll be condemned forever to throw out random, and doomed, suggestions like monorails. (Bock the Robber 2012)

¹⁰<http://tinyurl.com/LLH-photos>.

5 Discussion

The case I presented is not a typical city hacking endeavor. The intervention was inspired by an official discourse promoted by the national television: In dark times, the citizens should get together and help turn their town around. While the initial motivation was to show the whole country that Limerick was a city capable of change, in time this shifted inwardly, and the main goal became connecting people who were willing to do something positive to improve resilience and livability in the city. It was a response to a problem the city was confronted with, and the solution was not a technological one. While activism took the front seat, technology and design played more of a supporting role. Involving a variety of individual local actors, the Limerick Local Heroes initiative avoided to associate itself with any political party or local institution. The initial group was made of business people, artists, unemployed, academics, and others, listening to the voices of their families, colleagues, and neighbors and bringing their stories to the fore. The aim was to support everyone in the city, irrespective of their social, professional, or ethnic backgrounds.

The local authorities watched the initiative unfolding, as their role and authority were not challenged. After a prolonged period of resource scarcity, they had come to recognize and appreciate the contributions the citizens could bring. When invited, public representatives came on board and supported the Limerick Local Heroes' actions. The local business community fully embraced the initiative and supported it (both morally and financially) throughout the whole period, as they were well aware that a change in the economic climate would benefit them too. As noted by Williams and her colleagues, these were “social actors *positioned* within flows of capital that structure these spaces, negotiating their circumstances via independent processes of mobility.” The social settings were indeed “rich and familiar,” and the environment was “already thick with information technologies and infrastructures, full of mobile people using mobile technologies” (Williams et al. 2009).

The steps followed fit well those described by Ampatzidou et al. (2015) in The Hackable City Manifesto.

The initiative started with the definition of the issue: “The local economic situation is dire; let us try to do something to change this.” Rather than a single actor, a loose group of people who were simultaneously watching the same TV show were inspired to come together and follow the template of the TV show. The issue at hand was *communicated* through both digital media platforms and traditional media (local radio and newspapers) *to the general public*. Additionally, word of mouth and printed leaflets and posters were used in the city. Attention was paid to the graphical identity—the TV show logo was altered to read Limerick Local Heroes, offering a connection to something well known to the public and a specific local character. Group photographs including local VIPs (from rugby players to small business owners) helped people connect with the group and its values. This way, *a larger public became engaged with the issue*, through the online and offline campaigns, with many of the members of the public volunteering to help.

The platform for collaborating with the public started with the two public meetings: the Town Hall meeting and the Ideas Summit. The Web site played a similar role online. When the hub opened in spring, it became the main venue for meetings and activities. The platform allowed the *gathering, categorization, and transparent sharing of ideas* for local initiatives. During the two public meetings, and later in the hub, community members and volunteers were able to discuss the feasibility of various initiatives and the resources needed. Several of the initiatives formulated were *put in practice by citizens* who found each other due to the group's intermediation. Some of these initiatives took a life of their own and were continued by those who founded them. Some others disappeared after a year or two. Although the Limerick Local Heroes group ceased its existence, several of its former members are still collaborating in other local initiatives.

Ampatzidou (2013) critiqued the "widespread rise of active citizens" and the perceived lack of efficiency, representativeness, and accountability of such initiatives, showing that "self-organizing systems are quick and direct, but they are also temporary and have no real impact on legal structures." Although the case presented here had, indeed, no impact on legal structures, I argue that it had an impact on weaving the social fabric and created trust, a precedent and opened the way for other citizen interventions. The quick and direct self-organizing system described was in existence for about 18 months, achieved its strategic goals and left a lasting impact on the city as a whole, and on the local authorities' appetite to partner with local organizations and communities in the future.

Saitta (2014) suggests three ways of evaluating the quality of alterations brought about: How they "change people's understanding of the city"; how they "create or help affordances"; and how they "help make spaces more human and alive." In this case, the Limerick Local Heroes initiative has triggered a significant change in understanding the city, moving the balance toward a proactive attitude and taking pride in the city. Valuable communication and action affordances were created, and the city center gradually came back to life. Social media played a paramount role in this direction, contributing considerably to the transformation of a desolated and unfriendly space into a familiar place (Avram et al. 2013).

Saitta (2014) also showed that informality plays a vital role in urban interventions, making them possible "outside of sanctioned spaces," but in many situations this is accompanied by a direct social cost. In this case, no permission was sought or obtained. Using a logo and a name created by the national television and following a pre-established formula and course of events, nobody questioned the legitimacy of the group. Its openness and lack of hierarchical structure led to decisions being taken by consensus in most of the situations. In this case, the informality of the group's work was complemented by formal elements taken from the formula of the TV show and later on by setting up a proper structure for the initiative. Rather than being the urban backdrop for designing and developing a technological intervention, like in many research-through-design approaches, or the field for experiments "in the wild," in this case the city played the role of the object the community attempted to remodel, without the involvement of urban planners, just by mobilizing, connecting, and coordinating existing resources—mainly human actors.

6 Scaffolding—Potential Templates for Civic Activism

I defined scaffolding earlier in this chapter as building on an existing, publicly known, openly available model of community and adopting its modes of interaction, roles, tools, functions, ideas, and values. I showed how scaffolding inspired and facilitated the emergence of local communities such as miLKlabs (the local maker space), Limerick Transition City, Limerick OpenCoffee, and Midwest CoderDojo. While all these movements found their inspiration primarily online, the civic activism initiative presented here was triggered by a formula used in a national TV show (supposed to present a different Irish city every couple of months), before emerging and developing with the support of digital media platforms.

Scaffolding offers the advantage of providing a shortcut and introducing transparent goals and success criteria. Rather than trying to create a community from scratch, which involves at some point formulating a mission statement and goals (in any shape or form), embracing a ready-made formula that is open and hackable already implies adherence to the values exposed by the model. Scaffolding facilitates adapting initiatives that have worked elsewhere to hack the design of the city. It also provides communication with and support from a national/global community.

Building on an existing, known template for creating a community involves adopting and adapting its:

- Modes of interaction: face to face and/or online, frequency of, and preferred location for interaction;
- Digital tools, ranging from Google Calendars and mailing lists, through own Web sites to Facebook pages or groups and Twitter hashtags or accounts;
- Specific roles: champions, initiators, chairperson, founding members;
- Functions: providing a hub for facilitating networking, creating an own space, knowledge sharing facilitation;
- Goals and values: from providing free computer training to kids to creating jobs or supporting new entrepreneurs.

Scaffolding has the advantage that it gives those participating the feeling of being part of something bigger, putting the community on the map. Eventually, many of these communities outgrow their initial model and disappear. Such endeavors can have a remarkable impact on local communities. The social fabric is woven, and the network continues to exist when one community is gone; new initiatives are built on existing networks.

7 Conclusions

In this chapter, I examined a citizens' intervention that can be regarded as "hacking"; the initiative empowered citizens to organize themselves around a communal issue and enact urban interventions at economic, social, environmental, and cultural levels.

Starting from a formula created for a TV show that provided scaffolding and brought the community together in a very short interval of time, the formula was hacked and appropriated in a convenient way, shifting from the expected support of broadcast media to an assemblage of social media tools fit for the purpose.

The lived experience and the concrete results demonstrated to the local authorities the value of openness, collaboration with local communities of volunteers and social media usage. In recent years, initiatives like “Limerick City of Culture 2014” and “Team Limerick Clean-Up” have built on the former experience and networks, offering hackable, purpose-designed formulas and a social media platform to the public to organize their own events. Demonstrating trust and openness for partnership, this development provides an example of top-down curation of bottom-up city-making initiatives, opening the way toward hackable institutions.

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Removing Barriers for Citizen Participation to Urban Innovation



Annika Wolff, Daniel Gooch, Jose Cavero, Umar Rashid and Gerd Kortuem

Abstract The potential of open data as a resource for driving citizen-led urban innovation relies not only on a suitable technical infrastructure but also on the skills and knowledge of the citizens themselves. In this chapter, we describe how a smart city project in Milton Keynes, UK, is supporting multiple stages of citizen innovation, from ideation to citizen-led smart city projects. The *Our MK* initiative provides support and funding to help citizens develop their ideas about making their communities more sustainable into reality. This approach encounters challenges when engaging with citizens in identifying and implementing data-driven solutions to urban problems. The majority of citizens have little practical experience with the types of data sets that might be available or possess the appropriate skills for their analysis and utilisation for addressing urban issues or finding novel ways to hack their city. We go on to describe the Urban Data School, which aims to offer a long-term solution to this problem by providing teaching resources around urban data sets aimed at raising the standard of data literacy amongst future generations. Lesson resources that form part of the Urban Data School have been piloted in one primary and three secondary schools in Milton Keynes. This work has demonstrated that with the appropriate support, even young children can begin to develop the skills necessary to work with

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large complex data sets. Through our two approaches, we illustrate some of the barriers to citizen participation in urban innovation and detail our solutions to overcoming those barriers.

Keywords Big data · Data literacy · Citizen participation · Citizen engagement · Smart cities

1 Introduction

Citizen-led smart city innovation is increasingly considered to provide an important counterbalance to the more traditional official-led planning. This shift from ‘citizens as users’ to ‘citizens as active participators’ and finally to ‘citizens as innovators’ is partially driven by the increasing number of open data sets that can be used to drive urban innovation (Anderson and Rainie 2012; Janssen et al. 2012). The expectation that citizens are able to first identify and then carry forward solutions to local problems is based on the premise that citizens have sufficient understanding of big data, smart city technologies and how open data can be used to drive urban innovation. While the average citizen is relatively comfortable in the use of technologies and the Internet for daily activities, big data and smart cities are new phenomena and therefore less familiar. As a consequence, the ability for citizens to use the available data and resources may be limited to those in society who already have good technical skills upon which to draw, such as those who would typically sign up for the wave of city Hackathons and Appathons that have been seen in recent years, the target audience for which is unlikely to reflect a good cross section of society.

This chapter will describe how we are aiming to remove barriers for citizen participation to urban innovation within the MK:Smart project (<http://www.mksmart.org>). This project is developing smart technologies for the city of Milton Keynes (MK), UK, in three key areas of energy, water and transport. Central to MK:Smart is a data hub which is aggregating both specific project-related data sets and other open data sets. The data hub, in turn, is available for businesses to develop applications, for citizens to create citizen projects and as an educational resource to teach data skills in schools. This chapter focuses on the latter two uses, through three related initiatives within MK:Smart.

The first initiative is the Community Action Platform for Energy (CAPE) project which has a focus on enabling bottom-up community energy projects. The second initiative is an ideation and innovation platform called Our MK (www.ourmk.org). The platform allows the crowdsourcing of ideas from citizens to change the city, some of which are funded to turn their idea into a reality. The third initiative is the Urban Data School (UDS) which is a school engagement programme, teaching data skills in schools using some real Milton Keynes data sets in the domain of energy. This is given focused attention within this chapter as the work with the young citizens becomes important when considering how to address some of the barriers revealed through the first two initiatives in terms of engaging citizens with data.

Based on an analysis of these related projects within MK:Smart—CAPE, Our MK and Urban Data School—we highlight the role of professionals and intermediaries in the process of making a city hackable due to their ability to help the public engage and organise around issues and provide them with skills, in particular data literacy skills. In the remainder of this chapter, we will describe each of these projects in detail before identifying a number of barriers to creating hackable cities.

2 MK:Smart

Milton Keynes is one of the fastest growing cities in the UK. Its population is expected to grow from around 230,000 today to over 300,000 by 2026. Such growth creates unsustainable pressure on key local infrastructure, particularly transport, energy and water. Each of these resources is already operating close to full capacity. The MK:Smart project is developing technology solutions aimed at addressing these issues and making Milton Keynes more sustainable in future. To support the technological innovation, MK:Smart is putting in place a data hub¹ through which all of the project-related data sets are aggregated along with additional open-source data, such as from the Milton Keynes Observatory (<http://www.mkiobservatory.org.uk/>) that contains data specific to Milton Keynes, open government data (such as census data), weather data and crime data. MK:Smart has put community engagement activities at the heart of its strategy through instigating three separate initiatives. This choice was made as it was felt that the citizen-centric activities would provide an interesting and important counterbalance to the more traditional ‘top-down’ activities that were also happening within the project, such as devising apps and services for improved energy efficiency, water use and transport.

3 Citizens as Innovators

There are both philosophical and practical reasons for promoting citizen participation in smart city projects. From the philosophical perspective, the argument is clear; those people that live in a community should have a sense of control over how that community is run. From a practical perspective, there are benefits to both individuals and city at large. For those who engage with civic affairs, benefits include increases in self-esteem, acquiring new skills and making new friends (Clary and Snyder 2002). Additionally, it has been noted that areas with ‘good citizenship’ get a better quality of service from their local government than areas with poor citizenship (Pattie et al. 2004). From the city perspective, by improving engagement and interaction, local authorities will become more aware of citizen needs and can better serve the public (Torres et al. 2006).

¹<http://www.mksmart.org/data/>.

Recognising these benefits, some of the MK:Smart project activities have focused on engaging with citizens. Participatory Design approaches highlight how innovation can be amplified and citizen involvement prioritised (Carroll and Rosson 2007) through bringing together a variety of stakeholders. While citizen engagement is key, intermediaries have a significant role to play in achieving this through providing expertise and scaffolding the hacking process.

3.1 Community Action Platform for Energy

The Community Action Platform for Energy (CAPE) project will develop a platform to enable bottom-up social action through fostering the development of community energy initiatives, which can make a better use of energy, reduce CO₂ emissions and moderate citizens' fuel bills. This platform will connect citizens with a number of energy-related data sets and will provide them with a range of analytic capabilities. Citizens will in turn provide their energy information, which will help to understand how energy is consumed in Milton Keynes, identify the factors influencing this consumption and highlight opportunities and potentials of future energy projects.

In addition to data provided by citizens, data sets provided by the platform will comprise a mix of open and licensed urban data, including, but not restricted to, satellite and aerial imagery-derived data sets (such as ground source heat pump potential), socio-economic data (such as selected census data) and energy data sets (such as domestic electricity consumption data). Analytics will comprise basic statistics values such as average, median and standard deviation to characterise features under inspection, and more advanced statistics and inference mechanisms such as cluster analysis to group together householders with similar characteristics. The platform will also support the representation and exploration of spatial data in the form of a queryable map, which will be useful to represent satellite and aerial-derived data.

Citizens will be able to use the platform in different ways. Individual householders can use the platform to explore their consumption patterns, their insulation levels and their potential to install solar panels, compare them with general trends in Milton Keynes and with other people and learn from the experiences of others. With this information at hand, they can decide if there is potential to improve the use they make of energy. The platform will connect householders to users with similar interests and to existing communities they could be interested to join. In case a user would like to lead a new project, the platform will provide them with information about how to start a community energy initiative, funding opportunities, existing technologies that could fit their initiative and advice and good practice examples from existing projects.

Existing communities will be able to share their projects and experience within the platform. This will allow them to gain visibility amongst potential new members and to foster the growth of the projects. Additionally, they will benefit from the data sets provided by the platform and the data provided by users about their consumption patterns, measures they have taken to lower their bills and energy infrastructure

they have in place, such as solar panels. Communities will also use the analytical capabilities provided by the platform, which could help them to make better informed decisions and find potential householders interested in their initiative. Therefore, this platform will support active collaboration amongst communities and individual users, facilitating the collective identification, analysis and interpretation of data sets, inspiring and guiding collective action that will empower communities to collectively decide how they want to consume energy. Communities will then play a key role to maintain energy security, tackle climate change, save money for citizens and help those in fuel poverty.

3.2 Our MK—Supporting Citizen Innovation

In addition to researcher-led innovations such as CAPE, in which researchers choose the domain and frame the space of possibilities for engagement within it, the MK:Smart project adopts a user-centred approach and has set aside resources to support the development of citizen projects that ‘hack’ Milton Keynes. These citizen projects are conceived, designed and implemented by citizens with support from the MK:Smart team. We have developed an online platform (www.ourmk.org) that facilitates this process, capturing the ideas of citizens, from which the project team select a number to be realised.

To support the citizen projects, an online platform has been developed (www.ourmk.org). The Our MK initiative captures citizen ideas for changing the city for the better. Citizens have been able to apply for funding and support from the MK:Smart project to turn their idea into a reality. There have been 13 successful projects realised this way. Our MK acts as a starting point for dialogue around which projects are of interest to the citizens, are feasible to create and are likely to make a difference to the city. Those projects that fulfil these criteria are being funded and supported, thereby helping citizens to hack their city. Key to the success of this platform is the involvement of Community Action MK (CAMK), an organisation who support communities within MK, in particular engaging with the more disadvantaged and lower socio-economic regions to speak with citizens and discover their concerns. CAMK provide valuable insight into how to engage the public with the ideas of MK:Smart and to further elicit project ideas. CAMK act as mediators, first learning themselves the key ideas and then working out strategies for community engagement and knowledge exchange.

To help bootstrap the platform and encourage citizens to post their ideas, CAMK have utilised their ten Community Mobilisers. Community Mobilisers are individuals whose role is to support people to have a voice in their community. The Community Mobiliser approach is based on the premise that residents are the experts about what they need and want and should be supported to play an active role in decision-making. Mobilisers visit areas within Milton Keynes that are identified by the council as being most in need of community support and engage with citizens through a range of one-to-one conversations, group discussions or hosting stands as part of community

events. Mobilisers have expertise in engaging citizens and eliciting their issues and concerns, which are recorded, actioned and followed up. As such, these individuals are key intermediaries in organising and mobilising citizens, helping to achieve cities that are hackable.

In addition to the work of the Community Mobilisers, we have also been engaging citizens through targeted workshops and roadshow events. Six workshops were conducted between April and September 2014, attended by a total of 104 Milton Keynes citizens (with 33 citizens attending multiple workshops). From these workshops, we collected 198 dialogues related to sustainability concerns in Milton Keynes. Subsequent dialogues have been collected as part of ongoing roadshows which started in October 2014 and have visited 22 locations so far, with many more planned in the coming months. This process has so far elicited 591 dialogues. These can be loosely categorised according to the main smart city topic they address: 43.7% of conversations related to transport issues, 34.2% to energy and 22.1% to water.

Ideas alone are interesting but where we deviate from previous crowdsourcing approaches (e.g. Schuurman et al. 2012) is that these ideas are then refined into viable projects that have both a strong plan of action and a team of volunteers to carry them out. Since the Our MK website went live at the beginning of July 2015, over 3,500 people have visited the site, viewing nearly 17,000 pages of the site. Fifty-one ideas have been posted to the site of which 14 are being considered for support. The ideas we have received are extremely diverse ranging from promoting low-cost solar installations to drilling water bore holes, from installing digital signage on cycle paths to developing a scheme to promote locally grown food. Details on the ideas we have received, and the projects we are supporting, can be found on the Our MK website (www.ourmk.org).

4 Challenges to Facilitating Citizens as Innovators

Through developing our approach to facilitating the ability of citizens to hack their city, we have identified a number of open questions. We have had to produce answers for some of these questions such that the MK:Smart project can progress; we note that these answers are not optimal and remain open to discussion.

The first important issue that needs addressing is that of governance and control—who has control over what projects are encouraged and realised? Within the programme, we have outlined the provision of funding and expertise is still governed by MK:Smart meaning that ultimately we as researchers have control over which citizen-led projects are realised. The majority of citizen hacks will require some form of resources—be that money, time, technical expertise or access to organisational policies—that are not always easily accessible to groups of citizens. An important issue then remains of determining who should control the hackability of cities? While city councils have democratic legitimacy, ‘hacking’ can be understood as attempts to circumvent official interventions or to demonstrate a need to democratic institutes. Should citizens be able to hack their cities without interventions

from research projects, councils or businesses? Where do the required resources come from and how do you form groups around particular issues without a single central authority? These are significant and complex questions which need to be considered if we want to open up innovation to ordinary citizens.

This is particularly complex when we consider how long-term strategic impact is engendered. Long-term success necessitates that projects have stable sources of money and a commitment from citizens to be involved in the project over a long period of time. The MK:Smart project plans on helping successful citizen-led projects become sustainable through using our contacts with the business community and CAMK's experience of creating charities, co-operatives and community enterprises to ensure that any project which has had a positive impact can continue to benefit the local community. While this approach is inherently unscalable, due to the resources committed by the research team, as far as the authors are aware no other project has attempted to create sustainable projects and developing a mechanism to facilitate such projects remains a challenge.

An additional issue we continue to grapple with is the dissemination of results to other smart city projects. Many of the findings or issues we have uncovered are of a practical rather than academic nature and are not necessarily suitable for discussion within academic publications. How then do we discuss, experiment and improve upon our methodologies for engaging and supporting citizens in developing innovations? Furthermore, it is not yet clear how transferrable results are from one city to the next. Each city has its own governance structure, sense of community and set of challenges. Sharing best practice is key to ensuring that cities become hackable without repeating the mistakes of others; how that is best achieved is not yet clear.

One approach to facilitating citizens' innovation is to simply release data sets to the public (Williams 2015). However, releasing this data and expecting city-level hacks to occur organically are relatively optimistic. The UK government has opened up its non-personal, non-sensitive data sets for other people to reuse through the data.gov.uk website. At the time of writing, there are 24,992 different data sets and only 372 apps. Generating 372 apps is a big achievement but is orders of magnitudes smaller than what could be achieved using these data sets.

The idea of 'hacking' a city or developing a city-centric app requires not only a host of technical skills but also an appreciation of data as a resource for change. This ties into the idea that citizens need to have a certain level of data literacy to be fully empowered. Big data and smart cities are new phenomena and therefore unfamiliar to many people. For example, the dialogues the MK:Smart project has gathered from citizens have been processed into 101 ideas around improving the local community which do not focus on the use or generation of data. These range from Segway hire schemes to heated bus shelters, from better lighting on the cycle network to community-funded water butts.

The idea of 'hacking' a city has got to account for the issue of the digital divide (Norris 2001). The digital divide is instantiated in three forms across smart city projects—who is producing the hacks, who is using the hacks that are produced and

also who is producing the data used for the hacks. In each case, at the moment the answer is technologically aware users—a small segment of the population as a whole and, arguably, the citizens who are least likely to need help in improving their local communities.

5 Addressing the Digital Divide Through Data Literacy

The digital divide essentially faces two challenges. First, in the short term, we need to develop approaches to open up the possibilities that data gives in terms of hacking cities. But while increasingly a large amount of data is accessible to a large segment of population, only a few people are at home with the interpretation and analysis of data. This disparity between data access and data literacy may add to digital inequality, thus hampering the empowerment of citizens and contradicting the purposes behind the openness of data (Anderson and Rainie 2012). Therefore, in the longer term we need to tackle the problem by raising the general level of data literacy amongst school leavers such that they can become more informed citizens.

Data literacy is typically defined as the ability to explore, interpret, analyse and contextualise data. It may include a wide and diverse range of skills such as ‘the ability to: formulate and answer questions using data as part of evidence-based thinking; use appropriate data, tools and representations to support this thinking; interpret information from data; develop and evaluate data-based inferences and explanations; and use data to solve real problems and communicate their solutions’ (Vahey et al. 2006). This implies that teaching and improving data literacy would require a cross-disciplinary approach.

There have been some previous projects that have focused on improving data literacy of school children. These tend to incorporate activities both inside and outside the classroom. Lee and Drake (2013) made use of students tracking and reflecting on their own physical activities to learn concepts such as the impact of outliers on means and medians. The City Digits project of Williams et al. (2014) aimed at teaching data literacy skills to school children by encouraging them to investigate social issues in local, urban context. While these projects no doubt present interesting approaches for teaching specific data skills with small, personally collected data sets, they do not address the particular challenges of data literacy related to asking questions, analysing and drawing conclusions from large externally sourced data. The Urban Data School project focused specifically on how to engage young learners with large data sets they had not collected themselves.

6 The Urban Data School

The Urban Data School (UDS) is an initiative designed to improve data literacy amongst 8–18-year-old school students. The UDS aims to create a next generation of

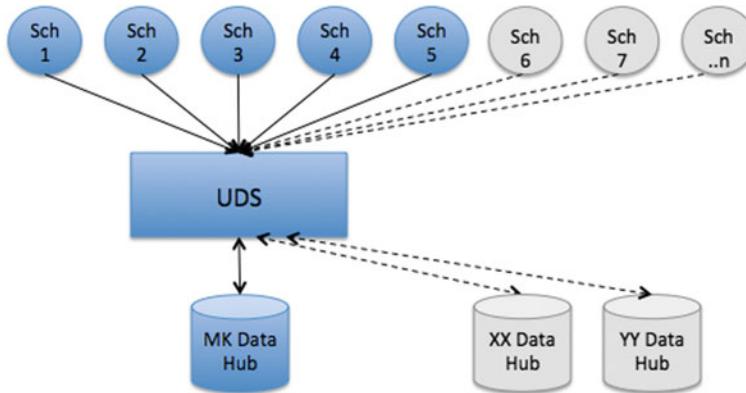


Fig. 1 Urban Data School—connecting schools to real urban data

school leavers who are comfortable in asking and answering questions from data, who can critique data, use it as evidence to tell stories and who can recognise opportunities for using data to their own benefit or the benefit of their community. The UDS will connect schools, teachers and students to real, urban data sets and provide support for students to get hands on with data and begin to ask and answer their own questions. The MK:Smart data, as provided through the data hub, provides a starting point for testing the approach, providing local schools with data sets related to their local area. The eventual aim is to integrate additional data to make the UDS a national, or possibly international, resource (Fig. 1).

6.1 Conducting Inquiries with Real Urban Data sets

An approach has been developed for teaching data literacy using real-life urban data sets based on the principles of data inquiry and using PPDAC (Wild and Pfannkuch 1999) as a starting point for structuring tasks from urban data sets. The approach is designed to prompt students to use their interpretation of a ‘snapshot’ of a larger data set as a starting point for understanding how to frame further questions around the same data set or to bring in new data to the inquiry. Thus, students improve their ability to formulate and answer questions from data. Students are supported in learning how to create answers to questions which use data as evidence and to present these as stories. Tasks use real data that has been used as part of smart city research. While on the one hand students replicate to some extent the existing research, there is the possibility that students can find novel questions from the data and potentially produce some really innovative outputs. There are no correct questions to ask of the data, but the aim is to ensure that students present an answer that is backed up by evidence.

6.2 Data

Several energy-related data sets have been identified for use in schools. One is smart meter data from a number of Milton Keynes homes that can be used to ask and answer questions related to home energy consumption across one or more houses, to investigate individual appliance use or to find how much energy is produced by solar panels at different times of the day or year. Another is aerial-obtained data relating to the potential for houses in Milton Keynes to have solar panels, which can be used to ask and answer questions related to whether or not all buildings are suitable for the placement of solar panels. Finally, a heat loss aerial survey can be used to ask and answer questions around thermal efficiency of different houses, or types of building, across different estates in Milton Keynes.

6.3 School Trials

Lesson plans based on these data sets have been trialled in four schools—one primary school (year 5–9/10 years) and three secondary schools (2 with year 9–13/14 years, 1 with year 7–11/12 years)—in Milton Keynes. What follows is a high-level analysis of some of the results. Feedback from these trials indicates that schools have a clear interest in using real data sets, especially those related to the local context. Teachers report good engagement in sessions using these activities. Observations of students in both age groups reveal good competence in interpreting graphs of energy consumption (Fig. 2) and generation (from solar PV) and a good ability to interpret map-based visualisations and cross reference to other sources of data in a table. Both students and teachers have—on some occasions—been seen to ask novel and valid scientific questions (questions that were testable through the data) that was not part of the original teaching or student materials. This indicates that the materials can support this type of reasoning. Secondary school students further demonstrated that they were able to construct and execute their own queries and visualisations of data to begin answering some of their questions.

In addition to lesson plans based on existing data, students in two schools have been asked to design their own mobile phone app for smart city innovation. The app design sessions were run competitively. Student worked in groups and presented their ideas to everyone at the end.

The goal was to gain a better understanding of the conceptual difficulties students might face when thinking how to design solutions for their homes and communities. One group were given an open-ended task in which they could identify themselves a potential source of data to drive the mobile phone application to address some local issue. The other group were asked to assess their own home energy consumption by effectively being a ‘smart meter’ and recording usage of individual appliances. This group then was asked to find a novel way to visualise energy use in a home and to use this visualisation somehow within a mobile phone app for monitoring home energy

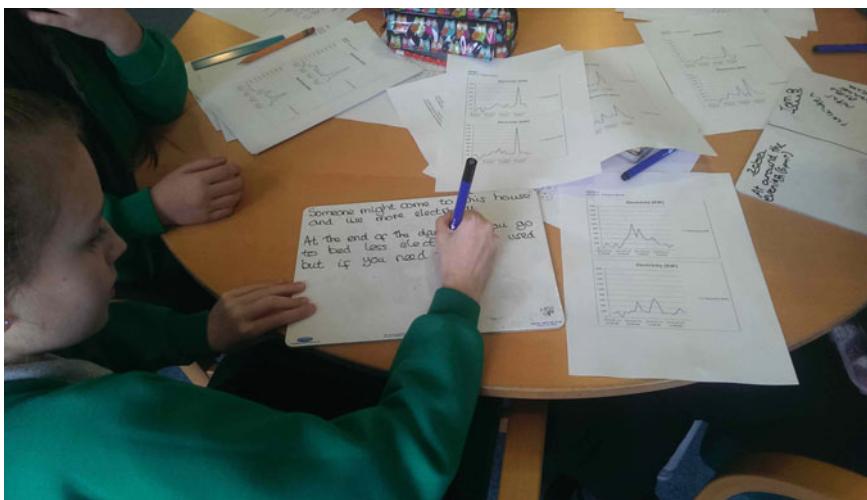


Fig. 2 Primary school children interpreting energy consumption graphs

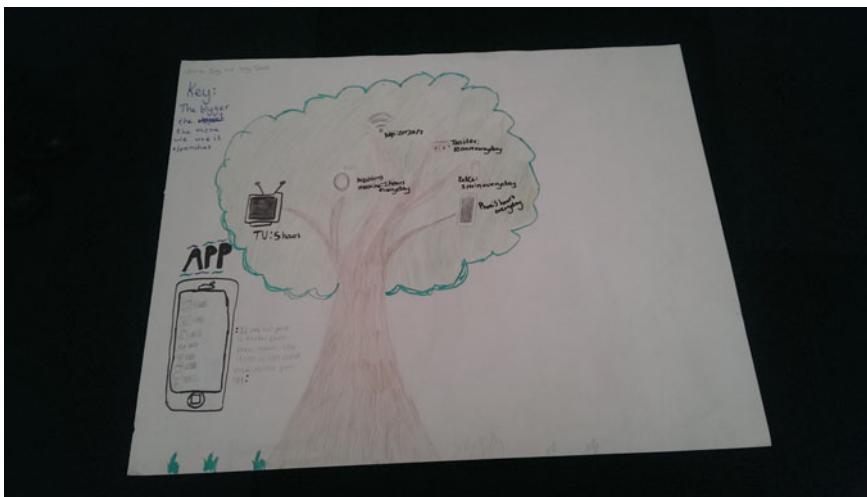


Fig. 3 Visualising energy as a tree

use. Students worked in groups and were tasked with thinking how a collective data set across a number of homes could be used as part of the app design.

These design sessions reveal that, without prompting any ideas, students find difficulties in creating novel data visualisations that are beyond their normal experience with graphs and charts. However, with support students can begin to imagine new ways to create visualisations. One example of energy visualisation is shown in Fig. 3.



Fig. 4 Judging the Walking Wardrobe app

Students also seem to have difficulty in comprehending how data that is collected from across a geographical area—e.g. from people or sensors—might be reasoned across to find knowledge to drive a smart city application. Students tend instead to think of collected data as a very localised resource that can be used as a ‘lookup’ to address an individual’s need. As an example, students might propose to collect data from people about their clothing size and shopping habits. This was the idea behind the ‘Walking Wardrobe’ app shown being judged in Fig. 4. Instead of thinking how this collective data source could be used to identify clothing trends in Milton Keynes or inform shops about sizing of the population to better stock appropriate quantities of stock in the right size and style, students want to use this data to match individuals clothing requirements against the database of clothing shops in the Milton Keynes area so they can find where to go and shop for clothes.

Through working with teachers to prepare lesson materials and observing their use in the classroom, it is clear that teachers themselves can have some problems with working with these types of data sets. This can cause teachers to be reluctant to bring the materials into the classroom and teach something that they themselves are not familiar with. It is possible to overcome this barrier with a small group of teachers through individual discussions around the teaching materials and lessons. The goal of the UDS is just not to educate students but to engage the teachers themselves in learning more about working with and from these types of data sets.

7 Discussion and Conclusion

In this paper, we have described three distinct projects, linked through a common theme of urban innovation from city data. They each reveal some of the difficulties that citizens, who are not expert in smart cities and data analysis, face when engaging with complex urban data and in framing solutions to problems around it.

The CAPE project presents a researcher-led approach to innovation, in which the problem space is mapped out by researchers and an infrastructure built within which citizens can then identify common areas to start discussing community energy initiatives. This mitigates against many of the problems that citizens face in engaging with data by doing a lot of work ‘upfront’ to constrain the possibilities and support much of the interaction with data through easy to access visualisations. However, this facilitated approach, while it has obvious benefits, has the effect of reducing the space for creative innovation from the citizens themselves. The Our MK approach, on the other hand, is completely unrestrained, at least initially. Citizens are free to frame problems and solutions in any way they choose. However, this freedom is currently short-lived as only a few selected projects are taken further, and these are selected by the project team. Similar to CAPE, the realisation of the ideas is facilitated by researchers. The main difference is that in CAPE, the researchers choose the domain and in Our MK this is sourced from citizens. In both cases, the citizens themselves are part of implementing the solution. Our MK has also revealed that citizens find it difficult to frame problems around complex data and may miss some of the benefits that this data, as a resource for civic hacking, can bring.

Thus, through our work on the MK:Smart project, we have identified a number of substantial barriers as to how to encourage citizens to first identify the types of problems that can be addressed through data and then how to organise citizen projects to implement sustainable solutions. Specifically, we have identified that:

1. The majority of citizens are not data literate. We have proposed the Urban Data School as a solution for ensuring that the next generation are more data literate. However, it will be many years before they form the bedrock of a city’s citizens and we must continue to explore mechanisms to educate older generations about how to use data effectively.
2. There remain open questions with respect to governance and control regarding citizen-led projects. Currently, all of the MK:Smart citizen initiatives remain under the control of the project. For us to enjoy truly hackable cities, we have to construct policies and governance models which allow citizens a greater degree of freedom in their hacking activities.
3. Financing and resourcing hacking projects remain a challenge. While a variety of options are available (crowd-funding, philanthropy, corporate sponsorship to name a few) until hackable city initiatives can highlight that they have led to meaningful change within the city, accessing these sources of funding remains a challenge.

4. Sustaining and scaling citizen initiatives are essential if hackable cities are to become effective at generating real change. However, identifying the mechanisms to do this is not easy and is not the typical focus of most research-led projects.
5. Sharing best practice is essential to the success of making cities hackable. However, the practical nature of much of this practice, and the unique challenges each city faces, means that how to effectively share these practices remains an open challenge.

These barriers are huge challenges to citizen innovation. We have overcome some of these barriers within the MK:Smart project, utilising community engagement techniques and long-term planning to develop solutions to unlock the potential of the citizens of Milton Keynes.

We do not want to conclude with a statement of doom and gloom. Early classroom trials have demonstrated the effectiveness of the UDS approach in eliciting novel questions and developing data literate students. Similarly, the Our MK initiative has highlighted the innovativeness and creativity of the citizens of Milton Keynes in developing ideas to address the sustainability challenges the city faces. This chapter and the work reported highlight the importance of researching how to overcome barriers to citizen innovation to ensure that citizens are fully aware of their environment and the possibilities they have to shape the cities they live in.

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Part III

Hackers and Institutions

Working in Beta: Testing Urban Experiments and Innovation Policy Within Dublin City Council



Fiona McDermott

Abstract This chapter describes Dublin City Council (DCC) Beta, an initiative developed as part of the City Council's Architects' Division to experiment, innovate and quickly test ideas directly 'on the street'. Through the detailing of a number of Beta Projects, it illustrates how a project is initiated, what the key processes are, what the role of the citizen is and how the outcomes of completed projects are measured and formalised. It also discusses the Beta Model, highlighting the opportunities and challenges that such a model present for other city governments. Ultimately, it addresses the question of how such an initiative can increase the potential for more inclusive, immediate and innovative approaches to urban problems in a context of risk-averse city governments with increasing constraints of both resources and finance alongside a growing demand for greater democratic authorship and ownership of the built environment.

Keywords Urban governance · Citizen engagement · Experimentation
Urban innovation · Scalability

1 Introduction

Beta testing is rarely done in the field of placemaking, which is ironic considering that the longest-lasting products we create are the places in which we live. (Ermacora and Bullivant 2015, p. 76)

While the means, and degree to which citizens participate in urban development projects has been under scrutiny at least since the late 1960 s when Arnstein categorised the levels of citizen participation in *A Ladder of Citizen Participation* (1969), over the past decade, local governments and city authorities around the world have come under renewed pressure to open up their processes and investigate new and

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alternative models for citizen engagement. A combination of factors that incorporate the shrinking budgets of local governments (Forlano 2013), a growing perception of declining social inclusion and cohesion (de Lange and de Waal 2013) and the rejection of traditional consultation processes in urban design projects (Beebejaun 2016) have all contributed to a growing public appetite for alternative modes of citizen engagement in urban decision-making processes. Advancements in digital and networked media technology have also played a significant role in increased expectations from citizens for public engagement in matters pertaining to their local environment (Ermacora and Bullivant 2015). This includes the significant role of social media as a tool for facilitating citizen engagement and collaborative design in urban design projects (de Lange and de Waal 2013; Saunders and Baeck 2015), the emergence of social platforms that allow communities to form around concepts and causes (Ratti and Claudel 2016), as well the availability of new platforms for hosting dialogues between citizens and local government (Ermacora and Bullivant 2015), which have collectively contributed to ‘a new definition of the urban public sphere’ (de Waal 2014).

As a result of these changes, both citizens and city authorities have started to look for new ways to include citizens in urban decision-making and planning in more empowering, democratic and meaningful ways. The concept of *parklets* (Merker 2010)—the conversion of parking spots or other underused public space into tiny parks, complete with greenery and seating—illustrates a citizen-led initiative that has since been adopted as an official city programme. Parklets were originally a public space hack by the artists and urban interventionists group ‘Rebar’ in San Francisco in 2005, which allowed the group ‘the freedom to experiment with our chosen medium—public space—without the risks inherent in public bureaucracy’ (Bela 2015). When the city saw that they could create an avenue for businesses and residents to apply for a permit to convert underused street space into an amenity that served the community better, they adopted the strategy as an official city programme. Similarly, initiatives such as New Lots Triangle Plaza (New York City Department of Transportation 2011) in New York—a community requested public space project to enhance streets and support local businesses—also demonstrated this new collaborative approach to city-making, as it was implemented through the government in collaboration with a non-profit organisation and the local business owners.

Attempts by city governments to open up their processes have contributed to the emergence of urban innovation labs in different cities around the world (Crawford and Walters 2013; Saunders and Baeck 2015; Townsend 2013). Commonly, these labs have a direct connection to the public sector (city council, local government) and have been developed to challenge complex public issues that more traditional governmental structures seek to resolve. With the general aim of developing innovative solutions to urban problems, the labs are typically made up of designers, public officials, and local business and community members. An example of one such lab is ‘New Urban Mechanics’, an initiative based within city government in Boston that experiments with new designs and policies with a strong emphasis on civic engagement (Townsend 2013; New Urban Mechanics 2016). Lauded as a successful case in its ability to facilitate collaborations between various city government departments

and the public (Crawford and Walters 2013), New Urban Mechanics has also managed to expand into a network of civic innovation offices, whereby individually, each civic office builds partnerships between internal agencies and outside entrepreneurs to pilot projects that address residents' needs and then as a network, lessons are shared so that good practice can be scaled more rapidly (New Urban Mechanics 2016).

The above examples of citizen engagement originating from both citizen-led and government-led resources can be understood to exhibit some important common lessons and challenges. For example, the approach of implementing trial projects 'on the street' and seeking public opinion as exemplified by both the parklets and the urban innovation labs could be seen as viable alternatives to traditional citizen engagement measures. Indeed, in terms of the key outputs of urban innovation labs, citizen engagement is sometimes perceived to be as important if not more important than the actual innovation itself. This is illustrated through the case of the aforementioned New Urban Mechanics, for which the co-chair Chris Osgood has described the public engagement factor to be more important than the innovation itself, stated that the new offering 'should be a distant second, relative to improving new models of civic engagement or adding value to the lives of constituents' (Townsend 2013, 216).

But while the examples of implementing parklets and plazas illustrate the potential of hacks to the city's public space and demonstrate public engagement on a local level, there is debate as to whether a localised approach such as this diminishes the possibility of achieving cohesive city design. In '*The Fall of Public Man*', Richard Sennett argues that contemporary design for community has been based on an inability on the part of urban planners and designers to deal with the city as a whole. He debates that designing for small-scale community can undermine the city at large and encourage the establishment of isolated fractions. This splintering can make the city difficult to govern and can hinder participatory planning processes. He laments that '...today planners have largely given up hope on properly designing the city as a whole—because they have come to recognise both their own limits of knowledge and their lack of political clout' (Sennett 1977, 294). On the other hand, in describing the preferable scale for rolling out smart technology innovations, Anthony Townsend comments that historically a local scale has been the best approach for policy innovation as this scale makes it 'easier to engage participants and identify problems, and the impact of new solutions can be seen immediately' (Townsend 2013, 10). Clearly, there are outstanding questions concerning the systemic application and viable scalability of citizen and local government-led initiatives such as those mentioned here, as well as questions concerning the role of physical interventions themselves.

In this chapter, the case of Dublin City Council (DCC) Beta will be explored as a concrete instantiation of one such local government-led initiative. Stemming from the identification of a need for the city council to be able to innovate through the use of experimentation and to engage more actively with citizens, DCC Beta was initially proposed as a '10% Innovation Time Project' by a staff member of the City Architects' Division in 2012 and later became a formalised City Architects project

in 2015, before being discontinued in 2016. During that intervening time, DCC Beta was developed for the purpose of experimenting, innovating and quickly testing ideas directly ‘on the street’. The next section of this chapter will explain the origins, the guiding principles and the general operations and processes of the DCC Beta. This will be followed by a section dedicated to describing three individual DCC Beta Projects as detailed case studies and finally, the chapter concludes with a discussion of the outcomes, successes and shortcomings of the DCC Beta platform.

2 The Story of DCC Beta

The need for city governments to rethink their processes and investigate alternatives to citizen engagement resulted in the emergence of local government-led initiatives such as the urban innovation labs. But within this type of initiative, there was also a need for new mechanisms to allow for experimentation with new ideas outside of the traditionally restrictive operations of local government. This challenge of overcoming commonly arduous planning hurdles and red tape led to the initiation of a new model for trialling small-scale projects in the city.

2.1 *The Origins of DCC Beta*

Conceived of as a means of bypassing the normal lengthy and bureaucratic process of implementing trial projects, Dublin City Council (DCC) Beta operated from 2012 to 2016 as part of the City Council’s Architects’ Division as a live mechanism to trial, assess and implement test ideas directly in the city. According to the DCC Beta website, ‘Dublin City and Dublin City Council need to be able to easily and regularly freely discuss ideas and to innovate—and to innovate you need to be able to experiment and to then learn from those experiments, and which in turn enables greater discussion’ (DCC Beta 2014).

The initiative was instigated as an individual response to the realisation of how difficult it was to trial ideas in the city council, and also the lack of personal motivation that results from the hierarchical structures in the institution. DCC Beta was also prompted by the observation that certain previously realised public realm projects by the city council that were described as trials (i.e. projects to be implemented on a temporary basis) but were in effect irreversible without major disruption. New ideas receive a cautious reaction in the city council, so a need was identified for a platform that allowed experiments to happen independently from other formal projects. In addition, DCC Beta also sought to find a place to discuss new concepts and not the specific location that prompted them.

In January 2012, DCC Beta was proposed as a ‘10% Innovation Time Project’ by a staff member of the City Architects Division, the division of approximately thirty members of staff, which is responsible for promoting design and providing architec-

tural, urban and conservation design services to Dublin City Council (Dublin City Council 2016). DCC Beta operated on two primary levels. Firstly, it developed so-called Beta Projects—individual physical projects for testing micro-scale solutions to problems in the city that were usually supplemented by a high level of citizen and local business involvement. Secondly and in parallel with the development of Beta Projects, DCC Beta developed the Beta Model, as an approach to develop an ‘innovation ecosystem’ within DCC which would enable city council staff to become accustomed to the idea of experimentation and evidence-based learning within the city council.

The first Beta Project went live in March 2012. DCC Beta was primarily led by a single staff member from the City Council’s Architects’ Division while other members of staff had also been self-selecting themselves and getting involved with various Beta Projects as required. These ‘diagonal slices’ (i.e. not adhering to hierarchical structures) across the organisation formed non-grade-based teams with different competency staff addressing different parts of the problem and solution.

According to the DCC Beta Report (2016), the initiative had run fourteen projects in total, six of which were scaled to a certain degree and one that had become a formalised stand-alone project. Examples of the types of projects include the implementation of novel forms of bicycle parking solutions and hangars, the design and implementation of parklets, the trialling of rain box planters and the creation of platforms for public art initiatives. In addition, the Beta Projects had supported and informed the development of the Beta Model. This model was an attempt to establish an innovation ecosystem within the city council which would improve the capacity of city council staff to innovate and provide them the capability and road map to do so in a controlled environment. The Beta Model also aimed to improve the systematic accumulation of internal knowledge so that this knowledge could be shared efficiently across innovative projects and teams within the council.

2.2 Key Principles of DCC Beta

As part of its operation, DCC Beta relied on a number of key elements and principles which included using lean techniques, leveraging public feedback, adhering to decision classification and measuring itself. A dominant influence on DCC Beta was the Lean Startup, an influential book in start-up culture which promoted experimentation, iterative testing and validated learning as aspects of a successful methodology for developing businesses and products (Ries 2011). Techniques and elements of this Lean Startup process were adapted and tweaked by DCC Beta in order to better suit their use with the complex issues and opportunities that cities and local government tend to face. For example, one of the techniques was to use ‘Lean Resourcing’, which meant trialling projects only for as long as was required to test assumptions and to only make solutions as big as they need to be to effectively test the idea. Another Lean Startup technique borrowed by DCC Beta was to follow a ‘Build-Measure-Learn’ loop when trialling projects. This technique focuses on rapid iterations of product

development whereby emphasis is put on quickly building a product or prototype, measuring its effectiveness in the real world, and then learning from that experiment.

While approximately half of the Beta Projects originated as a result of suggestions from city council staff internally, the other half were made up of those suggested by the public via the DCC Beta website and social media channels and so public input and feedback played a pivotal role for both the origin and development of the individual Beta Projects. Social media channels were very active, and regular blogposts on the project website were designed to communicate the processes being developed as part of DCC Beta and to update the public on the status of specific Beta Projects. Through these media, public feedback was actively encouraged and commonly questions are asked of the public, for example, ‘What do you think of the idea?’ or ‘How could you see the idea being used or changed?’. The use of project-specific hashtags on social media was also encouraged in order to generate debate and to aid people in following the conversation. Because Beta Projects were trialled ‘in the real world’ as soon as possible, this enables DCC Beta to see how an idea was actually performing in real life, and it also allowed the public a chance to give feedback and suggestions during the early stages of a project while it was still relatively easy to change direction.

As part of drawing up the process for DCC Beta Projects, one of the issues that emerged was the need to have a more coherent mechanism for prioritising project suggestions and defining which projects would be developed. For example, when the issue of on-street dumping was initially explored under DCC Beta, it became apparent that it was potentially a popular project with multiple high-quality suggestions coming from the public and city council staff, of how to address the problem. It also became clear that on-street dumping represented a ‘wicked problem’ (Rittel and Webber 1973), i.e. a highly complex problem with multiple feedback loops, which would require multiple different Beta Projects. In order to be able to deal with a complex challenge such as on-street dumping, DCC Beta would need to develop a mechanism for concurrently managing and prioritising multiple Beta Projects. Therefore, a framework was proposed by DCC Beta that enabled individual larger challenges (e.g. on-street dumping, housing) to be defined as a result of input from senior management of the city council, as well as elected officials and DCC Beta staff. Then, below each of these larger challenges would fall the individual Beta Projects by per suggestions from citizens and DCC Beta staff. This framework would allow for projects to be prioritised succinctly and transparently while communicating (internally and for the public) what projects were being undertaken. The framework also enabled senior management input into larger challenges while maintaining a hands-off approach to individual projects.

Arising from ‘Build-Measure-Learn’, another Lean Startup technique, a metrics system was also developed by DCC Beta and applied as a means of assessing Beta Projects once a trial had lapsed. In doing so, the metrics system provided evidence of the impact of individual Beta Projects, allowing DCC to make actionable decisions about each Beta Project and justifying requests for additional DCC resources to specific Beta Projects. This wide set of metrics was defined based on the experience of developing the individual Beta Projects in order to reflect both the experience of the public and the council. They included a number of hard metrics (e.g. cost, time

and resources, demand and transferability) as well as soft metrics (e.g. perception, engagement, sustainability and resilience). These soft metrics were based on qualitative feedback from the public as collected during the trial, for example, questioning how the project impacted on their perception of the area where it was trialled or what impact a project had on their sustainable travel choices.

2.3 *The Process for Beta Projects*

Beta Projects followed a rigid A–F process, as devised by DCC Beta staff for the purpose of applying a systematic methodology to each of the individual Beta Projects. Below is a brief description of the individual steps.

- *Step A: Awareness*—What is the issue or opportunity that needs looking at? Awareness of an issue can come in three different ways: ‘bottom-up’ (based on suggestions from citizens), ‘middle-out’ (based on everyday awareness of an issue or opportunity by Dublin City Council’s staff) or ‘top-down’ (based on issues raised by Dublin City Council’s management or Central Government/EU policy changes, etc.).
- *Step B: Baseline*—What’s the situation around it as of today? How much is spent on the current solution? Are there other issues that directly or indirectly result out of the issue?
- *Step C: Create Knowing*—A + B above, what are all of the various ways this could be solved?
- *Step D: Decide*—Prioritisation of the various solutions.
- *Step E: Effect, Evaluate, Evolve*—Prototyping of solutions in order of priority to test all of the assumptions around it and application of evaluation metrics. As necessary, evolution of the idea over multiple iterations.
- *Step F: Formalise*—Once a solution has been found, it is formalised, usually in the form of an open report. In some cases, formalisation will also require that policy arrangements are adopted in order to formalise the idea, for example, to resolve any planning issues, financial/staffing/departmental issues, legal issues, procurement and council policies.

At the end of a Beta Project, a ‘Beta Project Report Card’¹ is compiled, the objective of which is to let people know how the Beta Project went, what was measured, how feedback and suggestions were taken into account and what the outcomes of the project were.

By employing the above described metric system, the intention was that it would reveal a simple, clear, decision for DCC Beta staff at the end of each Beta Project. The decision would then fall under one of the four following classifications, as originally devised by DCC Beta:

¹For an example of a ‘Beta Project Report Card’, see <https://dubcitybeta.files.wordpress.com/2015/11/beta-project-report-card-public-full-bike-hangar-version-1-1.pdf> (accessed 01 June 2017).

- Pull (wouldn't appear to be a good solution in any way, time to pull it);
- Pivot (use what has been learned in order to make a major change in direction);
- Persevere (on right track, need to learn more);
- Policy (would appear to be a good solution, formalise as necessary—e.g. planning, hard infrastructure).

For example, a Beta Project might undergo three iterations before a good solution is found. The first two Beta Project Report Cards (as compiled and evaluated by DCC Beta staff) could report the need to 'Persevere' and then the final Report Card would report the need to move to 'Policy'. While on the one hand, this classification system ensured the provision of a clear and definite decision, it was also acknowledged by DCC Beta staff, that the system was not without its own limitations, in that there was often internal disagreement amongst DCC Beta and city council staff on which was the correct decision to take and who should have the executive power to decide.

3 Beta Projects

This section will detail the cases of three Beta Projects—the Bike Hangar, the Street Parklet and the Traffic Light Box Artworks—as examples of how the DCC Beta process was applied. These three examples serve to illustrate different cases that have undergone varying degrees of scaling and formalisation. The Bike Hangar is an example of a Beta Project that had completed a single iteration and the Street Parklet an example of a Beta Project that had undergone multiple iterations, while Traffic Light Box Artworks is a former Beta Project that has become part of a formalised policy. The case studies demonstrate a number of details including how the decision-making processes evolved, how the Beta Projects were assessed and the varying degree to which the public and external stakeholders had an influence on the project outcomes.

3.1 Case Study 1—The Bike Hangar Beta Project

The origins of this Beta Project stemmed from the identification by city council staff, of a need to better support people in storing their bicycles near their homes in a safe and convenient manner. Addressing this need also aligned itself to the Dublin City Council 2011–2017 Development Plan, which prioritised promoting cycling as a sustainable mode of transport in Dublin. The need to address this issue was further reinforced when in October 2013, DCC Beta held a public workshop in collaboration with 'City Intersections', an urban forum for the city of Dublin. The workshop gave people a chance to come up with their own Beta Projects by asking them three questions. The questions included: 'What is the problem or opportunity you see?', 'Why is it a problem for you personally?' and 'How might this issue be addressed?'.

Afterwards, members of the public explained their ideas and potential solutions and the idea of providing bike hangars emerged as one of the top items that people would like to have had addressed.

Subsequently, DCC Beta began to explore the idea of on-street bicycle hangars as a solution for residents to better store their bicycles. Because this was a city-wide issue, the focus of the research was around policy and if/how it should be done. Another major focus for the Beta Project was to test public reaction to the idea. A public call looking for a household to trial the proposed hangar was issued via social media in Autumn 2014. In addition to the call, a set of discussion points were published in relation to the proposed hangar, in order to provoke public discussion. In January 2015, on choosing a household and location for the Beta Project, a single Cyclehoop hangar was installed on John Dillon Street in Dublin's south inner city. This specific location was chosen on the grounds that the street generally had a low occupancy of its car parking provision and had a low rate of through traffic, as well as the fact that it was in close proximity to the relevant Dublin City Council staff. Six individuals from four households took part in this trial of a single bicycle hangar at this one location.

Following the installation, news reports on local and national media reiterated the call for feedback on the hangar from the general public. At a very early stage, a spokesman for the council stated that 100 submissions of feedback had been received since the first hangar was installed last week, and that 'almost all' were positive.² In addition, tours of the hangar were offered by DCC Beta staff to the public via social media during lunchtimes and evenings on three occasions. The bicycle hangar was removed at the trial end (as per the Beta plan), after 5 months.

The evaluation of this first iteration of the Bike Hangar Beta Project showed that the trial participants reported that using the hangar was a generally positive experience. It also showed that there would appear to be a large demand for this solution ranging from the city centre to the inner suburbs but that distance to the nearest hangar and aspects such as pricing could be expected to have an impact on this.

After submissions have been evaluated and discussed internally amongst the various city council departments, a decision of 'Persevere' was made with the scheme. This means that while the first iteration of Beta Project was successful, further learning is required as to how the hangar might work in alternative locations and another iteration of the trial would be developed before it would be considered as a policy.

²Sam Griffin, "Public asked to get behind new bike 'hangars' in Dublin", <http://www.independent.ie/irish-news/public-asked-to-get-behind-new-bike-hangars-in-dublin-30949725.html> (accessed 01 June 2017).

3.2 Case Study 2—*The Street Parklet Beta Project*

As a result of a suggestion from a member of the public, this Beta Project began to look at the ‘Street Parklet’ concept—an idea which involved converting a parking space into a ‘mini-park’, very often to act as an additional resource space for a nearby business. In preparation for this Beta Project, the key staff member behind DCC Beta spoke to the organisers of Park(ing) Day Dublin³ (a one-day festival that hosts parklets around the city) and also to a number of business proprietors who had expressed interest in the idea. It was decided to locate the first iteration of the Street Parklet Beta Project on a parking spot outside of a pub on Capel Street, a busy mixed-use street in the north inner city of Dublin. In selecting a site for the parklet, there was specific criteria including that the trial site would be reasonably visible/busy, that it wasn’t too busy from a traffic and parking point of view, that the site would be watched over by an interested party and that a need for a parklet would be reasonably realistic—i.e. somewhere where people might like to be able to sit outside. This location was partly chosen as there was a lower level of pressure for car parking there than surrounding areas and through traffic was relatively low. As part of Park(ing) Day Dublin, a local landscape architect had previously proposed a one-day parklet at this location, and so he was chosen to design and install the parklet as a Beta Project.

The parklet was popular with the business management, and their customers and noncustomers appeared to have also felt welcome to sit at the parklet. The staff at the pub were very supportive of the parklet (both in seeking out its installation and also in its maintenance). Each night at closing, the pub staff removed the temporary seating and replaced it upon opening the following day. This first iteration of the Street Parklet Beta Project was in place for two weeks. Much of the feedback received indicated that it had a positive effect on the immediate area and that there was an unmet need in the city and opportunity for the city council to further explore policy on long-term parklet provision in the city. In terms of changes to the public realm, parklets appear to have the capacity to provide a more interesting street experience as they animate both sides of the footpath, in a way that pavement chairs and tables cannot. According to recommendations as set out in the Beta Project Report Card, ‘as a result of observations, and conversations with, parents and children at the parklet, there may be ways that such a policy could find ways to encourage city-living by families or encourage parents to visit the city centre with their children, or as a draw for specific businesses in the city. This option should be further explored’.⁴ In conclusion, it was decided that a series of longer trials in diverse locations and scenarios would be beneficial to better assess the potential impact of parklets on the local residential and business community.

Following this, in May 2015, a second iteration of the Street Parklet Beta Project was temporarily installed next to a cafe on South William Street, in the south inner

³‘Park(ing) Day’, <http://www.dublinparkingday.org/parking> (accessed 01 June 2017).

⁴‘Report Card Street Parklet’, <https://dubcitybeta.wordpress.com/2014/10/16/report-card-street-parklet> (accessed 01 June 2017).

city of Dublin. The second iteration, which was in place for three months, featured a new parklet design that was designed, fabricated and installed by the city council's own joinery workshop and while in operation the parklet, was tended to (swept it in the mornings and watered the plants as necessary) by the nearby cafe. The parklet was designed to have a basic, generic, design so that the debate would be primarily about the concept rather than being overly focused on the aesthetics. Both iterations helped DCC Beta see what practical issues or opportunities might arise from parklets and inform any possible related policy. In terms of impact on the city, it appeared that the parklets were popular in both locations and that there was a certain level of demand from other businesses. Following subsequent evaluation of the second iteration, a decision was again made by DCC Beta staff to 'Persevere' with the parklet scheme, meaning that the idea was worth pursuing further but would require further iterations with trials in alternative locations before being considered as a city-wide policy.

3.3 Case Study 3—The Traffic Light Box Artworks Beta Project

This Beta Project was seeking to solve an ongoing maintenance issue due to tagging, graffiti and stickering of traffic light boxes and the ongoing need to repaint with associated costs. A secondary aim was the improved visual amenity and creation of locally referenced talking points. The solution proposed was that by putting artworks onto the boxes we could remove or alleviate the need for maintenance, while improving the public realm experience. The first iteration of this Beta Project took place in the Markets Area of Dublin as here there were eleven suitable traffic light boxes. There was an open call for expression of interest in painting these boxes with art and a defined brief was given. This Beta Project only looked at artworks on the boxes, and not any forms of commercial work or advertising. Once submissions had qualified (i.e. fit the criteria—which all submissions incidentally did), they were voted on by those who had participated and those with a stated interest who were invited to an open meeting. Eleven designs were selected from fifteen submissions. The boxes were then painted over an agreed period of time to maximise effect and the trial ran for twelve months from June 2012 to July 2013. Commentary on social media and from local business and residents was very positive. Some pieces were favoured over others, but this is naturally subjective.

On evaluation of this Beta Project, it was verified that the objective of reducing the amount of graffiti/tagging and the associated costs of removal which is a significant direct cost saving to Dublin City Council had been achieved. It was also evident that the Traffic Light Box Artworks were successful in adding to the visual amenity of streets and were very popular with both locals and tourists. In the light of this being a proven solution to addressing the maintenance issue of traffic light boxes, the decision taken was 'Policy', as per the DCC Beta decision classification, and plans were made to develop the necessary policy. The traffic light boxes Beta Project

was the first and only Beta Project to progress to this stage, an achievement which DCC Beta staff attributed to the fact that it was a positive and quite easily defined project.

However, it is worth noting that the decision to formalise the project and roll it out on a larger scale posed a new set of challenges for DCC Beta as the question now arose as to who should run the fully-fledged initiative. In the end, ‘Dublin Canvas’⁵ an independent community art project with a particular interest in the traffic light boxes artworks, volunteered to manage the project but the shift from a trial to a formalised project, demonstrated that DCC Beta still had a lot to learn in terms of scaling up initiatives and adopting appropriate business models.

4 Discussion

In discussing the outcomes of DCC Beta, the reasons for which DCC Beta could be seen as an approximated form of ‘City Hacking’ will be elaborated on. Additionally, the discussion features a summary of the valuable lessons that the experiences of DCC Beta can offer to other city governments who wish to develop a culture of innovation and experimentation. In conclusion, some of the notable shortcomings of the project are outlined and finally, further associated development and research for the institutionalisation of hackable city practices are suggested.

4.1 *DCC Beta as an Approximated Form of ‘City Hacking’*

In the context of a conservative and risk-averse institution, the instantiation of both the Beta Model and the Beta Project suggests an attempt of developing an unconventional approach to traditional city-making from within the city government itself and so it could be argued that DCC Beta is a form of ‘urban hacking’. More specifically, through the individual Beta Projects, DCC Beta is seen to embrace trial projects and to leverage the collective intelligence of the public in order to develop micro-scale solutions to urban problems, while the development of the Beta Model itself is seen as a genuine attempt to develop an ‘innovation ecosystem’ within the city council and therefore introduce a systematic methodology which enabled city council staff to cut through the institutional silos and to become accustomed to the idea of experimentation and evidence-based learning. By providing staff with the capacity and clear road map to innovate in a controlled manner, the Beta Model has the potential to overcome barriers to change while also ensuring the resilience of solutions that are being developed.

⁵‘Dublin Canvas’, <http://www.dublincanvas.com/> (accessed 01 June 2017).

4.2 Lessons from DCC Beta

DCC Beta demonstrated that it was possible to temporarily implement projects in the city with an alternative approach in order to support iterative testing, better public engagement and to better manage risk through the use of the beta testing method. Whereby the traditional approach to testing out ideas and implementing projects can be costly and long drawn out (as every eventuality is attempted to be worked out in advance of implementation), DCC Beta allowed the city council to test new ideas in a different way that emphasised learning through small-scale experiments with the potential to scale up. This approach enabled a process of continual learning, reflection and evaluation which resulted in better insights and data on which a later project brief, or a tender, could be based.

In addition, DCC Beta leveraged the diverse wealth of local and expert knowledge that existed outside the city council through engaging with citizens and organisations in the development of the individual Beta Projects. The strong focus on maintaining a public discussion around the Beta Projects via on-street reports cards, blogposts and social media, allowed DCC Beta to tap into the collective intelligence inherent to the wider public while also making it easy for the public to have a say on the individual Beta Projects. Equally, by creating physical on-street prototypes, each Beta Project developed as a talking point between the city council and the public. And while Beta Projects were not classified as conventional or direct public engagement initiatives, by their very physical and visible nature, they were noted as being one of the council's most successful examples of citizen engagement.⁶

4.3 Potential Future Development and Research

Although the advantages of sourcing ideas from the public and greater citizen engagement are clear, one of the issues that emerged over the course of DCC Beta was the need for a coherent mechanism for prioritising projects. So, although on the one hand, the described framework for prioritising projects (which organised individual Beta Projects suggestions under large city-wide challenges) added a welcome structure to the hierarchy of projects and demonstrated how the city council were working on several large issues with short- and long-term solutions, on the other hand, it opens up significant questions about the decision-making behind the Beta Projects. And while DCC Beta placed a strong emphasis on taking into account suggestions, input and feedback from citizens, as well as the development of a metrics system (some of which were based on public feedback) to evaluate the Beta Projects, the decision-making processes around Beta Projects are firmly dictated by senior management or staff members of the city council. This restrictive level of participation inherent to DCC Beta is also noted by Cardullo and Kitchin, whereby they suggest that this type

⁶'Some Councillors want DCC Beta Projects Back', www.dublininquirer.com/2016/12/07/some-councillors-want-beta-projects-back (accessed 01 June 2017).

of participation is ‘often instrumental rather than empowering in a political sense’ (Cardullo and Kitchin 2017). Further development of DCC Beta might thus seek to incorporate a more transparent, open and democratic system for the purpose of decision-making connected to DCC Beta.

Another important issue that warrants further investigation as part of any future development of DCC Beta concerns scalability as arguably the real challenge in urban innovation and governance is providing a solid framework that allows ideas to take hold and grow. As Anthony Townsend acknowledges, ‘the grass roots may be a source of new ideas, but what they need is someone who can design and deliver a robust infrastructure that is centrally planned to be safe, efficient, and reliable at a reasonable cost...Scaling up things that work at the grass roots is a challenge few have overcome’ (Townsend 2013, 165).

The failure to scale DCC Beta is inevitably dually linked to the modest resources behind the project while in existence and the fact that in December 2016, a decision was made to discontinue DCC Beta. According to the City Architects Divisions, the official reasons for this discontinuation were due to the lack of resources and finance,⁷ which is understandable considering the undeniable pressures on the City Architects Division in the context of the severe ongoing housing crisis. Since the discontinuation of DCC Beta, a subsequent pilot project called ‘Framework’ has been initiated as a joint initiative of Dublin City Architects Division and the American Institute of Architects to empower ‘communities to improve their built environment through an open, collaborative and systematic approach’.⁸ A subsequent report published as part of the Framework pilot presents a set of recommendations and while the pilot approach is arguably more integrated and holistic approach to one defined area of the city centre than that of the single intervention approach of DCC Beta, it is interesting to note that many of the ‘lighter, quicker, cheaper’ recommendations⁹ include interventions which mirror those of the DCC Beta Projects, including the provision of parklets and low cost public art.

The conclusion of these recommendations is strong evidence that there is indeed a genuine need for the type of solutions as those which had previously been developed and trialled by DCC Beta. While it remains to be seen how and when these proposed recommendations would be implemented as per the Framework project, it does raise the question as to whether it is productive for local government to seek to reinvent the wheel in this way or instead, to commit adequate resources to and continue to invest in the development of existing mechanisms such as DCC Beta. On this note, the short-lived case of DCC Beta points to a need to further examine the broader factors of democratic decision-making in local government and institutional support for alternative urban innovation initiatives.

⁷Some Councillors want DCC Beta Projects Back. www.dublininquirer.com/2016/12/07/some-councillors-want-beta-projects-back (accessed 01 June 2017).

⁸Framework Pilot Project <http://www.pivotdublin.com/projects/framework-pilot/> (accessed 01 June 2017).

⁹Reimagining Dublin One. <http://designframework.ie/wp-content/uploads/2017/03/Reimaging-Dublin-One-Document.pdf> (accessed 01 June 2017).

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Reinventing the Rules: Emergent Gameplay for Civic Learning



Cristina Ampatzidou

Abstract Serious games are tools that can instigate civic learning through the social interaction among players who exchange information, negotiate and deliberate during gameplay. Energy Safari is a serious board game developed to make citizens familiar with the energy transition in the province of Groningen, the Netherlands and how it translates in local and regional policies. This chapter analyses how players have collectively exploited the ambiguities in the rule set of the game to define their own rules, regarding project selection, partnerships, knowledge exchange and attitude towards the local government. These ad hoc agreements encouraged players to reflect and relate in-game situations to their real-life experiences with energy transition, leading to civic learning. In doing so, they “bend the logic” of current assumptions for the energy transition and demonstrate possibilities for positioning emergent gameplay within the design and negotiation processes of actual hackable urban and regional policymaking.

Keywords Board games · Energy policy game · Emergent gameplay
Civic learning

1 Introduction

Within the field of urban planning and policy, games have been employed as early as the 1950s (Abt 1969; Duke 1975) and are still a popular medium, particularly in the areas of participatory and interactive policymaking (Mayer 2009; Poplin 2012). In contrast with other methods of citizen participation that are based on information and consultation, games can be appealing both to citizens and policymakers, because a major part of control is placed on the players, providing them with a sense of agency (Sweetser 2006). Games are usually conceptualized as rule-based systems, where

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players try to achieve given goals by overcoming set obstacles (Abt 1969; Juul 2011; Parlett 1999; Suits 1979). However, games have also always been collective activities and social experiences that allowed players to relate to one another. This social aspect adds a layer of complexity to the rule-based gameplay, which is associated with several benefits, such as improving interpersonal relations between players (Fang et al. 2016), increasing the fun aspect (Gajadhar et al. 2008) and contributing to learning (Abdul Jabbar and Felicia 2015; Dahlgren 2009; Whitton 2011).

Energy Safari is a serious board game about the energy transition in Groningen, the Netherlands. The energy transition is a large-scale structural policy change towards the increased use of renewable energy sources, the introduction of energy saving measures and the significant reduction of dependency on fossil energy (Hauff et al. 2014). As the success of the energy transition depends both on centralized policies, corporate responsibility, and on a widespread application of local energy initiatives from the side of citizens, Energy Safari can be considered as a tool for hackable city-making (Ampatzidou et al. 2015) that engages players in an open and inclusive process of addressing the nuances of energy planning and policy. The goal of Energy Safari is to make players familiar with the regional policy vision for the energy transition, with a focus on the province of Groningen and instigate interest in local energy initiatives. It aspires to achieve that in two distinct ways. First, it aims to encourage civic learning; that is, to facilitate a process of learning about the social, political and economic reality of the community (Shaffer et al. 2005) represented in local energy projects. Civic learning comprises the knowledge of institutions, ability for deliberation, and personal interest for common affairs (Raphael et al. 2010), a set of conditions deemed essential to hackable city-making. The second goal of the game is to enable collective efficacy, that is, to stimulate the capacity of the group to realize collective, as opposed to forced, goals (Sampson et al. 1997) by providing players with ideas about the variety of potential projects that can be part of decentralized energy saving and production.

Early applications of games for urban planning were influenced by systems thinking and focused mainly on modelling and simulating urban dynamics, in areas such as transportation, land use and natural resources management (Abt 1969; Duke 1975; Mayer 2009). However, following developments in planning theory, there is a reorientation in thinking of cities as systems to be designed and controlled towards cities as systems that evolve based on social processes and behaviours (Batty 2010). So even though simulation and modelling still have a strong presence in urban planning and policy games, the focus seems to be shifting towards the potential of games to create environments for negotiation, deliberation and collaboration among players (Gordon and Baldwin-Philippi 2014; Poplin 2012). The research project described in this chapter contributes to this debate by examining whether gameplay that emerges from the spontaneous social interaction among players in a co-located game setting can contribute to the instigation of civic learning. The exploitation of inexactitudes in the rule set of Energy Safari by the players, in order to define their own rules and enhance their playing experience, is framed borrowing the notion of emergent gameplay from game studies. This study analyses seventeen game sessions of Energy Safari and the ensuing debriefing conver-

sations, that took place over a period of one month in various locations in the city of Groningen. The analysis documents emergent behaviour in the ways the players came up with new rules, and locates civic learning in the connections players made between their in-game behaviour and their real-life experiences. Finally, it reflects on the possibilities for hackable city-making, as games utilize the uncertain and unpredictable manifestations of emergent gameplay to reveal the underlying rationalities of actors and encourage them to undertake new pathways to action.

2 Civic Learning: A Condition for Hackable City-Making

Civic learning is a process of learning about the social, political and economic reality of the community (Shaffer et al. 2005) and is a central requirement for appreciating social responsibility, justice and personal freedom (Lee et al. 2013) and for effective and reliable participation in civic life (Raphael et al. 2012). Civic learning is a complex process that is influenced by a person's community, education and participation and requires collective reflection and trust building (Gordon and Baldwin-Philippi 2014). For Raphael et al. (2010), civic engagement is connected to three practical attitudes, which set the desired goals of civic learning: first, encouraging citizens to be familiar with the institutions and legal frameworks that orchestrate civic processes; second, fostering the cultivation of skills that allow citizens to express themselves and articulate their interests and concerns, also through tools such as petitioning, advocacy and protest; and finally, instigating a personal interest in community life and public affairs. That means that civic learning is a condition for a hackable city in that it enables citizens to understand and engage with existing institutions, perhaps encouraging them to open up their administrative processes to new ideas and frameworks. Through civic learning, citizens also develop the skills to explore new solutions and ideas on on-going urban processes and communicate them and pursue their collective interests through coordinated action and efforts that also contribute to hackable city-making.

Games are ever more considered a significant educational resource as they combine entertainment and learning (Abdul Jabbar and Felicia 2015; Boyle et al. 2012; Whitton 2011) found at the balanced amount of progressing challenges, the feedback loops and rewards offered to the players, the social interactions that develop among players and replayability (Gee 2005). Benefits associated with the use of serious games as learning technologies to improve both cognitive and social learning encompass increasing literacy on specific topics, raising awareness, developing (complex) problem-solving skills, increasing media literacy, enhancing visual thinking and spatial sense, and building networks and coalitions (Crookall 2010; Erhel and Jamet 2013; Gee 2005; Granic et al. 2014; Shaffer et al. 2005). Harteveld and Bekebrede (2011) separate between direct transfer learning, which consists of concrete, predefined and measurable objectives and open-ended learning, which is abstract and difficult to measure. Unlike in simulations and models, real people

can discover new knowledge during the gameplay (de Caluwe et al. 2012) and can experience both direct transfer learning on the level of the game content and open-ended learning from the behaviours that emerge out of the social interactions of the players, while, for example, negotiating strategies, sharing knowledge or resources. Even when players play competitively, learning still happens in a cooperative way (Oertig 2010), and positive social interaction among the players during the game has also been connected to increased learning (Padilla Zea et al. 2009). Particularly, board games provide more fun and immersion (Gajadhar et al. 2008) and can improve interpersonal relationships (Fang et al. 2016) leading to trust development among players and possibilities for collaboration in contexts external to the game.

Civic learning can be achieved when players reflect on their current civic practices, conceptualize them within a wider context and are able to apply the skills they acquire through the game in the real world (Dahlgren 2009). Raphael et al. (2010) also pay attention to the transfer of knowledge from the game to the real world arguing that games can “foster civic learning when they help players to develop knowledge, skills, and dispositions that players can then apply to public matters in the world outside the game.” (203). The authors have proposed a framework for understanding how games can foster civic learning, arguing for a balanced integration between content and gameplay, the linkage of ethical and expedient reasoning, and the facilitation of connections between individual actions and collective or social structures. As civic learning is a predominantly social and open-ended form of learning, turning to the social interactions between the players of a co-located game setting can offer valuable insight into how civic learning takes place.

3 Reinventing the Rules: How Emergent Gameplay Happens

In complexity sciences, the term “emergence” is associated with the unpredictable behaviour of dynamic systems that arises from the interaction of their parts (Casti 1997), with the whole being more than the parts (Holland 1998; Lissack 1999) and to processes of self-organization (Holland 1998; Goldstein 1999). In the context of games, emergence is used to describe the complexity of gameplay that cannot be deterministically attributed to the simplicity of the rules (Juul 2002), and for several scholars, such as Adams and Rollings (2007); Baterman and Boon (2006), even gameplay is an emergent quality of the game (Doormans 2008). Emergence is particularly important for game designers because it ensures that rules can be played out differently every time. Emergence in games can include patterns that appear because of complex programmed mechanisms within a game and the behaviour that manifests on an experiential level, when complex social relationships form between the players, during social play (Salen and Zimmerman 2004). As Jeremy Campbell

has put it “One can describe the rules but not necessarily all the products of the rules” (Campbell 1982 cited in Salen and Zimmerman 2004, 159).

Emergence in games can happen either in the direction of narrative, as with role-playing games, or of gameplay, as with strategy games (Sweetser 2006; Yap et al. 2015). Emergent behaviour can be implied (Vogiazou 2007; Juul 2002), as in the case of chess or even be hardcoded (Sweetser 2006) in the rules of the game, for example, by the use of algorithms that simulate actor behaviour or fluid movement in video games, but it can also manifest itself in the interactions of players with game elements (Yap et al. 2015) and with each other (Salen and Zimmerman 2004). In the last two cases, emergent gameplay also denotes the use of a game by the players in ways unintended by the designer (Sweetser 2006; Smith, n.d.), for example, in abolishing or introducing rules and creating new strategies. In this sense, emergent gameplay constitutes a form of playful reverting of the logic of the game, to make it do things it was not designed for. Rule breaking in any form is a “natural extension of the flexibility of the game structure” (Salen and Zimmerman 2004, 282). By cheating, changing the rules and improvising new ones, players subvert the meaning of the game in order to improve their playing experience. Salen and Zimmerman (2004) attribute the various attitudes of rule breaking (cheating, workarounds, spoil-sport hacking, etc.) in digital games to the anonymous and mediated nature of the gameplay and the limited physical presence of other players.

However, rule breaking, cheating and hacking also happen in board games, which are naturally co-located with a small group of players that usually know each other. In addition, the social relations among players can greatly influence their in-game choices. An obvious quality of board games is that they bring people together in the same space, around the game board. Holland (1998) used board games as an example of emergent behaviour in his definition of emergence as a whole that is more than the sum of its parts. This is because in board games, individual player agency and social interactions among players can expand the space of possibility of the game well beyond the magic circle (Salen and Zimmerman 2004), which includes the finite space of the board, objects such as tokens and the rule set. Rules in board games are usually simpler than in computer games and are always explicit, which make emergence in board games easier to study (Doormans 2008; Zagal José et al. 2006). Harteveld and Bekebrede (2011) argue that multiplayer games are process intensive and characterized by social rules. These conditions make board games a well-suited case for observing emergent gameplay and evaluate whether the emerging behaviours and social interactions between the players and the game, and among the players, contribute to civic learning.

4 Playing with the Rules of Energy Safari

Energy Safari was created in the framework of the JPI Urban Europe program “Playing with urban complexity: using co-located serious games to reduce the urban carbon footprint among young adults”. The game was developed by a small team of urban

planning researchers through a series of co-creation sessions with local stakeholders involved in the energy transition in Groningen. These included policymakers from the local government, researchers from urban planning, sociology, architecture and game design, members of citizen energy initiatives and employees of private utility companies. The prototype that resulted from this process of co-creation was consequently tested in a series of 17 sessions spread over the period of one month, in various locations in the city of Groningen, including a cultural space, the premises of the municipality, the university campus and the offices of private companies. The players involved in these sessions consisted of students, members of citizen energy initiatives, policymakers and city officials, researchers of various disciplines and institutions, employees of local utility companies and lay people, which were recruited using a variety of methods, such as direct invitation, social media announcements, newsletters and snowball sampling. Playing sessions were mapped using participant observation and were also audio recorded, coded and analysed. Players had to fill in a before and after survey enquiring socio-demographic data, knowledge and attitude towards the environment, energy and civic participation, player types and game preferences, gameplay and strategy and learning impact. Each session concluded with a debriefing session in the form of a focus group discussion.

Energy Safari is a six-player board game designed for a closed co-located setting and played with the support of a game master, usually a member of the research team. Players move their avatars across the board and seek to realize energy-related projects by finding partners among other players, securing permissions and providing the financing. The specific requirements to fulfil these three steps vary per project and are described in project cards that players draw from a deck depending on their position on the board (Fig. 1). Additional elements of the game include joker cards that allow players to overcome certain steps of project realization, rising energy prices and global events that take place at the end of each round, projects' contingent effects and interdependencies between neighbouring projects. The game attempts to balance competition and collaboration among players. Players need to achieve individual goals, but they need the support of their fellow players. Each realized project provides three types of revenues to the contributing players, leading to three possible winning conditions: a financial revenue in coins, a renewable energy output measured in KW points and a community output, also measured in points, that corresponds to the local social value of each project. It is in the three separate steps of realizing a project where players most intensely competed and collaborated with each other by establishing new rules and exploring the possibilities in the space afforded by the ambiguous rule set of the game. Some instances of the specific ways that emergent behaviours manifested during each step of realizing a project within the game are described in the following sections.



Fig. 1 Energy safari board during a gameplay session. The colourful cards describe projects. Realized projects are placed on the board, and each collaborator adds their own flag and keep track of their revenues in the board

4.1 Project Selection

People participate in local energy initiatives for different reasons that may include care for the environment, reduced energy bills, independence from big energy corporations, social cohesion (Boon 2012), adding local value and creating jobs (Rogers et al. 2008). As such, during the game, the selection of projects was often subject to personal experiences and ideological choices. Players often refused to participate to projects that they deemed unsustainable in real life, even when that meant that their in-game winning chances would be compromised. Upon picking a biodiesel related project card, a player involved in an existing community energy project said: “Oh! This is about biodiesel... No, I don’t want to do it. I don’t like biodiesel, I think it’s the stupidest thing to do!” (G605-1). In several cases, players already involved in energy initiatives in the city could answer quiz questions based on their practical knowledge. “This is what we do!” (G614-2) explained to his fellow players, a player faced with a question about energy cooperatives selling energy to consumers, after answering correctly.

4.2 *Forming Partnerships*

Each project card requests from the player to find a specific number of partners in order to realize the project. In order for another player to participate in the project, they have to invest a small amount. Should the project not succeed at a later step, this investment is lost. Should the project advance, each partner receives a one-time revenue of energy and community points and a financial return in all consequent rounds. As such, becoming somebody's partner includes a risk, but the earlier on a player invests the more profitable his investment could become in the long run.

As the exact mechanism of choosing one's partners is not specified, in some cases, players automatically adopted a first-come, first-served rule to forming partnerships. Project initiators advertised their projects and the revenues that their partners would receive, and players would chip in the requested amount. But as the number of required partners was always lower than the number of total players, several occasions of competition arose among players who wanted to participate. Sometimes players would ask the project initiator to explain in detail the project at hand, and very often they would bid their way to partnership by offering more than the requested investment amount: "If you want, I can pay two coins to join." (G614-1) Occasionally players would contest that or check with the game master if that is permitted: "Is that even allowed?" (G614-1), but most often, they would adopt this dynamic as an emergent rule and play along with negotiating the exact terms of the cooperation. In other occasions, partnerships were formed in terms of reciprocity. Players tended to include fellow players that had previously included them in their projects and exclude players that had excluded them. Collaboration based on reciprocity was stronger among players that knew each other than among people who only met during the game. A pattern that emerged in several sessions was that of excluded players punishing their fellow players by blocking the projects they were left out from: "I was not included, and I promised you were going to regret it." (G615-1). Blocking other players' moves intensified towards the end of the game, when players had a better overview of everybody's points, so blocking was used as a tool to hold back players that had collected several points and were closer to winning.

4.3 *Knowledge Exchange*

In order to secure permission for the projects, players have to roll the dice or answer a quiz question. Depending on the project, sometimes they can choose which option to use, and in rare occasions no permission is necessary but other conditions need to be met, such as paying a higher price for the project. When the choice between rolling the dice or answering a question was available, players were forced to choose between basing their project on luck or trying out their knowledge. The questioning mechanics indirectly provides players with some information about sustainability goals and the energy transition in the Netherlands. In practice, the quiz questions

proved to be one of the most collaborative elements of the game. Despite the fact that the question was addressed to the player currently playing, in almost all sessions players, sometimes only the project partners and other times all the players, started collaborating spontaneously in trying to find the correct answer regardless of whom the question was addressed to.

Some of the joker cards featured in the game allow players to go ahead without a permit or to learn the answer to the question and move on. An additional strong element of collaboration was the fact that joker cards were often used as a common resource. When the project initiator did not have a card that would allow her to overcome the question, other players would offer their cards, to the advantage of the group.

Player groups were mixed and included both people unfamiliar with and people involved in energy initiatives, as well as researchers and employees of the local government. That meant that some players were more knowledgeable than others in answering the questions, and other players would expect them to be able to answer the quiz questions correctly and wanted to use this to their advantage. As a player said to another: "OK then let's go for answering a question, because you work for the municipality, so you should know." (G605-2). From time to time, these expectations also led to interesting negotiations, where players would exchange coins, joker cards or the promise of priority inclusion in future projects. Often, knowledgeable players would avoid showing off and would prefer to either provide some clues or help players in other ways. On one occasion, a player not participating in a project preferred to sacrifice a joker card that would allow her fellow players to bypass the question, instead of providing the answer.

4.4 Bribing

A bribing mechanic also exists in selected projects. Players can choose to pay a few coins extra to overcome a disadvantageous chance to get a permit by rolling the dice. However, when they opt for a bribe they lose their community points revenue. This forced players to adopt an ethical attitude and decide whether they would engage in bribing and advance easier in the game or whether they would take the risk of proceeding with unfavourable chances of success. The following excerpt (G605-2), which brings together almost every manifested attitude towards bribing, demonstrates that some players self-imposed a rule of not bribing and not participating in projects that would involve bribing, while others agreed on the spot that bribing was not only accepted but even essential in advancing, and others went as far as to withdraw their participation from projects whose owner was not willing to be corrupted:

[Upon hearing that the project conditions allow bribing]

Player1: What? What? no... I 'm out obviously!

Player2: If the project leader wants to corrupt, I 'm in!

Player1: You are so corrupt all of you!

[...]

Player3: So if I throw the dice, you are all out?

Player2: I 'm out. If you roll, maybe there is no project... So you have to be corrupt!

4.5 Attitude Towards Local Government

The municipality or the province is most often the institution that provides the permits for the projects to go on. This reference to a real institution prompted players to share their personal experiences from the difficulties they had to face in trying to realize their own energy projects in real life, and to express their views on the role of these institutions in facilitating or impeding local initiatives, as well as on broader issues of policymaking. Some players referred to citizen initiatives being expensive to engage in because so much time is wasted in negotiations with local institutions, while others lamented their own difficulties in securing permissions and praised the game for representing them realistically: "It's too realistic!" (G605-1). Another a player said characteristically: "The permit is really the most difficult part of all. It's always the municipality, isn't it?" (G605-2). In another case, a question about the intended reduction of CO₂ emissions by the municipality triggered a long debate on the goals of the local government which were perceived as unrealistic: "Yeah, that's ridiculous, but it speaks about how the municipality thinks. That they can save so much just by energy saving." (G614-2). The conversation ensued with players commenting on the dependency on gas, the existing sources of electricity and potential solutions based on their recent readings.

5 Civic Learning Through Emergent Gameplay?

Mapping the emergent attitudes and interactions that develop during gameplay is a necessary step to identify any form of social or collective learning (Dörner et al. 2016; Medema et al. 2016; Wendel and Konert 2016), such as civic learning. In order to transform the gaming experience into a learning experience for the players, both individual and as a group, reflection, feedback and debriefing are crucial (Crookall 2010; de Caluwe et al. 2012; Harteveld and Bekebrede 2011; Lederman 1992). Thus, the debriefing sessions allowed the players to revisit their in-game actions and behaviours and link what is represented in the game with their real-life experiences (Garris et al. 2002). From changing and inventing new rules to share their real-life experiences and debating their opinions on current matters, civic learning has manifested in different degrees in all three aspects defined by Raphael et al. (2010).

5.1 *Bringing the Energy Transition One Step Closer*

In terms of encouraging players to understand and engage with the institutions involved in the energy transition, the participation of people with actual involvement in energy initiatives, energy policy and corporate pilot projects in the field of green energy contributed significantly to conveying both direct knowledge and a sense of vicinity to the stakeholders actually involved in this process. De Caluwe et al. 2012 assert that it is wise to include participants with relevant real-life experience in research-oriented games as these players bring their knowledge to the game and enhance realism. In the case of Energy Safari, the players with practical experience in the field of the energy transition were crucial in connecting the emergent gameplay to the topic of the game. They did this on one hand by bringing in their content-related knowledge and on the other hand by describing their real-life experiences to the other players, unwittingly keeping the discussion focused on the topic of the game.

The project cards and the knowledge questions played the role of conveying information related to the institutions and stakeholders involved in the energy transition, policy sustainability goals and existing projects and technologies. The clear structure of the project cards made the process of getting involved in a project more accessible to players with no experience in energy projects. Players with more experience, sometimes contested this simplicity but in doing so, they had to explain to other players the actual complexities that these projects involve, also indirectly contributing to building institutional capacity. Finally, the differences in players' attitudes towards bribing show that for some people, the game functioned as a mirror of their reality and for others, it represented a magic circle within which they could adopt behaviours that they would not adopt in real life. Games are considered safe environments for testing out difficult scenarios (Dörner 1996) and as the players' diverse reactions to bribing imply, in the context of a game, players feel safe in exercising behaviours that would be considered unacceptable or socially deviant outside the magic circle. In addition, this particular mechanic triggered several discussions on the actual existence of bribing and corruption in various levels of local government.

5.2 *Negotiation, Deliberation and Collaboration*

The second condition for civic learning according to Raphael et al. (2010) is the ability of citizens to articulate and claim their interests. Within the gameplay of Energy Safari, this was expressed both in the motivation behind selecting one project over another, in the ways players pitched their projects to other players to find partners and in how they handled cooperation and knowledge sharing. Some players chose their projects based on what was most beneficial within the game world. Others based their decisions on their actual ethical or ideological convictions in their decision-making, particularly concerning the selection of projects to initiate or invest in. As in actual planning processes, players had to negotiate with each other and find a balance

between their individual and collective interests. This level of interaction emerged by the setting and the attitude of the players. With regards to collaborating with one another, the game did not prescribe exactly how partners should be selected, so players invented a variety of rules, namely rules of speed (the fastest one to chip in is selected), rules of reciprocity (players exchanging partnership in each other's projects) and rules of bidding (including the players with the highest bid). Each of these rules privileges a certain value of partnering. The first-come, first-served rule was perceived as the fairest because it did not discriminate the players' attitudes during the game, whereas the partnerships based on the highest bid were disproportionately in favour of the individual gain of the project initiator. Reciprocity rules were based on acknowledging other players' in-game behaviour and rewarding or punishing it.

Apart from serving a direct transfer of information, the questions also triggered intense collaborative behaviours with regards to knowledge sharing and building upon the information provided by the question cards. The game designers expected that the player leading the project would answer the questions, but this did not occur in any single occasion. On the contrary, several new rules came to effect with regards to knowledge sharing among players. Firstly, there was a rule of collaboration among project partners based on dialogue and negotiations. Secondly, when consensus about the correct answer could not be reached, players would resort to voting for the correct answer. Finally, players would share joker cards among partners to the collective benefit of the project.

5.3 *Reflecting on Community Dynamics*

Participants to games, particularly ones for research, come to a game with the expectation to learn (de Caluwe et al. 2012). During the debriefing, most players admitted to have learned something on two levels: directly from the questions and indirectly from the gameplay about regional energy planning more broadly. Additionally, several players reported that they were inspired by the game to learn more about the energy transition in Groningen, while others mentioned that the main lesson they took out of the game was the complexity and interdependency of energy projects on a regional scale. Others focused on the necessity of cooperation in order to realize projects and win the game, a metaphor for a condition where a collective goal can lead to individual gain. This reflection also offers important indicators of the values that players assign to the different aspects of gaming, both content-wise and in terms of rules and interactions. During the debriefing, players were asked among others whether they were consciously following a strategy and whether they perceived the game as collaborative or competitive. Several players reported that they were just trying to get involved in as many projects as possible, without a real strategy and played rather individualistically. There was, however, a general agreement that in real-life contexts, people are also often willing to cooperate only for their personal benefit and not because they are intrinsically motivated.

6 Conclusion

Yap et al. (2015) argue for the potential of intentionally and sufficiently ambiguous game design to encourage players to construct part of the game experience themselves, outside of the hardcoded rules of the game. In the case of Energy Safari, the institutional space that was left open by the loosely defined rules allowed players to devise their own schemes of interaction, which increased enjoyment but also helped them reflect on their individual strategies, their position within the group and the contingencies inherent in real-life endeavours. Reflection over real-life situations consistently appeared in all groups and varied according to players' familiarity to energy-related topics. If the rule set was more strictly structured or the game master behaved more rigidly with regards to adhering to the rules, a lot of this knowledge exchange and consolidation would have been lost. Different initial conditions and rules would have led to different negotiations among players and different emerging rules. The potential of emergent gameplay does not lay with the exact outcomes of cheating, modding or inventing new rules, even when patterns become recognizable, but with its possibility to enable players to imagine new ways to appropriate, adjust, extend or improve the social, cultural and economic processes involved in the citizen-driven part of the energy transition. This inquisitive attitude has been connected to the value of participatory governance and extensive accessibility to knowledge, particularly through collaborative processes (Powell 2016) and is fundamental to a process of hackable city-making.

Emergent gameplay seemed to have a significant contribution in players' enjoyment and learning by indirectly enhancing their breadth. During Energy Safari, reinventing the rules of the game made players more aware of the formal rules and facilitated their experiential civic learning, at least with regards to reflecting on their current practices and reconceptualizing them within a wider social context (Dahlgren 2009). However, a significant limitation of this study is that the ability and willingness to transfer the acquired knowledge in the real world is only based on the self-reported intentions of the players. But since most players played Energy Safari only once because of the research design, there is little reason to assume that it will have any long-lasting effects. At best, it can act as a trigger for deeper inquisition into the topic of the energy transition. Games could lead to long-lasting civic learning, when they are used in various stages throughout the planning process, during which players can discover new forms of knowledge.

Mayer (2009) argues that games can be used in policymaking and public planning because they can model the complexity of technical, physical and economic aspects of policy-related issues as well as the social and political aspects by including human input not as digital agents but as real people. This paper adds that while games can indeed incorporate the technical and physical aspects of policymaking in the hardcoded rules, player input alone can only partly account for the real intricacy of social and political features. Observing and analysing emergent behaviour during policy-related games can become productive for actual participatory policymaking, making it more open to appropriation by the participating citizens. Games create an

environment where actors can still exchange information, while acting strategically to advance their own interests and demonstrating actual, spontaneous social interaction. Within the field of using serious games in urban planning, the study of emergent gameplay can offer indications of how similarly difficult to simulate behaviours might play out in the real world. Players bring into the game their irrationalities, assumptions and unconscious, tacit knowledge; all hard to delineate aspects that surface during the gameplay (de Caluwe et al. 2012). Through their genuine reactions and interactions, players of Energy Safari have spontaneously revealed how they regard the current energy policy as citizens. They have devised and implemented new rules in the game that make evident parameters, values and behaviours that are at play in thinking about and negotiating for a community project, such as a solar or biomass installation. Co-located games, be they analogue or digital, could potentially be used as negotiation and brainstorming tools to make urban policymaking more hackable, that is more tuned to the uncertainties and unpredictabilities of citizen input.

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Data Flow in the Smart City: Open Data Versus the Commons



Richard Beckwith, John Sherry and David Prendergast

Abstract Much of the recent excitement around data, especially ‘Big Data,’ focuses on the potential commercial or economic value of data. How that data will affect people isn’t much discussed. People know that smart cities will deploy Internet-based monitoring and that flows of the collected data promise to produce new values. Less considered is that smart cities will be sites of new forms of citizen action—enabled by an ‘economy’ of data that will lead to new methods of collectivization, accountability, and control which, themselves, can provide both positive and negative values to the citizenry. Therefore, smart city design needs to consider not just measurement and publication of data but also the implications of city-wide deployment, data openness, and the possibility of unintended consequences if data leave the city.

Keywords Open data · The commons · Data stewardship

1 Introduction

This paper explores the complex relationship between cities and data or, more accurately, the way that the citizens of a city want data about their community to be managed. Openly accessible data is often argued to provide the best ways for citizens to organize themselves around relevant issues and hold accountable those in power. Our research into one community’s gathering of data about flooding not only helped them to organize around the issue but also helped them to solve a recalcitrant

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problem. However, we also found that making this data available as open data would lead to community impacts that were most unwelcome.

We will argue that in data governance for smart cities, the notion of ‘data as commons’ is crucial because community data is best understood as a rivalrous good that requires stewardship *by the community*. In addition, the notions of ‘datashed’ and ‘contextual integrity’ are presented as helpful in coming to a more nuanced strategy for the management of data and understanding of the affordances provided by data for communities. Simply put, we will argue that citizens of a smart city can find value in collecting and sharing data, but that they may also find value in restricting that data’s flow. Sharing and sheltering strategies will define data governance policies, which will, in turn, define how people can use that data for ‘hacking the city.’ We’ll close the paper with an argument that communities themselves must act as stewards of the data about their community and that sometimes this means that the data will not be fully open.

1.1 *The Value of Data*

The past decade has seen an explosion in the creation of—and interest in—data. Data had been growing in decades past, driven by individuals using the Internet and then mobile technologies. Most recently, we’ve seen volumes of data collected by digitally instrumented and connected devices. This superabundance of data has been called ‘The New Oil.’¹ This metaphor brings connotations of boomtown economics based on data flowing from a source to a purchasing destination. Indeed, most of the discussions of such data emphasize the financial returns and the importance of data acquisition. As one CTO has put it: ‘Even if I don’t know yet how I’ll use that data, I want it because I can store it so cheaply. My data science team might find a use for it.’ (Bertolucci 2014). The economics of data appear to be driving an explosion in surveillance undertaken by those large organizations with the reach and wherewithal to gather the most data. From this point of view, one could imagine a ‘smart city’ as a locus for the creation of new financial value for some favored few of its constituents. Given this, the city can be seen as a site of increasing surveillance—although, often, for no reason other than to enable a private entity to collect additional data for itself as it provides municipal services.

In contrast to this private acquisition-focused approach to ‘The New Oil’ is the Open Data philosophy, where data has no private owner and is made available to any and all. McKinsey Global Institute (Manyinka et al. 2013) argues that opening data up to broader sharing and use could generate \$3–5 trillion in economic value over the coming decade. Research suggests that these open approaches to data offer a variety of benefits. For instance, our own research in the Chilean *comuna* of Peñalolén

¹The quote ‘Data is the new oil’ has most commonly been attributed to marketing professional Clive Humby in a presentation at the ANA Senior Marketer’s Summit at the Kellogg School of Management, 2006.

showed that opening up city government procurement systems led to greater local participation in contracts, with more equitably distributed economic benefits (Kitner et al. 2007). In an entirely different arena, farmers using shared water data were able to demonstrate their ability to manage a watershed and avoid unwanted government intervention (Levin and Beckwith 2015). In a different arena yet again, Mann et al. (2002) have argued that ‘sousveillance’ by the populace, eyes on the powerful, would produce greater government accountability. Thus, freely shared (or open) data can have many positive effects.

For all of open data’s potential benefits, it is itself also a problematic construct, requiring us to ask such questions as who benefits and who might be harmed by the unselective sharing of data. Raman and Benjamin (2011), for instance, document what happened when Bangalore, India, put property ownership data online in the hopes of providing greater transparency and efficiency in property records. This inadvertently created a situation where those with the technical means and education were able to identify and effectively seize property that had problematic records. This enabled wealthier, more educated citizens to effectively steal land from citizens with less education, less technology access, or more tenuous legal claims on the property. Similarly, this chapter will address a smart city application focused on urban flooding. From one perspective, the open sharing of such data helped residents identify the source of the problem and organize for collective action. From another perspective, this community discovered that open flood data could, perhaps undeservedly, put some homeowners at risk of seeing property values suddenly and steeply decline.

In addition to these issues about who should share data and the potential impact on monetary value, there is also non-monetary value associated with data. Common models for dealing with smart city data do not seem to appreciate possible non-monetary values of data for the community (e.g., social value). This lack of awareness creates a sword that cuts two ways. On the one hand, the acquisitive private ownership model seems to see data only as material for ephemeral monetary transactions that have no history or future (Gudeman 2001). To this way of thinking, there are no relationships among people with which to be concerned. The community, to whom the data may refer, will have been forgotten. On the other hand, proponents of open data, in their rush to shed light on every aspect of a community, forget that communities consist of relationships and have boundaries. These relationships and boundaries help the community to cohere but are also vulnerable to forces from outside the community. We will see that sharing data can be detrimental to those relationships. Because of these issues, smart cities need more nuanced ways to think about data.

1.2 *Thinking About the Flow of Data*

Much of the recent interest in data is due to the fact that data has monetary value, but the value under discussion will accrue only if data flows. As we’ve noted, data can have both positive and negative values as it flows from one constituency to another. Given that data flow can create new value and can increase or decrease existing

values, we must ask: What data governance policies will best serve the citizens of a smart city?

Data doesn't flow by itself. It is pushed and pulled between different constituencies with their own goals and desires. Policies for data access and use create affordances that allow for these changes in value. Facilitations and constraints are placed on data flows, and these can determine the ways in which people can hack the city. Since it is the city's policies that create these affordances, they also must ask: How will these policies make our future cities 'hackable' in ways that citizens and communities desire?

In our thinking about how to construct a data governance policy for the people, we build on three conceptual frameworks: *the commons*, *datasheds*, and *contextual integrity*. These each inform our thinking about how smart city data *should* flow. The commons are community resources meant to be freely used by those in the community (in this discussion, that resource will be data). 'Datashed' is our term for all of the constituencies among whom some collection of data flows. Finally, 'contextual integrity' is a privacy framework (Nissenbaum 2004) that argues, in part, that people's expectations of information flow and use within a given context will determine their perception of privacy violations. Citizens' perceptions of privacy requirements for community data can be used to establish better policies (and regulations) for who should be able to use the data and for what.

1.2.1 The Commons

The commons is a well-known concept having to do with resources that are shared by members of a community: 'common pool resources.' Work regarding the commons (e.g., Ostrom 1990) is important to consider, especially because recent years have seen a very reasonable push to make civic data 'open.'²

Open data has often been said to establish a 'data commons' (e.g., Grossman et al. 2016). Commons resources are considered public goods, meaning that they are accessible to the public, and also *rivalrous*, meaning that their use by one precludes their use by another. Rivalrous phenomena are contentious because of the potential diminution of the value of the resource for later users. As an example, the grass in a shared grazing land: If one person's cattle eat all the forage, there will be none left for the cattle of others. Because of the rivalrous nature of common pool resources, they need to be protected from overuse. A key focus of Ostrom's studies of the commons is how non-market mechanisms are used by communities (and not a remote government or local gentry) to enact stewardship and to ensure sustainability of such

²Two examples: (1) By Executive Order, the US government ("Making Open and Machine Readable the New Default", 2013) has mandated that 'Government information shall be managed as an asset throughout its life cycle to promote interoperability and openness, and, wherever possible and legally permissible, to ensure that data are released to the public in ways that make the data easy to find, accessible, and usable.' (2) Open data is described by UK-based Open Knowledge International: 'Open data and content can be **freely used, modified, and shared** by **anyone** for any purpose' (emphasis in original).

resources (1990). Research into stewardship has established the deep intermingling of resource management and the community's social and cultural practices (Netting 1981; McKay and Acheson 1990).

One of the conceptual challenges of considering open data as a commons issue arises from the fact that the notion of data 'ownership' is fraught.³ Consider that data is often created at points of interaction among multiple parties—at the point of purchase, for instance, involving a buyer, a vendor, and a credit card company, all of whom may feel some entitlement to transaction data. All three are actors in the sales event. Clearly each of these actors has the potential to claim ownership. Data, therefore, often has ownership claims distributed across a number of parties. Dealing with these claims is one of the roles of a smart city.

Data *about* the commons increases this challenge. Should a private party be able to exclude community members from seeing data that the private party has collected about a community resource? For a negative example, consider whether a London cabbie (or London Taxi and Private Hire, which oversees the test for 'The Knowledge' of the arcane London street map) should be allowed to stop people from using GPS-enabled mobiles with maps because cabbies have traditionally been associated with The Knowledge. This kind of restriction is certainly not in the service of greater London (or anyone aside from cabbies) and wouldn't be likely to find much support, legal or otherwise. Maps of public thoroughfares can be owned but not the right to map. We might ask whether a private party could withhold from public view any data about 'public' resources. Consider, for example, privately collected data related to a grazing ground or even weather data. Should private companies be allowed to collect such data and keep it private? Examples from our fieldwork (reviewed below) suggest that the answer is not so simple.

In addition, questions about the rivalrous nature of information resources themselves raise another difficulty. In some ways, it is compelling to find a conceptual difficulty considering open data as a commons issue. Digital data can be copied endlessly with no diminution to the original in physical terms. Unlike most material goods, data and information are often considered non-rival goods—their access or use by one party does not preclude access or use by others (Benkler 2004).⁴ We believe that, in rivalry, the value of the resource is key. While it can be argued that data copies easily without changing the ability to physically access that same data for another user, access and monetization of the data do not exhaust the values that a piece of information might have. In fact, information (the stuff of open data) has been argued by Aragon (2011, discussed below) to have at least three forms of value—economic, sociological, and identity. The diminution of *any* of these values due to circulation, then, demonstrates that information resources are potentially rivalrous. Stewardship of the data itself, to which we shall now turn, is how communities can preserve those values.

³Indeed, Bezaitis and Anderson (2011) argue that, in the context of so many new information technologies, the very concept of ownership is in a state of flux.

⁴See Benkler's (2004) exegesis of non-market production of digital information and the results of the placement of that information into the commons.

Stewardship. Elinor Ostrom was awarded the Nobel Prize for her work on stewardship and the commons. Before her work, many economists had been swayed by potential overuse—‘the tragedy of the commons’—and argued for the rationality of removing rivalrous shared resources from the common pool (e.g., through private ownership of these resources) (Hardin 1968). Instead of privatization, Ostrom showed through her work investigating communities where the commons were left to the community that local stewardship could be effective. Ostrom offered eight ‘design principles’ (1990) that were present when communities could effectively engage in stewardship. These design principles were: (1) well-defined boundaries, (2) broad compliance with shared stewardship practices within those boundaries, (3) locally relevant stewardship rules, (4) effective compliance monitoring, (5) appropriate sanctions for non-compliance, (6) mechanisms for easy arbitration, (7) broad recognition of local powers, and (8) tiered management for large resources. When most (but not necessarily all) of these are in place, a commons can be effectively and sustainably managed from within.

One well-known example of effective commons stewardship involves the lobstermen of Maine as they worked together to manage fishing practices to ensure a sustainable lobster population (Acheson 2003). This example embodies many of the principles Ostrom noted as necessary to protect the commons. Here, the threat of over-fishing lobster in local estuaries could impact livelihoods so government regulation was proposed as a reasonable strategy for ensuring that lobsters would be plentiful. The community resisted outside regulation. To forestall regulation, the fishing community drove a set of relationships and agreements among various constituencies, including dealers, legislators, conservation groups, and state agencies (among others) to develop a set of institutional practices. These practices were developed to protect a common pool resource, that is, the lobsters around the Maine coastline.

Ostrom’s principles were well represented here. In this case, (a) lobstermen and parties with economic and ecological interests in their activities, (b) within a specific state of the USA and a region within that state, (c) saw the threat of a reduction in the output of lobster, and (d) they developed rules that could be easily enforced through sales channels. This locally driven approach proved to be remarkably effective.

Stewardship of information. Research on the commons has also been applied specifically to the use and sharing of information (Kollock and Smith 1999). When we consider how stewardship of that information should be accomplished, we must look to the community itself for local guidance because the ways in which a particular community may choose to enact stewardship can vary in surprising ways. Aragon’s (2011) work provides a specific example of the ways in which different communities steward similar information differently. Aragon looked at the surprisingly dissimilar ways in which two communities control the flow of similar information in order to steward their respective cultures. She frames her discussion in terms laid out by Gudeman: ‘taking away the commons destroys community, and destroying a complex of relationships demolishes a commons’ (2001, 27). That is, the commons and the specific community that shares it are inseparable. Aragon argued that controlling the flow of information is one way that communities express and steward their culture. Considering how communities choose to steward their culture (and their shared

information) allows us to see that it is not just the information but also shared beliefs about that information that define the practices of data governance.

Aragon compared two communities that manufacture textile goods and the different ways that they handled information about how these goods were produced. One employed a ‘circulation’ strategy in which they were happy to have outsiders gain access to the knowledge of the methods that they use to produce the goods. Another employed a ‘sequestration’ strategy where they tried to keep production methods a secret outside of their group. Their choice of strategy depended upon what type of value people were trying to steward. In the first case, the community felt that if their knowledge was kept alive, that would keep their culture (and community) alive so they chose circulation. The second community feared that if outsiders shared the knowledge of how they produce their goods, then the outsiders could steal their relationships with customers and their community would be diminished, so they chose sequestration. These contrasting strategies for stewardship—circulation and sequestration—are valuable concepts to use when we think about how a community wants to share data. It is worth noting that what is called ‘circulation’ here is the typical notion of open data. Sequestration, though, does allow for some data flow, but the flow is limited only to those inside a defined community.⁵

1.2.2 Datasheds

As described by Ostrom, a key element of successful management of a commons is a clear sense of physical boundaries. In talking about data circulation, one must address the boundaries within which data circulates. This is what Levin and Beckwith (2015) called a ‘datashed.’ Just as a watershed helps hydrologists think about water, looking at the circulation of data—its datashed—helps us to think about civic data. Because information shifts in value as it flows, observing the sites to which data flows tells us about how value may be assigned, who collects the data, and also tells us more about what those people care about.

Levin and Beckwith (2015) examined a community where a recent initiative had sought to use ‘Internet of Things’ (IoT) technologies to instrument a wide variety of industries and sectors. The data generated by these technologies was meant to flow not only between various constituencies with a history of interaction (e.g., among local farmers and the truckers who move their crops) but also to bring in new players who may have an interest in the data (e.g., investors in commodity futures or the banks that loan money to farms). That is, data would not just be used by the collectors and those with whom they collaborate to bring a product to market; the data would also be used by people within the same or adjacent industries and even people interested

⁵Not collecting data at all is a strategy, too. Some Native American communities do not collect or map the sacred sites for tribal members and, as a consequence, the tribes cannot share such information with those who would seek to develop the lands. What’s important to note here is that communities make decisions about data flow. Communities act (either as a collection of individuals or in concert) as the owners of the data.

in the data for purposes entirely distinct from the original intent. The datashed would include all of these people.

Levin and Beckwith called the value of data as it circulated outside the initial site or original intent ‘circulatory value’.⁶ Circulatory value has implications both for ‘sheltering’ and ‘sharing’ approaches. Positive circulatory value (for sharing) will depend upon the existence of an alternative constituency which may or may not have a common interest. Data only have value when their use or restrictions on use help someone achieve a goal. Once we understand this, it becomes easier to see why people often have concerns about downstream recipients of data, especially when that other’s goals are incommensurate with their own. This is where expectations of privacy come in and why we think it’s important to consider contextual integrity.

1.2.3 Contextual Integrity

Contextual integrity is the privacy framework that we used to think about the role of communities in data governance decisions. Contextual integrity (or Privacy in Context) (Nissenbaum 2004) provides a structure for addressing issues around stewardship by allowing people’s expectations of privacy to shape the rules for information flow. Contextual integrity establishes a framework for the problematic challenge of ensuring privacy in a society where new information technologies enable an ever-increasing sphere of public surveillance. Contextual integrity uses a concept quite like datasheds called ‘contextual boundaries’.⁷ Individuals define these contextual boundaries to contain the entities to which they believe their personal information might reasonably flow. The boundaries exclude entities to which the data should not flow. Through contextual integrity, we are able to identify a number of lenses through which to consider the ‘sharing’ or ‘sheltering’ of civic data. Within the framework of contextual integrity, Nissenbaum talks about three roles that people might fill with respect to shared personal information: information receiver (the person to whom data is transferred), the information sender (the agent acting to transfer the data, to cause it to flow), and the subject (the entity whom the data is ‘about’).

Nissenbaum’s work has been primarily applied to issues of personal data and privacy, but it is also a useful framework for thinking about the circulation of civic data. Specifically, combining the concept of contextual integrity with an understanding of civic data as a common pool resource, we can ask how community members, in addition to municipal governments or other large institutions, might contribute to and interact with data and information that is deemed valuable by the community. What facilitations and restrictions on gathering and use need to be applied? How should flow be controlled among community, municipality, and state? What about private

⁶This circulatory value, when considered in the context of Aragon’s work, could be the value of having one’s culture survive.

⁷Datasheds focus on the places where data flow. There is no sense in which the goals or values of constituencies are reflected. Contextual boundaries, however, do address goals and reflect desires with respect to data flow.

enterprise? It also raises questions such as what are the settings in which data might be appropriately gathered, who might legitimately lay claim to such data, and under what circumstances might it be circulated?

Before getting to our case study, we should review the three areas we believe are important for thinking about them. We have reviewed work on the commons showing how local governance can lead to sustainable resources. We talked about data flow and how various constituencies may interact with a set of data within what we are calling a datashed. Finally, we explored how rules for flow might be constructed so as to preserve contextual integrity—privacy.

We will now turn to a focused case study to help us understand data governance for a smart city. In addition to highlighting the importance of situatedness, the example below demonstrates the ways in which data or information can bring together opposing constituencies. In this particular case, it happened that some of those brought together by the data were somewhat unwelcome by others. In addition, and as a consequence of those unwelcome others, this example also provides a clear example of where a community wants to withhold data about the commons from others. It is our contention that the problems occurred because the interpretations of the data by remote users of the data were at odds with the understanding of the data shared by local community members, whose situated knowledge provided a different understanding.

2 Case Study: Watersheds and Datashedes

This case study concerns a US suburban town that had recently developed a significant problem with flooding. We worked with residents over a two-year period where we also spent time with government agencies that were undertaking activities in the community. We also worked closely with an advocacy group that was trying to influence policy and funding in the community.

We spent considerable time with one woman, in particular, who had lived in her house for over 25 years. In more recent years, her home had flooded over ten times. She was initially told by local government officials that there was no change in flooding within the community and this was a problem that was hers alone. Based on the fact that she lived hundreds of meters from the stream that was flooding and that a lake regularly formed in the backyards of all the people on her block, she knew this was not her problem alone. She described for us how she set about trying to get her neighbors involved in finding a solution. She canvassed the neighborhood and found others, like her, who were suffering property damage from an increasing number of floods. She enlisted these others to help the community understand more about the new floods. The group decided to create a map of each flooding event. With their mapped data, they were able to demonstrate that there was a significant flooding problem across their community and again asked the local government for help.

Even after collecting the data and sharing it with town officials, she and her neighbors were told that there was nothing that this group or even the town could

do. The officials claimed that this flooding was caused by climate change. It was, in effect, the new normal. This narrative held that because of changes in patterns of precipitation, the existing infrastructure was no longer capable of supporting the runoff and that changes in infrastructure would need to be balanced against other municipal expenditures. The community group did not believe this explanation and felt that infrastructural changes in an upstream community were to blame. These infrastructure changes were well known to this group, and they had a theory of exactly how it might have influenced flooding in their community. Their theory was supported by the data that the group collected.

The potentially relevant upstream infrastructure changes were discovered because another aspect of the group's work was to try to find the water sources, so they explored the full upstream watershed during flooding events. They found the locations where the stream flow began to increase substantially. There was one spot at a golf course where, they discovered, the culvert leading from the course was recently cleared of brush to facilitate drainage into the head of the stream. Another spot was the site of recreational sports fields that had been built in the past few years. A retention pond was built to compensate for the change in water flow that was caused by the sports fields, but this group observed that the pond was not filling during flooding events. These facilities were not in the same town but in an adjacent town where the flooding stream originates, and the incomes and property values are higher.

The group also tried to see what kinds of government programs were available to their community and to share this information with their flood-mates. This was when they discovered that certain federal money would be hard to get. It seems that, according to the Federal Emergency Management Authority (FEMA) maps, they were not in a floodplain. This did not preclude getting government funds but made these funds more challenging to access.

Their town had no jurisdiction in any case since the problem originated upstream. This exemplifies an interesting property of datasheds: A datashed is not necessarily coextensive with a single jurisdiction. A community can choose to extend its datashed well beyond the community's jurisdictional boundaries. This group pushed beyond the officials of their town and sought relief from regional and national agencies charged with stewardship of the waters. When they tried to see if there was something that could be done to protect their downstream community, they were informed that they were ignorant of the situation and lacked credentials required of someone who could understand a watershed. Nevertheless, they had a body of theory, data, and maps which they subsequently brought to many public meetings.

At one of the more raucous public meetings, there was a representative of the upstream community that the residents blamed. He was quiet through much of the meeting but when residents started to complain about his town and blame the upstream community for the floods, he stood up and informed the group that he worked for the town and was, in fact, the person in control of the retention pond and that it, too, was overflowing during flooding events. The group then produced photographs they said were taken during floods that showed the pond was not filled as it should have been. He questioned whether the photographs were actually taken when the residents claimed. This photographic evidence was open to being questioned,

but the accusation was now out there. Interestingly, after this meeting, whenever there was a heavy rain, the group would go and check the retention pond, and it was always full. More interestingly, the flooding also abated. It would seem that the residents were right. Despite their lack of hydrology credentials, they were able to use their awareness of local conditions to collect relevant data and interpret this data in a manner unavailable to their credentialled but remote partners.

The story is not yet over. This community next faced a new problem. Recall that FEMA maps did not have this community as a floodplain. Across the USA, FEMA is in the process of redrawing the flood maps that it uses to assign risk to communities. Existing maps are inaccurate and insufficient, but it is expensive to collect new data. To what extent should the data that was collected to argue for these successful mitigation strategies be used to characterize the flooding potential of the community? Recall that flooding in this community was felt to be a function of upstream mismanagement, a problem that has been rectified. The homes are not flooding as they were. What FEMA would like to do is to use the data collected by this community to determine the level of risk to assign. Obviously, if they use that data without considering that potential causal factors have been addressed, they will determine that a large number of people need to carry flood insurance. This insurance could add about 20% to the average monthly mortgage payment and potentially reduce the value of homes. Community members feel that this is unfair as the data had been used to fix the problem, and they decided that they were no longer willing to share data with the federal government. That is, they developed a sequestration strategy.

2.1 Circulation and Sequestration

While free circulation—that is, open data—is a popular option for data from the smart city, sometimes data may be better suited for a ‘commons-like’ treatment. A more suitable option may be free use within the community, but sequestration of that data with respect to some parties or for some uses outside the community. With this in mind, we address sequestration with respect to data about the commons.

We might ask first, what are the boundaries of the commons? The datashed, watershed, and jurisdictional boundaries can all be dissimilar. That is, the boundaries of one may not be the boundaries of another. The first data flow option to occur to a community might be to allow data to circulate freely to enable openness and accountability. However, expectations around data flows are important to understand. Contextual integrity tells us that we should be especially concerned with the expectations of those whom the data is about. We believe that the ‘subjects’ of commons data are community residents, those locals charged with stewardship of the physical resources of the commons. This militates against the notion that all potential constituencies of the datashed should have equivalent access to the data or equivalent power in determining data flows.

One point to consider here is that the datashed is sometimes not the same as the resource boundaries because the resource may be controlled by actors who are outside that boundary. Frequently, elements of jurisdiction or control over a resource are a function of distant parties, and in these cases, data sometimes must be shared with these distant participants. The datashed, then, cannot be constrained to the entities within the boundaries of the resource. When distant authorities regulate local resources, they may use locally collected data as a tool. What we show here is a case where the locals who collect the data want to sequester the data from some distant authorities who are desirous of regulation.

As noted, open data circulation can be quite beneficial. However, it is also the case that sometimes people do not want specific data to circulate freely or to share that data with specific others. For example, misleading data that is consistent with frequent flooding or even the risk of flooding can be used to mandate that home owners carry significant flood insurance which can impact the value of a home. It might come as no surprise that some people are hesitant to share information. They don't want open data—maybe just *slightly ajar data*. Some people might argue that anything less than full disclosure of this information is dishonest. What if the data being shared would easily invite inferences that are incorrect?

The costs associated with sharing are a consideration for people in the community. Even before the time that the upstream problem had been addressed, let alone FEMA threatening to reduce the value of their homes, one community member told us that some ‘people are always afraid that it’s going to be “information means punishment”.’ It is not that they do not wish the problem solved, they are simply afraid that they will ultimately not benefit from data sharing.

Sequestration does not mean that there can be no sharing at all. These people were happy to share their data with those involved in mitigation. The sequestration that they argued for would restrict the parties among whom the data would circulate and the purposes to which the data could be put. This request is not out of line with how we would expect stewardship to come into play around data that a community has willingly collected. It hardly needs to be said that an unwillingness to participate in sharing is quite problematic from the perspective of open data. If people do not participate, there will be no data to make open.

2.1.1 Outstanding Problems

Community-led circulation and sequestration decisions may not work to support every individual. Consider a person who wants to opt out of the flood information system because they do not ever want to share their flooding status with anyone. What if they are right in the middle of flood zone? A system using local topography and the presence of water in some locations could clearly implicate their property as one that would be inundated before a neighbor’s (higher) property. How can such a person opt out? It really is not an option. Inferences can be drawn from a neighbor’s data. With open civic data, there may be no way to truly implement an individual ‘right to be forgotten’ since the inferences across the commons are made irrespective of

the individuals. Yet, properties associated with individuals may be easily identified. Figuring out governance issues such as how to protect or whether to protect data in such a system will be important.

One of the issues with civic data is that, by providing transparency, this data can support accountability. That was certainly the case in Peñalolén where community residents were finally able to profit from municipal procurement (Kitner et al. 2007). It was easier to see when money was being spent and whether favoritism was involved in vendor decisions. Accountability, in fact, is often held up as one of the most important outcomes following from open data. However, one person's accountability can be another's control. By making visible the results of one's actions, this could invite inferences about activities or states that one might prefer not to imply. Sensors cannot show that reasonable decisions have been made for reasons outside the view of the sensors. If interpretation of data requires contextualization that is not available to all data users, how is that accountability?

Another issue with open city data is something that we have seen widely throughout the IoT developer world. Many denizens of the datashed are not capable of managing the data science to produce answers to the questions they would ask. Others may be vulnerable to exploitation by tech elites as we saw earlier in the Bangalore example (Raman and Benjamin 2011). This lack of data science expertise means that some people will not know how to meet their needs relative to the circulating data. This does not mean that they will not be part of the datashed. In fact, people may not have an option; the data may implicate them in any case. What this lack of data literacy means is that some people will need to enroll others in the datashed who will educate, represent, or collaborate with them.

3 Discussion and Summary

As we think about hacking a smart city, it is wise to think about what a smart city does. At smart cities' core is the creation and use of data for new services. Many proponents of smart cities encourage the idea that this data should be made open to support a new economy. The main argument of this chapter is that smart cities have a choice of what to do with their data; information resources can be open and available to all or they can be understood and managed as a commons. There are significant differences between these two options. On the one hand, open data is typically free to all with no owner controlling the flow of data. On the other hand, a data commons, as is true for all commons, should be about resources held in common by a group. A data commons effectively asserts group ownership of the information resources. This data would, of course, be collected and distributed to benefit that group.

Rivalry, Stewardship, and the Commons. We argued that the shifts in value that follow from data flow allow us to conceive of information as rivalrous and, thereby, characteristic of what stewardship of the commons is meant to manage. The changes in value we've referred to have to do with value being created or destroyed as data flow from one constituency to another. If value for the first constituency can

be lessened by the flow of data to a second constituency, then we have a form of rivalry.

Because of this potential rivalrous nature of data, stewardship of informational resources will be key to a successful data commons. A commons has the property that the community has to take care of (or steward) the resource. The community has to worry about sustainability and equity and must, in the case of information resources, put data governance procedures in place that will ensure these.

This means that cities have a social role to play with stewardship of data. Data governance needs to consider data gathering, analysis, sharing, sheltering, and is, above all, necessary so that the community has control over shifts in value. They will be concerned with the circulation and sequestration of data flows both inside the city and when data leave the city. Stewardship is not just about the data while it is in the city. Stewardship is for the life of the data throughout the datashed.

In addition, we argued that while smart city data can create community, not all communities are created equally. When needs are met and value created by broadly accessible affordances, various constituencies can be formed, some with ties to the community, some without. Within the city, constituencies will mostly be composed of those with some kind of relationship to the resources or phenomena being measured. Although the data is produced by measuring phenomena within a community, other constituencies can be brought into the datashed by data alone. Because their interest is only in data, these outside communities can more easily have interests that conflict with those stewarding the measured resource.

We have argued that stewardship is one of the social roles that the smart city must play. There is another way to look at data stewardship that is perhaps even more obviously social. Stewards of information resources must understand the range of players and consider the pathways and consequences of how data will be used. A smart city is the most likely candidate to define the criteria for admission to the datashed and communities need to trust city administrators to put good data governance in place. In making decisions about sharing, they may be ‘inviting’ outsiders to interact with city resources.

Who Owns the Data of the Smart City? In terms of real ownership, it might be reasonable to say that no one owns a data commons. That is why no individual is empowered to sell to another that thing over which they are the steward. The most important aspect of a steward is that their job is to take care of a resource so that its value does not diminish for others.

Given that the same data could have both positive and negative impacts, it is important to ask who should make the stewardship decisions and whose positive and negative impacts should have priority. Not everyone who might have a stake *in the data* should have an equivalent say in data flows. Obviously, people who see value for themselves in the data would be interested in how the data flows but an interest in extracting value does not give them the right to control the data. Also, among those with a stake in the data are those who see a potential diminution of value (of the measured phenomena, the data, or the community at large) when that data moves beyond a ‘contextual boundary.’

Among each of the potential constituencies, just one can make the final decision as to which values must be preserved and which flows must be forbidden. Whose values are most significant? We know from the work in contextual integrity that when data is *about someone*, expectations of privacy are most significant. Perhaps, then, the question should be ‘who are the data about’? In many ways, the data could only be ‘about’ a community that knows how the data relates to the measured phenomena, people who know how to interpret the data as it relates to the local resource.

Data is ‘about’ locals, since they are best able to understand the data and its meaning. Some potentially impactful interpretations of data actually require situated knowledge, the requirement for which impairs the distant communities’ interpretation of local data. In our fieldwork, for example, the implications of circulating data (without situated knowledge) could be seen as negative and unfair.

We have tried to show that typical ‘smart city’ data—data about the commons—may require restrictions on data flow. As we’ve seen, openness of data may not always be the best thing for a community nor what a community might choose for itself. Circulation and sequestration are data stewardship strategies that need to be considered with smart city data. Whatever strategy is chosen, processes need to be put in place for decision-making that are consonant with community desires. Then the stewardship of information resources can help people to work together. This is one way that communities can cohere.

Smart cities can be a locus for the creation of new value for those within the city. They can also be the locus of serious breaches of trust where information can be shared to provide value to others while it simultaneously harms city residents. As a bulwark against this, we believe that a city should manage its data as a commons. To do so means trying to understand potential data flows and the values of the communities within the city, while also being respectful to rightful claims of ‘ownership’ and rules of stewardship. If cities do this, they can expect that the citizens of the smart city will be better served by the smart city itself and will be more strongly invested in its success.

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Part IV
Theorizing the Hackable City

Hacking, Making, and Prototyping for Social Change



Ingrid Mulder and Péter Kun

Abstract Even though emerging city-makers are increasingly organized to trigger social changes, it is still hard to apprehend their real power to transform space and the way we live together. In this chapter, we explore how designerly approaches, such as hacking, making, and prototyping, can empower emerging city-makers to trigger a broader change and transformation process. It can be concluded that hackable city-making can make a difference when combining top-down public management with bottom-up social innovation. A patchable plug-in platform might enable emerging city-makers to create value for the city and for society. However, it asks for new ways of participatory governance that enable these emerging, heterogeneous city-makers to participate actively in exploring the collaborative envisioned potential and to have constructive dialogues aiming for transformational change for the common good.

Keywords City-making · Urban interaction design · Societal challenges
Systemic change

1 Introduction

Every day, new individuals, new creative communities, and new collaborative networks get organized to ‘reclaim’ public space, spatially, physically, and politically. Even though they intend to trigger substantial changes, it is still hard to apprehend their real power to transform space and the way we live together. At the same time, mundane cities are being laced with sensors and mobile technologies that are generating a myriad of opportunities for developing smart solutions and generating new directions for social innovation. When these emergent technologies *go urban* and

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become embedded into our everyday lived environments, these technologies have the potential to transform our public spaces, and more importantly how we live and interact together. In the cities of the future, a digital landscape overlays our physical world. Differently put, computing is not just with us; it surrounds us, and it uses the context of our environment to empower us in more natural, yet powerful ways (Urban IxD Manifesto 2014). Urban interaction design is a forming field that explores new methodologies for new ways of city-making elaborating upon the fact that the ‘making of the city’ is no longer the sole concern of urban planners (Brynskov et al. 2014). No longer do their methodologies, expertise, and theories suffice to address the increasing complexity cities face. That is why designers of all sorts, IT specialists, urban anthropologists, philosophers, HCI researchers, artists, and sociologists are increasingly teaming up in coalitions that up to a few years ago were unthinkable to come up with (Brynskov et al. 2014).

Although promising, these opportunities also contribute to an increasing complexity in city-making. In the current work, we view this increasing complexity in city-making as a collaborative design challenge and explore how designerly approaches and co-creative activities, such as hacking, making, and prototyping may bring city-making activities further than grassroots activities and generalized smart city ‘visions’, aiming to trigger a broader change and transformation process. In our view of city-making, smart solutions only work when they fit in with as well as arise from the everyday settings people live in.

In other words, traditional city-makers need to collaborate with grassroots’ initiatives and other active citizens in changing city lives and living conditions. More specifically, we explore how the core mechanisms behind hacking, making, and prototyping intertwine, and next, we discuss how this triad can enable emerging city-makers to positively influence urban interaction design projects for systemic change.

2 City as a Platform

As the physical and digital aspects of a city started to interfuse and the stakeholders that create value for the city became multi-faceted, the city itself has become a patchable plug-in platform: a platform for city hacking. Platform thinking addresses the interplay of data, technology, and community. In keeping with the ‘Hackable City’ metaphor (de Waal et al. 2017), this interplay resembles the commercial platform of Github: a platform to connect individuals, organizations, and open-source projects to better software projects together. The city as a platform connects its citizens with its decision-makers and local projects, enabling all the stakeholders to combine top-down planning and bottom-up participation in patches to better their city.

On the city as a platform lays interaction design’s stretch towards the urban scale, which also redefines how the fuzzy front-end of the design process is conducted: citizens navigating in a rich urban context, in order to improve life quality in their proximity, working with democratized technology within their reach. Aiming to get

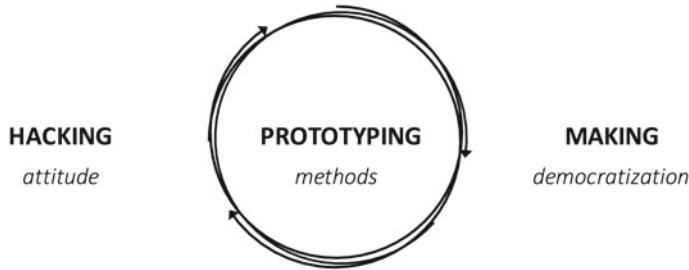


Fig. 1 Hacking, making, and prototyping in relation to each other

a more nuanced understanding of the city as a design platform, we elaborate upon the concepts hacking, making, and prototyping while entering the cityscape. In the next sections, we discuss these concepts, which hold several different connotations, and make them operational for hackable city-making, using an urban interaction design perspective and take stock of its roots in arts, technology, and activism (Fig. 1).

2.1 *Hacking*

Hacking is an ambiguous term with multiple, competing meanings in contemporary culture. Firstly, in its original meaning, hacking refers to the ‘hacker culture’ of software and hardware tinkerers coming from MIT and then Silicon Valley (Levy 2001). The notion that Levy calls ‘true hacking’ is based on the hacker ethic, with core principles, such as sharing, openness, and world improvement. These principles are referring to a general constructive behaviour. Secondly, another contemporary meaning of a hacker is associated with criminality, a person that exploits computer security systems. This notion carries negative sentiment and describes destructive behaviour that is almost the opposite of the ‘true hacking’ idea. Thirdly, a modern pop culture connotation of hacking is lifehacking. Lifehacking was coined by technology writer Danny O’Brien (Thompson 2005), referring to productivity and efficiency shortcuts, skills, and tricks for daily life. Such shortcuts and tricks as a hack follows the description of a kludge—a historical computer jargon term from the 1960s—as described by Koopman and Hoffman (2003: 73):

A fix that is awkward or clumsy but is at least temporarily effective or An overall design that is of questionable elegance or downright ugly.

Expanding this definition from decades ago, today the previous contemporary connotations of hacking carry a refined understanding of what a hack is: an exploratory, creative way of overcoming limitations of a system. How this takes shape is often by modifying or repurposing a certain knowledge, technique, or technology for a new use. Moreover, this repurposing also leads to a hacker attitude ‘because we can’, trying out if a technique works in another context. An iconic example of this thinking

is the story of the ‘Trojan Room Coffee Machine’: in 1991, people at the Computer Laboratory of University of Cambridge installed a camera showing the coffee pot. The creators needed to develop many things from scratch, like server and client software, and generally went a great length for solving a non-substantial problem (Stafford-Fraser 2001). This coffee machine broadcast became the first webcam.

When looking at city-making from an urban interaction design perspective, hacking is considered as a constructive activity, such as Townsend’s Civic hackers (2013) or The Hackable City project (Ampatzidou et al. 2015). In our view, hacking can indeed be seen as a social constructivist activity in city-making, and embrace a typical hacker attitude. Such an attitude can manifest as optimizing an inefficient, bureaucratic policy-making process that is often lagging behind technology advancements. An early exploration of the hacker attitude applied to city-making can be found in squatting, the movement of occupying abandoned or unoccupied buildings that the squatters do not own. There are many policies for squatting today, though a commonality is its history of operating in a legal grey zone and the corresponding legislation that was lagging behind. In the case of squatting, the hacker attitude refers to a new way of thinking around redistributing unoccupied, available buildings for residential purposes. Beyond squatting, a timely example for hacker attitude in city-making addresses the rise of various sharing economy start-ups that are operating at the borderline of governmental policies and use–abuse the lagging of policy-making to flourish. For example, Airbnb hacked the general accepted way of short-term room rental while Uber hacked the established norms in transportation services. Sharing economy start-ups often question the status quo, and in our view, this is the hacker attitude applied in city-making. Although often experienced as controversial, it is obvious that these new kinds of businesses introduced by Airbnb and Uber do not necessarily refer to a constructive hacker attitude. However, these exemplary sharing economy business cases do challenge the current, established way of city-making, and open the floor to new city-makers to trigger a systemic change for new types of social innovation. Urban interaction design operates in a world full of complexities, from stakeholders to citizen needs and policy-making; there are various layers, various actors, and various types of problems. To cut through these complexities, we argue that the hacker attitude is core: people need to be proactive to trigger change, sometimes to provoke change. Many art and design schools teach by Grace Hopper’s famous quote [retrieved from CHIPS Magazine (2002)]:

It is often easier to ask for forgiveness than to ask for permission—Grace Hopper

Innovation oftentimes happens fast and is not bounded by the lagging of governmental regulations. Considering urban complexities, the core mechanisms of the hacker attitude are exploring the borders and stretching the status quo, let them be legislation or the public’s thinking on a certain matter (such as ownership in the age of the sharing economy). To conclude, the hacker attitude might appear disobedient or unabashed, but also pioneering and daring to be the first, and these we find key characteristics. The hacker value for city-making lies in the potential to serve the public interest, but still too often hackers undermine the common good due to a short time, activist focus on political protest.

2.2 *Making*

With the third industrial revolution (Rifkin 2008), manufacturing has been expected to shift towards a democratized and decentralized, distributed ecosystem, enabling the masses to realize bespoke products with modern technology, such as 3D printers, accessible electronic prototyping kits, or a blossoming open-source culture on the Internet. Pioneer activists leading this movement, the makers, initiated physical spaces all around the globe. Fablabs, Hackerspaces, and Makerspaces are appearing, providing a physical shop as well as a meeting point for like-minded people, who come together to work on their own Do-It-Yourself (DIY) projects, but also to collaborate with other makers, exchanging expertise or share knowledge. The knowledge and expertise sharing aspect of making makes it also intertwined with education all over the world, as illustrated by Mostert-van der Sar and her colleagues (2013). Educational institutions are increasingly hosting Fablabs and other fabrication workshops become available for the masses. Such connections to education provide a safe environment to test and experiment. When people visit a Fablab or a Makerspace, they are not expected to know how equipment, tools, and devices work; they go there to learn. Furthermore, specialized working tools are not available in every household, and it is hard to justify having, e.g. a soldering station or a 3D printer at home if you have never tried it beforehand. These physical spaces where making can take place are democratizing who has access to realizing various hobbies or professional projects.

Besides providing spaces for making, a vast number of tools are getting available for people that are not very tech-savvy or trained. The focus is not anymore on creating tools for experts, but to serve a broader user base including complete beginners and interested amateurs. Makers have been successful in attracting children to code, 3D print, or build in Minecraft, and this success generates demand for better end-user tools that are not overcomplicated and has the right constraints and trade-offs to still remain usable and productive after a little-learning curve. For urban interaction design this is important, because in the urban context design often happens by citizens that are not necessarily trained in design.

To leverage making in cities, the fabrication communities are essential to provide places where lead users of a city (i.e. citizens) can gather to realize technological projects that better the living in the city. In this way, making enables citizens to create bespoke solutions (patchable plug-ins) for their city; when the citizen needs are addressed by citizen-designed solutions, that is a major shift from the dominant concept of urban services being provided by the government, more often than not resulting in services that are far from how reality works. In all complexities in urban space, making democratizes the creation of bespoke solutions by providing infrastructure and knowledge and skills for the urban interaction designer. In the future, this could be further amplified by the maker community and its sharing practices on the Internet; when people upload their local bespoke products, services for peer-production sites, such as Instructables.com. The local bespoke solutions could live a global life, getting adapted to different circumstances.

2.3 Prototyping

In the past decades, the techniques and methods previously characterized with the design-related professions (e.g. industrial design, architecture) have started to find their use for a broader audience. Design thinking (Brown 2008) has gained popularity in the business world illustrating this trend of innovation and new ways of management. Living labs have grown in popularity in the past years to stimulate open, collaborative and bottom-up models of innovation where citizens are at the centre of the innovation process. A living lab can be defined as:

an experiential environment where users are immersed in a creative social space for designing and experiencing their own future. Policy makers and citizens can use living labs to design, explore, experience, and refine new policies and regulations in real-life scenarios before they are implemented. (McPhee et al. 2012: 3–4)

Where the origin of living labs started from the industry's or city management's drive for regional innovation, today's city laboratories are often initiated by emerging city-makers. Even though co-creative partnerships that join forces in developing new product and services are keys in both 'prototyping' initiatives (Mulder 2014, 2015). In the meanwhile, designers have been redefining design towards complex systems and tackling complex societal problems (Sanders and Stappers 2014). In our view, these trends illustrate that the designers' toolbox of techniques, methods, and ways of operating has the potential for cutting through the urban complexities as well.

A key aspect of problem solving (in design) is the use of prototypes. Prototypes can be all kind of artefacts, as long as they enable the different stakeholders to collaboratively explore alternatives and to articulate their different viewpoints. In this view, prototyping is a way of communication between different parties. We consider communicating via prototypes as a process where iterations happen throughout the discussion, evolving the prototypes in a trial-and-error manner towards finding the optimal design solution (Buxton 2010). Out of their context, early prototypes can easily be seen as *quick hacks*, and making often enables quick prototypes. In urban interaction design, prototypes are often design interventions, with the leading principle to engage the public in the conversation about the possible future. The powerful aspect of iterative development is to keep the tangible solutions close to its users, and continuously adapt the feedback in the following prototypes. These are the important aspects to abandon the principle to aim for over-polished solutions that are never-ready. Like this, people can dare to envision futures with bolder ideas, iterating their way towards one prototype a time.

A manifestation of prototyping and design for solving urban or societal matters is the emergence of different design jams and hackathons—pressure cooker events that are targeted at establishing active local communities, while teaching design techniques to interested people. These types of events enrich the spectrum of the physical places connected to *making* and encouraging the *hacker attitude* to innovate solving complex problems by applying cheeky or clever thinking in repurposing of previous knowledge or techniques on new problem areas. The time frame a pressure cooker event enables is short, so people should not think too much about an approach,

just do it and see what happens. This set-up is interventional and based on weekend-long get-togethers, consequently the outcomes might not be sustainable. However, on personal and community levels, such an approach is a boost to probe ideas, get stakeholders together, and learn new things. This transition is doing the groundwork for sustainable change for projects that has bigger potentials.

3 Hackable City-Making: Towards Systemic Change

Seeing the city as a platform that welcomes bottom-up social innovation and allows for hackable city-making opens the path towards system change. In keeping with Suchman et al. (2002) as well as Junginger (2008), we use prototyping as an insight-giving tool enabling society to change. Considering the complete spectrum from an idea to actual change in society, the role of hacking, making, and prototyping is ranging from prompting the idea to the creation of prototypes to communicate the idea.

We refer to the definition of social innovation as elaborated in the report of the European Policy Advisors (2010) entitled ‘Empowering people, driving change: Social innovation in the European Union’. Social innovation refers to social demands that are traditionally not addressed by the market and are not directed towards or involve vulnerable groups in society. A common case of social innovation is the care for elderly, which is a ubiquitous problem in the world, and as the world’s population is ageing, also addresses a growing need. Social innovation is complex from multiple aspects; the boundaries between ‘social’ and ‘economic’ blur for social challenges, which are directed towards society as a whole and often involve end-users (e.g. citizens, who proactively shape things). Further examples in cities for social innovation may be increasing social cohesion, creating sustainable living, supporting the ageing society, etc. However, in order to reshape society in the direction of a participatory arena where people are empowered, learning is central to make policies more effective. The following three approaches are interdependent and strengthen each other.

The first approach is the foundation for the second which creates the conditions for the third—an innovation that addresses a social demand (e.g. care of the elderly) contributes to addressing a societal challenge (ageing society) and, through its process dimension (e.g. the active engagement of the elderly), it contributes to reshape society in the direction of participation and empowerment. In the next section, we discuss how hackable city-making can trigger a broader change and transformation process.

To illustrate the complete life cycle of such a hackable city-making process, we adopted the six stages of social innovation as defined by Murray and his colleagues (2010) to address hackable city-making towards systemic change (see Fig. 2). Observing this model from a designerly perspective separates the ‘early stages’ from the ‘sustaining stages’ of social change. In the following part, we elaborate on this twofolded framing, to leverage the process of hacking, making, and prototyping for social change.

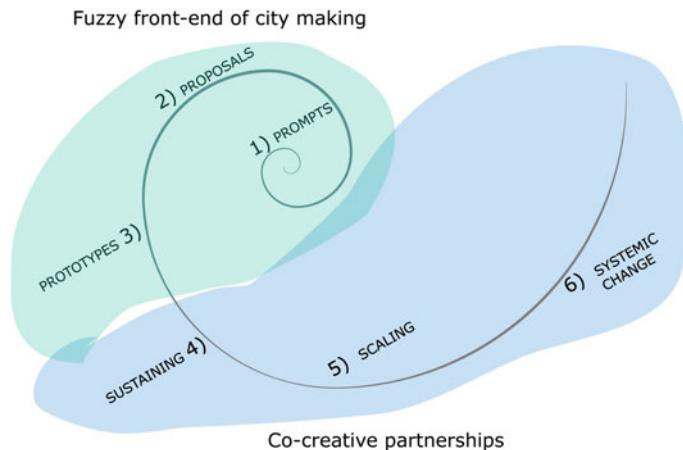


Fig. 2 Hackable city-making in relation to the six stages of social innovation

3.1 Fuzzy Front-End of City-Making

Following the hacking, making, and prototyping practices of doing urban interaction design, the outcomes are most frequently ‘design bursts’ and interventions, semi-worked out ideas; rarely take on the high-level (transformational) design challenges of establishing sustainable change. Considering Rittel and Webber’s wicked problems (1973), we observe an interventional design approach that targets solving wicked problems without a typical end point:

With wicked problems [...], any solution, after being implemented will generate waves of consequences over an extended – virtually an unbounded – period of time. [...] The full consequences cannot be appraised until the waves of repercussions have completely run out, and we have no way of tracing all the waves through all the affected lives ahead of time or within a limited time span. (Rittel and Webber 1973: 163)

In an urban context, we call the ‘fuzzy front-end of city-making’ the first three stages of social innovation: [1 Prompts], [2 Proposals], and [3 Prototypes]. The fuzzy front-end of city-making happens often at pressure cooker events, such as hackathons or design jams. These events host people from various stakeholder groups, who are all invited to propose problems [1 Prompts, 2 Proposals], often attend workshops to work on specific problems [1 Prompts] and by DNA of hackathons create prototypes to communicate the ideas [3 Prototypes]. Reaching the [3 Prototypes] stage is relatively easy, and there are many tools available from end-user development, co-design, or making. Co-designing activities during such events (but also student projects, etc.) can flesh out preliminary/immature ideas for envisioned futures. Turning these ideas tangible is important for discussing them with the different stakeholders, but also for ‘thinking through designing’, to really understand the core wicked problems the idea intends to solve. All these processes have hacking, making, and/or prototyping at their core.

As illustrated, this fuzzy front-end stage might take a long while, and the process might happen in a way that a preliminarily realized idea (e.g. as a prototype) inspired another project with another set of people, who figure a different angle to solve the problem which eventually succeed. This cross-pollination of ideas is a common characteristic of pressure cooker events, but also a cultural characteristic for social innovation and cities; cities do not exist in a vacuum, and best practices are there, out in the wild, to be copied as well as improved elsewhere.

3.2 Co-creative Partnerships

In keeping with Anthony Townsend (2013), we put the smart citizen in a central position. Interestingly, in a recent public debate, Townsend stressed that although hackathons are the main form to have citizens involved in demonstrating the potential of open data and smart cities, there are no best practices that stress the citizens' voices that can be scaled and sustained. Most hackathons organized nowadays act as nerd-meetups and remain stand-alone events. In our co-creative activities, we therefore deliberately elaborate upon various ways to involve 'civic hackers' and stakeholders representing a quadruple helix (van Waart et al. 2015, 2016) as well as upon the role of these co-creative activities in making them more aware of open data and the potential value in order to drive social change (Morelli et al. 2017). We refer to this quadruple helix consortium as 'co-creative partnerships' (Mulder 2014, 2015) and emphasize the human scale in a shared process of knowledge production in which they collaboratively envision desired futures (Brodersen et al. 2008; Carayannis and Campbell 2012; Mulder 2014; van Waart et al. 2016). Key to co-creative partnerships is a dialogical approach (Mulder 2014, 2015) while in most hackers' initiatives an activist approach is leading, which not necessarily lead to systemic changes that contribute to the common good.

Similarly, Manzini and Rizzo (2011) have demonstrated how 'large-scale sustainable changes' could be achieved by participatory design when citizens and designers work together, co-creative partnerships are a crucial asset to enable the collaborative activity of prototyping and scale these activities towards participatory city-making [4 Sustaining, 5 Scaling]. The fuzzy front-end activities can be interpreted as largely unobtrusive ways of building a common vision among the new city-makers for creating fertile structures and embedded areas that introduce design knowledge for the systematic exploration of new ways of city-making [6 System change].

3.3 From Designing for to Making Together

There is a plethora of promising cases and best practices that illustrates prompts, proposals, and/or prototypes. There might even be more good, best, and promising practices that stay unnoticed by the general publics. However, practices that address

systemic change are hard to find. The question why it is so hard to get from the fuzzy front-end of city-making towards co-creative partnerships making a systemic change largely remains unanswered. The current debate on social design largely focuses on what design can do, showing mainly prompts and proposals that are not evidenced by impact. Similarly, many toolkits have not shown their value in sustained practice. The outcomes of a workshop to map and collect various strategies for citizens' engagement and the role of cities held at the Design & the City conference (Amsterdam, April 22, 2016) contributed to a great bricolage of designerly approaches and a vivid discussion on how to scale up interventions and to foster system change; however, no clear guidelines could be derived (see Kun and Mulder 2016). Also, in a recent policy workshop on 'Shaping the Future of Digital Social Innovation' at the European Commission (June 29, 2016, Brussels), it was also concluded that it appears hard to sustain and scale these practices (see Mulgan 2016).

Of course, cherish and promote small experimentations is a welcome first step, but foremost the need to change designerly perspectives towards more participatory and systemic perspectives that reflect on how to activate new forms of collective action is key. The role of designers in hackable city-making moves towards orchestrators of the various stakeholders involved and includes 'designing' the relationships among them as well in order to triggering a process of broader change and transformation (Mulder and Loorbach 2016).

4 Discussion and Conclusions

Although promising, it is not straightforward that hacking, making, and prototyping allow for a systematic exploration of new ways of city-making. It requires a different designerly mindset, from an emphasis on the designed object towards strategic design and the process, such as the role of infrastructuring (Karasti 2014). Emerging contexts for systems perspectives in design are still in its infancy (Jones 2016). Both systems and design fields have developed largely independent and outside academia, with hardly any effort in uncovering the hidden links. Design has been largely biased by its practical materialism and driven by theories of use and human-centredness. Systems theory has been biased by its abstract nature, and lack of attention to designerly ordering and practicality. The main point is to see how hacking, making, and prototyping can go beyond the smart city visions and address real problems of the everyday life.

Even if initiatives as Uber and Airbnb might have started as social initiatives, the corresponding increase in popularity and economic benefits seemed to have encouraged the use of 'old economy' business models that continued dominating the further path. It is obvious that the current way of operation is far less 'addressing the common good', and that these initiatives no longer function as co-creative partnerships aiming for new city-making. Differently said, the value is no longer in and for the city.

In our view, hackable city-making needs to become more pluralistic and needs to involve more (inter-)disciplinary stakeholders in a dialogical way in order to face today's challenges. Such participatory city-making process envisioning livable and sustainable urban environments goes far beyond simple, or even complex, product-service design; it has political, organizational, and even cultural implications. Consequently, a collaborative systemic approach emphasizing the human scale, is vital for engaging stakeholders from public sector, industry, education, and research as well as citizens in a shared process of knowledge production in which they collaboratively envision desired future cities (Brodersen et al. 2008; Carayannis and Campbell 2012; van Waart et al. 2016). It requires co-creative partnerships to actually team up towards a future direction. In this, the biggest challenge is to embrace a new collaborative attitude, a participatory approach, and to have a proper infrastructure that supports this social fabric. This new city-making process is not only about bringing various disciplines together that addresses urban developments, but foremost to establish a collaborative effort of defining a new way of working between professional designers, academics, policy-makers, and citizens.

Although co-creative partnerships seem to be the answer and time is ripe for a more collaborative approach, it is not straightforward that everybody can participate. However, the participatory turn and the maker movement have contributed largely to fact that 'everybody is a designer'. Making and participatory prototyping can empower citizens and allow them to express and to be part of the city-making process. Participatory city-making is about democracy, rather than politics; it is about caring together for a shared environment and making your own future. Interestingly, Barber (2013) clearly points out why mayors should rule the world; mayors have a city to manage, but also need the people to make their city. Hackable city-making, thus, can make a difference through involving emerging city-makers and by elaborating upon the interplay between systems thinking and design thinking.

Having the city as a patchable plug-in platform asks for participatory governance, a new paradigm in city-making, which combines top-down public management with bottom-up social innovation (e.g. Bria et al. 2014; Loorbach 2014; Mulder 2014). A patchable plug-in platform enables emerging city-makers to create value for the city, for society; however, it asks for new ways of city management too. New participatory ways of governance include advanced hacking, making, and prototyping skills, such as envisioning, translating, or orchestrating, and enable emerging, heterogeneous city-makers to participate actively in exploring the collaborative envisioned potential and constructive dialogue aiming for transformational change for the common good.

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Unpacking the Smart City Through the Lens of the Right to the City: A Taxonomy as a Way Forward in Participatory City-Making



Irina Anastasiu

Abstract Henri Lefebvre's urgent utopia of right to the city to achieve a new form of urban governance that moves beyond both capitalism and state bureaucracy seems timely with the increasing critiques of how techno-centric, top-down and corporate-driven smart cities are ill-equipped to deliver their promised civic, economic and political benefits. The exploration of the smart city through Lefebvre's lens enables the reconceptualisation of the emerging notion of participatory city-making as a translation of the right to the city into practice. This chapter seeks, thus, to further unpack the concept of participatory city-making and, by linking it to operational concepts and proposing a taxonomy for the classification of initiatives that shape the city, clear a path forward towards systemic change.

Keywords Participatory city-making · Right to the city
Participatory action research · Hacker ethic · Civic engagement · Smart city
Human smart city · Urban informatics

1 Introduction

At a time when voices are increasingly raised on how the techno-centric, top-down smart city vision is flawed and cannot deliver the civic or economic benefits promised, partly also because it is driven by large corporations not attuned to the “messy, disruptive way people use technology” (Hemment and Townsend 2013), revisiting Lefebvre's radical concept on the right to the city to achieve a new form of urban governance that moves beyond both capitalism and the state seems timely.

The exploration of the smart city through Lefebvre's lens enables the reconceptualisation of the emerging notion of participatory city-making as a translation of the right to the city into practice. This chapter seeks thus to further unpack the concept of

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participatory city-making and, by linking it to operational concepts and proposing a taxonomy for the classification of initiatives that shape the city, clear a path forward towards systemic change.

It first presents a critique of the smart city discourse and its evolution towards embracing people-centricity. Along the way, it highlights key prerequisites for the emergence of a new sense of ownership of a city where its residents are active agents of change, before turning to using Lefebvre's (1996) *right to the city* as a key concept to understand and elaborate on the notion of *participatory city-making*. Subsequently, it further unpacks this notion, proposing understanding it as a participatory process governed by procedural and essential principles, that are also discussed in depth. It then turns to the more practical requirements and tools that can assist in implementing participatory city-making. Finally, it draws upon previous reviews of relevant initiatives to propose a taxonomy of participatory city-making initiatives, which not only allows for a snapshot of the city-making ecosystem and the extraction of best practices for a way forward, but also for the observation of its evolution over time and identification of trends and their coherence with Lefebvre's transformative idea.

2 From Smart City to Human Smart City

In academic literature, one of the earliest usages of the term *smart city* describes a city where urban planning and development turns towards technology, innovation and globalisation (Gibson et al. 1992). Coining of the term came about in the context of the emerging information or knowledge economy and the exploration of the role of metropolitan areas within it. With predecessors and contemporaries such as the *information city* (Hepworth 1987), the *technopolis* (Smilor et al. 1989) and the *intelligent city* (Heng and Low 1993), in essence these city concepts revolved around interactively linking “technology commercialisation with the public and private sectors to spur economic development and promote technology diversification” (Smilor et al. 1989, p. xiii), where local governments would strategically deploy the emerging networking and data transmission and storage technologies towards this goal (Hepworth 1987). Singapore has been an early adopter of the technopolis strategy (Heng and Low 1993).

An aspect that has been traditionally neglected in favour of understanding technology and policy aspects, despite being crucial, is the topic of people and communities in smart cities. This includes addressing digital divides, accessibility, participation and partnership, education and quality of life (Chourabi et al. 2012). While designing smart cities to benefit people, rather than abstract concepts like economic growth is a step forward, scholars highlight the missed opportunity of making precisely these people part of the solution to the challenges faced. People with agency are the “smart” in the human social or sociable city (Foth et al. 2011; Ratti and Townsend 2011; de Lange and de Waal 2013; Oliveira and Campolargo 2015; Mulder 2014).

Beyond the criticism related to the weakening of privacy protection and evolution towards total surveillance—the *panoptic city*, as Kitchin (2014) puts it, further

significant concerns have been raised. As Hollands (2008) summarises, these range from difficulties with the definition and actual components of “smart” cities, to social divide, inequality and the challenge of balancing sustainability and business goals. Specifically criticising the u-City (Hwang 2009), de Waal (2011) notes that personalised and context-aware systems address citizens as individual customers, when modern technology should treat them as citizens. He warns of a potential shift of the relations between citizens and city, leading to people becoming consumers indifferent to their civic rights or duties, and ultimately also altering the relationship they have with each other. This risk of passivity increases through what Crang and Graham call *anticipatory technologies* that provide users with a predefined set of alternative actions, or even create “delegated agency” to “pacify” the user (Crang and Graham 2007).

The discourse around top-down, centralised smart cities has not only begun to shift on a scholarly level, but increasingly we find initiatives of local governments taking a step forward to open up the aptly coined “city in a box” (Shepard and Simeti 2013). Cities such as members of the international Open and Agile Smart Cities network commit to develop and implement open standards and open access to city data driven by implementation, by concrete use cases. Open standards and open access create opportunities for bottom-up and grassroots initiatives, such as not-for-profits and individuals, to plug their own technologies into the city. This places the *smart citizen* centre stage, as Breuer et al. (2014) argue, and Capdevila and Zarlenga (2015) eloquently illustrate with concrete examples from Barcelona.

Although also containing the marketing-loaded word “smart” (Nam and Pardo 2011), and in spite of being inclusive of approaches that heavily rely on the skilful use of open data and digital technologies (e.g. smartphones, prototyping platforms such as Arduino or Raspberry Pi), the smart citizen movement goes beyond. It is rather about people engaging with their local environment, urban planning, policy and development processes (Shepard and Simeti 2013). Technology then takes on not only the role of means to an end to relieve social, economic, educational and other imbalances as well as other forms of malfunctioning that grassroots initiatives traditionally try to tackle but can be deployed towards the higher level of reshaping the process of addressing these challenges itself.

Achieving fundamental change in the way urban issues are tackled, de Lange (2013) suggests, can only occur when we rethink how technology integrates with the social fabric. He currently sees it deployed as “plugins” for “the continuation of normalcy and sameness”. It should, instead of blending in with everyday life, be profoundly political and move people, and, in turn, enable them to move others. As also suggested by Greenfield (2013), the same technologies can be deployed to go beyond providing “sterile ‘solutions’” to pose questions and raise issues of equity, power and access.

De Lange and de Waal (2012) point out that achieving what they call the *social city* is essentially about redefining the ownership of the city to “a sense of responsibility for shared issues and [...] taking action on these matters”—an inclusive, collective and participatory ownership, not its proprietary sibling inherent to top-down governance.

This new kind of ownership of the city has two dimensions: first, the *willingness* to act upon an issue that affects the collective, and second, the *right* to do so. The right to act requires changes in regulation towards policies that do not force citizens to operate in grey areas or even within the sphere of the illegal. It argues that, in the developed world, the barrier to urban innovation is not lack of funding, but the lack of permission, suggesting local governments either be supportive, or reduce their level of control (Tischler 2013). The willingness to act is strongly tied to motivation. In his framework, the *affective smart city*, de Lange (2013) proposes to build smart city interventions around “people’s emotional attachment, or lack thereof, to shared urban issues”. By directly addressing issues that move urban residents and acknowledging these feelings, such interventions nurture citizens’ willingness to act.

However, in order to be able to exercise the rights that come with this ownership, a *third* dimension seems crucial: the *ability* to act upon an issue. Without having the necessary resources, obtaining tangible results is difficult, no matter how motivated the citizen is and that the law grants him permission. Particularly in a context where aspects of urban life are increasingly permeated by technology, lack of digital literacy can be considered a key factor leading to exclusion from the process of active engagement. Chourabi et al. (2012) identify “digital divide(s)” as one of the key factors related to people and community that must be addressed by smart cities, based on their review of existing smart city definitions.

Grassroots movements fuelled by this new kind of ownership of the city not only face challenges in terms of scalability and achieving longevity and bigger impact (Breuer et al. 2014), but are commonly treated as a nuisance (Hollands 2008) and initiators perceived as a threat or trouble-makers by local government, as their goals may conflict with wider city strategies or even be illegal. Models of governance of zero tolerance towards minor infractions manage to stifle and overcriminalise this kind of interventions. Douglas (2014) provides a notable overview of the discourse on DIY urban design in academic literature, highlighting that even in the academic discourse these individuals are met with scepticism.

This makes evident their power struggle not only with government, but with the capitalist system, the commodification of urban life and the marginalisation and displacement it inherently brings with it. At its core, what we are witnessing through these initiatives is citizens claiming their *right to the city*, what Lefebvre (1996) describes as the “demand...[for] a transformed and renewed access to urban life”. Harvey (2008) criticises that this right, defined not only by individual access to public resources, but rather as the right to collectively reshape the process of urbanisation itself, is currently reserved for a small political and economic elite, who can at will shape the city to its own benefit. He argues that the right to the city is “one of the most precious yet most neglected of our human rights”, as it ultimately gives us the freedom to change ourselves by changing the city. Our experience from interacting with its tangible and intangible environment have a deep effect on shaping who we are, as well as the web of social relations in which we are embedded.

3 The Smart City Through the Lens of Lefebvre's Right to the City

In one of the last essays before his death, Lefebvre (2014) criticises the increasingly technocratic and bureaucratic approaches to shaping the city. He laments the deterioration of social relations, as well as of the urban as conceived and lived social practice.

The year 2016 has seen significant social and political polarisation. This is a powerful reminder of those who have been left behind in the frantic competition for innovation and economic growth. As of 2018, inequality is one of the four most dangerous global risk factors according to the World Economic Forum (2018). Voorheis et al. (2015) demonstrate how rising inequality increases political polarisation and leads to rightward shifts in political governance.

The rise of the creative class and the competition to innovate between cities has led to an urban crisis (Florida 2017), a global and regional struggle of the have-not cities to compete with the ones perpetually attracting wealth and people in a self-reinforcing loop. What Lefebvre lamented in this essay is arguably exacerbated in today's cities, not lastly through their hyperconnected nature, a network of both people and "things" as part of the Internet of things.

As argued by Hollands (2008) and Kitchin (2014), there is further need to deconstruct the term smart city towards an understanding that addresses deep-rooted structural problems with a prospect of systemic change.

The smart city seen through a Lefebvrian lens could serve as a deconstruction of the smart city, where technology and information is used and produced by its residents as a tool to exert their right to the city and/or is the product of these rights having been exercised. This discourse is people-centric, embracing the idea that citizens hold valuable tacit knowledge about their physical and social space collected from their lived experiences (Foth and Brynskov 2016), legitimising the right to self-management, a right that is inextricably embedded in the right to the city (Purcell 2014).

Lefebvre's concept is calling for two fundamental rights: the right to *appropriate* urban space and more importantly the right to *shape the process* of urbanisation itself (Lefebvre 1996; Harvey 2008). As part of applying this lens, Purcell (2016) stresses, it is crucial to understand it in its original, radical form, deeply rooted in Marxist humanism. Over time, the concept has been diluted to mean "everything and nothing" (Purcell 2014). While Purcell recognises the need of multiple formulations, he also emphasises that these formulations require specificity, as well as transparent political content. The striking contrast that emerges from comparing Purcell's (2014) exemplary liberal-democratic interpretation of the right to the city to the comprehensive one he situates within Lefebvre's larger body of work stands testimony to how strongly contemporary interpretations have drifted away from the most defining pillars of the original concept: self-management and self-organisation under conditions of prioritising use value over exchange value and the rejection of the notion of property rights (Purcell 2014). This implies a restructuring of urban space and

processes in response to the social, economic and cultural needs of people, rather than according to the needs of capital (Smith 1979).

Lefebvre conceptualised the right to the city not as mere addition to existing liberal-democratic rights. Instead, the concept is geared towards what might be labelled a form of “gradual revolution”, a wider political struggle to “move beyond both [the institution of] the state and capitalism” (Purcell 2014) and radically change not only cities, but society as a whole. This gradual revolution would be fuelled by self-management, by the city’s inhabitants increasingly actively and voluntarily taking over decisions and tasks traditionally reserved to the urban elite. Instead of exclusively relying on confrontation, as city-related tasks would increasingly be taken over by the majority of city inhabitants, the political-economic apparatus, its structures and its representatives would become redundant and gradually dissolve into the broader citizenship (Purcell 2014). Yet this kind of citizenship would require a radical redefinition that re-associates the act of inhabiting the city with citizenship, two entities currently dissociated (Lefebvre 2014) as a consequence of the narrow definition of citizenship as appurtenance to a country in a globalised world.

What could this citizenship that would allow the citizen a right to the city then look like, and thus whose right would it be? The key to a possible reconceptualisation may lie in exploring Lefebvre’s call to revive grassroots democracy and the more philosophical associative life—*la vie associative* (Lefebvre 2014). Grassroots democracy places as much decision-making authority as practical on the lowest geographical and social levels of the group, while at the same time creating the prerequisites for the ability of all individuals to participate. The associative life describes the voluntary coming together of individuals or groups to serve a common purpose, requiring the willingness and the motivation to associate. Citizenship (and the right to the city) then would become something one voluntarily claims. However, the level of influence is weighed in reverse-hierarchical social and geographical order, placing the power in the hands of the people of the lowest social level as well as of those living geographically closest. A definition of citizenship thus reconnects the individual with the geographic proximity and their belonging to the broad mass of the population of that given geographic location. Such a definition transcends nationality, origin, cultural background, gender and a myriad of other factors of diversity, encouraging exchange, learning and mutual exploration. And it lies at the core of Lefebvre’s vision of reviving the urban as a lived collective social experience as part of the right to the city.

In the context of the smart city or digital city, Lefebvre’s idea is not confined to the right to simply access the smart city, information, its data, the right to use services or technology, but as the right to both produce, manage, and *own* all of these as part of an act of political and economic empowerment that is geared primarily towards the collective benefit and the strengthening of social relations.

In today’s cities, where technology increasingly permeates cities both through physical deployment, for instance of IoT (Internet of things) devices, as well as by being linked conceptually to their virtual, abstract representations, such as online digital maps, the right to appropriate urban space evolves to include the appropriation of the hybrid space, and implicitly of the digital space included in it. Inadvertently, this

includes the access and manipulation of the information underpinning these hybrid and digital spaces, Lefebvre's complementary call for the "right to information" (Lefebvre 1990; Shaw and Graham 2017). Shaw and Graham (2017) explore the reproduction of power through code, content and control of urban information by informational monopolies that produce abstract space through their technologies, taking the example of Google. They conclude that Lefebvre's original separation of the right to the city and the right to information is rendered problematic by the dependence of virtual urban spaces on the flow of digital information.

The struggles required for the reconfiguration of power dynamics in cities, previously primarily involving citizens and governments, have now expanded to include global IT corporations. Power is even more concentrated when governments employ soft- and hardware from global technology purveyors, such as IBMs for city management, where obscure, protected algorithms are consulted by city officials to inform decisions on how infrastructure, space and services are to be designed and delivered. To whose advantage or detriment? Who makes this decision in the first place? "Technology is never neutral, it has the potential and capacity to be used socially and politically for quite different purposes" (Williams 1983; Calzada and Cobo 2015). Lefebvre's now unified right to the city and right to information go well beyond the simple right to access the information—or results—produced by these systems. They not only require transparency about the algorithms themselves, and, with the increasing usage of machine learning, about the kind of information used to train these new technologies. Instead, they imply that citizens should be in charge of their conceptualisation and the decision-making processes involved.

On the smart city level, Lefebvre's revolutionary idea includes the gradual reclaiming of urban technology from corporations to shared ownership by citizens, taking over the production and management of these technologies and thus incrementally working towards the withering away of technology monopolies.

In this new light, how does systemic change—the process through which the current system becomes a different system—connect with Lefebvre's right to the city? The right to the city is an open, ongoing project that fosters self-management and striving beyond the commodification of all aspects of urban life, yet whose outcomes cannot be fully known. Instead, it can be seen as a cascade of outcomes, each triggering the creation of a new outcome, closer to an alternative form of urban life, a form that itself is under constant reimagination. It is an ongoing democratic project of being "willing to imagine and demand a possible world, even if that world is impossible under the conditions that exist now" (Purcell 2014).

How might we go about putting this democratic project into practice? What would the mechanism underpinning it look like, and what existing tools can we rely on? And last but not least, where might the roles and opportunities for technology herein lie?

The emerging notion of *participatory city-making* seems suitable to be further shaped towards a mechanism consisting of methods, tools and principles that implements the right to the city and grounds it in practice.

4 Participatory City-Making as the Right to the City in Practice

The first logical connections between the term “participatory” and city-making appear to have emerged in 2014 in the Netherlands in the field of urban design, with the similarly new terminology of “collective city-making” as an intermediary (Tan 2014). Tan (2014) discusses citizen participation in the context of self-organising cities, elaborating on the evolution and nature of towns that had concrete outcomes with regards to moving towards Lefebvre’s concept: Gulensu in Turkey and the Dutch town Almere Haven. Further on, she proposes a set of properties of a new method for self-organising urban processes: multi-agency, open communication, collaboration, simple dynamic rules, incremental evolution, constant learning and a generative character. Finally, she proposes gaming—structured forms of playing—as a method for collaborative city-making (Tan 2014). A direct continuation of this idea can be identified together with one of the first occurrences of participatory city-making as a concatenation of the two terms in de Lange’s exploration of the playful smart city (de Lange 2015). While it does create an explicit link between participatory city-making and the smart citizen, it makes no explicit reference to a particular mode of governance. In the same year, Mulder calls for a “new paradigm in city-making, which combines top-down public management with bottom-up social innovation to reach meaningful design”, which she further distils into participatory city-making in the context of a sociable smart city (Mulder 2015a, b). Thus, these three early conceptualisations can be placed along a spectrum ranging from self-governance to multi-purpose and finally to a progress of negotiating power between the parties within the existing system and structures.

It may appear of no surprise that participatory city-making emerged within the urban design field, as the preceding *participatory design* is a well-suited point of departure. It describes a design process and research methodology, grounded in *action research* that originated in Scandinavia in the 1970s. It attempts to actively involve all relevant stakeholders in order to obtain a result that best meets the needs of its users (Spinuzzi 2005; Schuler and Namioka 1993). The clear distinction from *user-centred design* consists in research and design conducted *with* stakeholders, as opposed to *on behalf* of them (Iivari 2004). Participatory design attempts to tap into the “traditional, tacit and often invisible” types of knowledge of *knowing by doing* (Spinuzzi 2005). In this context, participatory city-making seems a legitimate approach, considering the “wealth of knowledge, wisdom and experiences collectively and privately held by each urbanite (Foth and Brynskov 2016).

Participatory design is coordinated by a superior entity, such as a researcher, an institution or a company that guides the process according to its methods (Spinuzzi 2005; Schuler and Namioka 1993). This line cannot clearly be drawn for participatory city-making, as there is no formal answer with regard to coordination yet—mediated stakeholder negotiation that includes the current bureaucratic structures, as Lefebvre would call them, or self-organisation?

In concordance with the initial aim of exploring the smart city through Lefebvre's lens, participatory city-making is inextricably linked with self-organisation, or what Lefebvre would call "autogestion". Participatory city-making as a form of power negotiation within the current structures would defy Lefebvre's radical idea, instead acting only as an incremental addition to liberal-democratic rights rather than a pathway to an inherently different system.

Purcell's (2014) conclusion that the right to the city is not an ideal utopianism and thus not describing a desired final state to be achieved, but rather sits in between ideal utopianism and reality as an urgent utopia provides a basis to further unpack a Lefebvrian participatory city-making, coherent with Tan's (2014) ideas. Lefebvre describes the urgent utopia as a "rigorous form of utopian thinking that demands constant feedback between its ideals and empirical observations" (Purcell 2014; Lefebvre 1996). This translates into a necessity for it to be governed by strong principles, both procedural and essential, that ensure the permeability of the process for new contributors and contributions on the one hand, and a coherent way forward on the other.

Foth and Brynskov (2016) propose *participatory action research* for civic engagement as an "indispensable component in the journey to develop new governance infrastructures and practices for civic engagement". This cyclic method, organised around phases of *planning, acting, observing* and *reflecting* and reinforcing a *collective* inquiry in all phases, can not only be used to gather insights to develop such final outcomes, but, applied continuously, to direct an ongoing process. It thus seems to provide appropriate procedural principles for participatory city-making, offering the necessary theories and methods (Chevalier and Buckles 2013) to systematise the process and ensure the rigour Lefebvre expects incorporated in an urgent utopia. We would then see a multitude of these cycles coexisting, each in its own phase, due to the decentralised nature of participatory city-making.

With the increase of prominence of the commons (Ostrom 2015; Cox 1985; Feeny et al. 1990), open licensing models, open-source software as well as open standards, data and interfaces, we observe a current that embraces the so-called hacker ethic, a set of moral values and the philosophy of individuals seeking to overcome the limitations of computer systems in playful, explorative and meaningful ways. These principles are built around *sharing, openness, decentralisation, free access to computers* and *world improvement* (Levy 2010). The core ideas, subject to continuous revision through the procedural principles delivered by participatory action research, could well function as the essential principles of participatory city-making. While the hacker movement's claims of strong influence from Weber's (2002) writing on the protestant work ethic and the spirit of capitalism (Himanen et al. 2001) may appear as a fundamental contradiction to Lefebvre's vision of going *beyond* capitalism, a more thorough examination reveals that there actually are significant consistencies, arguably more than with Weber's ideas. As Torvalds outlines in his prologue as Linus's Law and the book proceeds to further elaborate, the hacker movement is about survival, social life and entertainment, a sequence that describes progress. Ultimately, hacking is meant to be a joyous undertaking (Himanen et al. 2001). This is in perfect harmony with the revitalisation of social relations and the city as

oeuvre, as a masterpiece of playful and enjoyable interactions that Lefebvre (1996) envisions. Similarly, sharing, free access and world improvement are nothing less than a concrete articulation of prioritising use value over exchange value, and quite contradictory to notions of capitalism.

Due to the decentralised nature of participatory city-making, the reinforcement and application of these procedural and essential principles would be the product of participatory city-making itself. As its contributors join the movement entirely voluntarily, by conviction that it is the desirable way forward, they implement these principles within themselves and keep other contributors accountable, while themselves being held responsible by others.

5 Tools for Participatory City-Making

With a conceptual framework of participatory city-making at hand, the question arises of what concrete tools can be used to support it. We can attempt to identify an initial set by returning to the three prerequisites of a collective ownership of the city outlined at the beginning—citizen's *willingness*, *ability* and *right* to act, which are also fundamental to the translation of Lefebvre's right to the city into practice.

5.1 *The Willingness to Act and the Associative Life*

The willingness to act is strongly tied to motivation and its manifestation results in *civic engagement*, where the individual, the citizen, is the primary actor. Civic engagement refers to the attempt to “make a difference in the civic life of our communities and developing the combination of knowledge, skills, values and motivation to make that difference. It means promoting the quality of life in a community, through both political and non-political processes” (Ehrlich 2000). Notably, it is not only actions such as being members of a community association, voting or going to city council meetings that civic engagement consists of, but also educating oneself on how to best carry out these actions.

This is the arena where technology, particularly digital technologies such as websites, apps, videos, interactive visualisations, digital art installations, media architecture, photography can be used to raise the profound questions Greenfield (2013) calls for, implementing de Lange's (2013) proposal towards technology that is profoundly political and appeals to emotions. Combined with, e.g. social media, these achieve the technologies of scale-making Dourish (2010) sees as catalysts for social and political action.

5.2 *The Ability to Act*

The ability to act requires a horizon for action. This may involve access to particular resources, e.g. financial resources, material resources or access to city infrastructure, but also necessary skills, ranging from particular theoretical domain knowledge, to execution experience, to media literacy and technical affinity. With regard to skills, there are two distinct threads that can be identified: the social thread, that encourages exchange between people, for instance in co-working, hacker or makerspaces; and the experiential thread, that emphasises learning through immersion and/or immersion into the subject that is to be learnt, whether it is a concrete technology or a knowledge domain. Civic engagement or voluntary association becomes then the enabler for both oneself, as well as for other citizens to become active, as it supports both individual learning as well as exchange with the community.

5.3 *The Right to Act*

The right to act is the most difficult to achieve component, as it involves a struggle for power. In the current system, the various power dynamics are manifested through citizen and community engagement, where the degree of participation is decided by the initiator of the engagement process, usually the power holder, currently represented by government and increasingly by IT corporations.

Citizen and community engagement mainly refer to initiatives that should be pursued by an institution, e.g. the government, in order to foster collaboration when addressing issues of public concern. While the first focuses on engaging individuals, the latter targets groups of individuals. Citizen engagement is “based on a two way interaction, conversation or dialogue. Citizen engagement emphasises the sharing of power, information, and a mutual respect between government and citizens” (Sheedy et al. 2008). *Community engagement* is “a planned process with the specific purpose of working with identified groups of people, whether they are connected by geographic location, special interest, or affiliation or identify to address issues affecting their well-being [...] shifting the focus from the individual to the collective, with the associated implications for inclusiveness’ (Davies et al. 2011).

Citizen and community engagement are conceived as an outreach of inclusion initiated by the power holder, as opposed to voluntary and self-initiated *civic engagement*. Examined under Lefebvre’s lens, they fundamentally contradict the principles of voluntary, intentional and motivated participation. However, they serve as valuable tools to assess the evolution of the withering of the bureaucracy and technical monopolies: as participation levels reach the highest rungs, official’s tasks and decisions have been taken over by citizens and further increasing the redundancy of the state.

Although exposed to criticism, e.g. by Tritter and McCallum (2006), Collins and Ison (2009), Arnstein’s *ladder of participation* (1969) is still the de facto framework

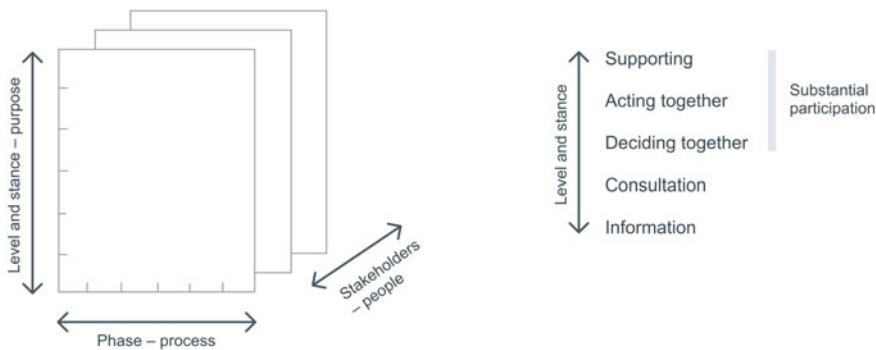


Fig. 1 Three dimensions of Wilcox' framework for participation (left); stances of participation (right)

to critique, design, implement and evaluate participation in both academia and policy practice (Collins and Ison 2009) and has significantly influenced approaches to governance and policy making, including urban planning (Schroeter 2012).

It outlines participation as a constant struggle for power between institutions and citizens. Similarly, re-works and alternatives, see Connor, Potapchuk or Choguill (Potapchuk 1991; Choguill 1996; Connor 1988), also look at participation in relation to governments and, as Collins et al. point out, imply that “meaningful participation occurs only in relation to the decisions, activities and power of state organizations or similar authority” (Collins and Ison 2009). This subsequently would erroneously reduce participatory city-making initiatives to being irrelevant—a fundamental contradiction to Lefebvre’s radical ideas around self-management.

Wilcox’ (1994) framework for participation, as shown in Fig. 1, is more appropriate for participatory city-making as it accommodates for complexity by taking a more nuanced standing with regard to power. Instead of the topmost stance always being considered the most desirable outcome, it acknowledges that different people may aim or fight for a different level of involvement depending on the purpose to be achieved. This is clearly embedded through the inclusion of a second dimension called “stakeholders”, which need to be understood not as representatives of authority, but rather as the diversity of a Lefebvrian citizenship. Finally, it reflects the fluid nature of participatory city-making through the third dimension, “Phase”, acknowledging that during this process, different levels of participation are claimed, necessary or desired.

Technology then can be deployed towards various aims. It can be used to reduce the access barrier, increase the quantity of participation, improve the quality of participation as well as the quality of the outcome of participation, and finally be either (a part of) the outcome itself or support the crafting of the outcome. For example, a 3D printer may have been used to generate elements to be incorporated in an interactive street art installation that raises awareness of a certain societal issue and was developed as part of a participatory and open process. Using such a participation

framework more systematically within each individual participatory city-making initiative, combined with other frameworks, would provide a basis for the wider phase of planning within the participatory action research cycle.

However, in order to clear the way forward, it is not only necessary to conceptualise the goal and identify the principles and mechanisms of implementation, items discussed in detail above. It is also necessary to develop a deep understanding of the status-quo, identify whether the evolution is consistent with fundamental notions of the right to the city, and extract the best practices of how these mechanisms are used in order to replicate, reappropriate and amplify them.

6 Identifying the Way Forward Through a Taxonomy

Initiatives that contribute to the city in one way or another are diverse and numerous, and discussing them is difficult, as it seems that there is no taxonomy and attached vocabulary to organise and describe them. Yet the ability to deconstruct them into key traits and understand how the different combinations of the representations of these key characteristics reflect the nature of these initiatives and implicitly the level of pervasion of participatory city-making, as a mechanism for systemic change beyond capitalism and the state, appear crucial in deciding where to invest our efforts next.

6.1 *Taxonomy Development Methodology*

The taxonomy to be outlined seeks to be an initial means to develop this ability. It evolved in three steps: first, a broad review of initiatives that contribute to the city and subsequently revisiting the emerging traits from the first step; second, linking them back to a moderate, liberal-democratic interpretation of Lefebvre towards participatory city-making to create a refined set of traits; and third, a last re-evaluation of the traits under the radical interpretation of the right to the city outlined earlier.

6.2 *Step One: A Broad Review as the Initial Step in Taxonomy Development*

The first step involved generating an initial set of traits based on the review of over fifty initiatives that contribute to the city, following the methodology of taxonomy development that allows the taxonomist to “make a more or less sound selection [of the characters] on the basis of an intuitive model of the organism, which is again determined by current knowledge and hypotheses” (de Hoog 1981). The implicit

research question of how participatory city-making with the aid of technology works in practice acted as the equivalent of the intuitive model of the organism.

The review included projects from both an academic and a non-academic background identified in previous related research, as well as an additional search on the Internet and in scholarly directories. The inclusion criterion was that the initiative had to make use of technology in some form, no matter whether to present itself on the Internet, to organise itself, as a direct result of the initiative, etc. The additional search was carried out with terms such as “civic engagement”, “citizen engagement”, “participatory”, “city”, “city-making”, “urban development”, etc., and combinations thereof in different languages. Some initiatives were found as they were cross-referenced by the ones already identified. Included in this set are, for example, the *MakeCity* festival in Berlin (2017), the online consultation platform *Neighborhood* (2017), the collective visioning platform *NextHamburg* (2017), matchmaking platform *synAthina* (2017) in Athens connecting volunteers with funders, the crowdfunding platform *SpaceHive* (2017) focusing on civic projects, and the innovation unit of Boston’s city council called *New Urban Mechanics* (2017).

The goal at this stage was solely to capture the breadth of what potentially could fit under the umbrella of participatory city-making. This also means *not* using prioritisation of exchange value over use value as an exclusion criterion—commercial organisations were included; similarly, initiatives developed in partnership with government.

Four broad areas emerged as relevant aspects to explore within the identified initiatives selected:

1. relation to technology;
2. relation to civic/citizen engagement;
3. contribution to city-making; and
4. degree to which they are participatory.

By reviewing them at medium depth, various salient characteristics emerged, again following the principles outlined by de Hoog (1981), where the researcher is free to choose the optimal criterion, as long as it is consistent with logical reasoning. The taxonomist’s intuition not only is present at the beginning, but also evolves during the entire data collection process. The data collection process, in turn, empirically is interwoven with the classificatory process, and thus, the ordering is equally intuitive.

The review leads to a total of six traits:

Participation stance it facilitates based on Wilcox’ framework of participation; **Form** that can vary but is not restricted to being a blog/online magazine, a community or crowdsourcing platform, collaboration network, company or research institution; **Direction** refers to the direction of the initiation; if initiated by an official body, the project is considered “top-down”, otherwise “bottom-up”, unless they’re not actively involved in the activity and act as a coordinator, which qualifies them as “mediator”; **Focus** describes the area relevant to city-making, e.g. mobility, economy, design of urban space;

Potential for impact on policy making to enable citizens’ right to act upon issues;

Potential for impact on citizen motivation highly important for the development of the participatory sense of ownership.

Further, a set of questions related to how participatory city-making can be understood emerged:

Who are the stakeholders? On a metalevel they may include government entities, businesses, universities, individual citizens but also collectives. On a smaller scale, it could be residents of a certain area, workers, shop owners and passers-by in general.

Which level does participatory city-making occupy? Referring to whether it is oriented inwards, ensuring the initiative itself respects participatory principles and had a dedicated coordinator, similar to participatory design, or whether it is a networked, distributed set of initiatives of various stakeholders and that constituting the participatory element.

At which scale does participatory city-making operate? Referring to small-scale grassroots initiatives, large-scale top-down initiatives, initiatives that bridge the two or the possibility of the sum of all three.

6.3 Step Two: Taxonomy Re-Evaluation Based on a Moderate Reconceptualisation of Participatory City-Making

The second step consisted of revisiting this set of open questions and further fleshing out the notion of participatory city-making to a moderate interpretation of the right to the city as an increment to the current liberal-democratic rights system, including thinking of it in more operational terms. These new insights and the deeper understanding achieved were then distilled into the eight traits highlighted below through the following process:

(1) Inward Participation Level and (2) Outward Participation Level: Considering the new distributed and networked understanding of participatory city-making that emerged from this moderate interpretation of Lefebvre, the trait *Participation Stance* had been split up into *Inward Participation Level* and *Outward Participation Level*, reflecting the governance model within the initiative (inward) and the collaboration model between initiatives (outward).

(3) Organisational Form, (4) Technologies and (5) Purpose: *Form* lacked a clear distinction between organisational/legal form, technological form and purpose. In consequence, *Form* was renamed to *Organisational Form* and supplemented by *Technologies* and *Purpose*.

Direction became obsolete with the new, distributed view of participatory city-making as the sum of all initiatives.

With the introduction of *Purpose* partially overlapping with the initial usage of *Focus*, the latter has been removed, particularly because *Purpose* covers the broader city aspects such as economy, culture, sustainability, mobility on a more granular level.

(6) Relation to Government: The *Potential for impact on policy making* is difficult to quantify, and results can come with a long delay, as methods for success assessment of academic research based on policy impact show (Donovan 2007, 2011). For this reason, *Relation to Government* was used as a proxy, as a partnership or funding relationship with a governmental institution increases both access to policymakers, as well as the probability of recommendations made to be considered.

(7) Participation Incentives: *Potential for impact on citizen motivation* suffered from a similar problem and was replaced with *Participation Incentives*, which could be of political, affective or hyperlocal nature, and more.

(8) Success: Finally, in order to leverage the potential of the taxonomy to identify the optimal representations of the above traits, a crucial trait to be added was *Success*, and substantive work is required to identify criteria and approaches to incorporate into success assessment.

6.4 Step Three: Participatory City-Making as a Radical Interpretation of the Right to the City

The final taxonomy, building on the results from the second step, was informed by two research questions:

- How well can the taxonomy assess the level of consistency of a given initiative with Lefebvre's radical interpretation of the right to the city, and the resulting understanding of participatory city-making?
- How does technology contribute towards this consistency?

7 A Taxonomy for the Classification of Participatory City-Making Initiatives

The proposed final taxonomy developed through the methodology described above consists of six traits:

1. Inward participation level

Based on the stances of participation in Wilcox' (1994) framework of participation, this trait seeks to identify the dominant stance the initiative adopts within itself, meaning amongst its own members. The stances can be *Information*, *Consultation*, *Deciding Together*, *Acting Together* and *Support*. It gives thus insights on the approach to governance the initiative takes in direct juxtaposition to the grassroots democracy Lefebvre calls for.

2. Outward participation level

Based on the same participation model, this trait focuses on the dominant stance the initiative seeks with other initiatives. This can give an indicator of the nature of

partnerships and their outcomes. For each partner, a stance can be assigned. The stronger, more numerous and more the ties to government or corporations, in comparison to those to civil society, the less consistent the initiative is with participatory city-making as seen through Lefebvre's lens.

3. Organisational form: profit versus common good

This trait can take multitude of representations, such as an individual, an informal collective, a cooperative, a not-for-profit organisation, a small business, a company, an institutional subdivision, etc. The more profit-oriented the initiative is without generating social and public value in return, the less it is in concordance with Lefebvre's idea of use value above exchange value. It must, nonetheless, be added that the legal form is not always an accurate representation of organisational practice.

4. Activities: constructive versus adversarial

Lefebvre's idea is built on generative and constructive principles, assuming people come together to take over tasks and decision-making, and make alternative visions happen. The initiatives activities should reflect this constructive spirit, instead of being *exclusively* adversarial.

5. Role of technologies

This trait maps a specific type of technology to its role, such as to inform, educate, enable collaboration, as a direct product of participatory city-making in order to develop a comprehensive matrix of its overall contribution to the initiative.

6. Consistency

By combining the levels of consistency of all previous traits into one overall indicator, indicator, the taxonomy provides a mechanism to rank initiatives based on their adherence to right to the city principles, quantify how many are converging towards these principles as well as identify trends based on regular application of the taxonomy to the participatory city-making ecosystem.

7.1 The Role of the Taxonomy in Status-Quo Assessment and Tracking the Evolution of Participatory City-Making

By revisiting the understanding of participatory city-making as an open-ended democratic project, as a process unfolding in cycles, the taxonomy can serve as an instrument in the evaluation phase of the participatory action research that underpins this process as a method. The development of the taxonomy serves as the necessary delimitation of what is, and what is not a participatory city-making initiative. The application of the taxonomy on the existing initiatives allows for the assessment of the status-quo, as well as identifying trends in respect to progressing towards Lefebvre's vision of grassroots democracy and the prevalence of use value over exchange value by it being periodically applied to the city's ecosystem. Thus, the taxonomy

development achieved more clarity through the framing of participatory city-making within the larger theoretical frame of reference of Lefebvre's (1996) right to the city.

8 Conclusion

Framed by Lefebvre's concept of the right to city, that addresses the structure of life in the city itself, rather than more operational aspects such as within the frame of collaboration to produce a specific urban space, participatory city-making can be elevated from a mere mechanism to incrementally amend the existing system to one that radically empowers citizens to fundamentally reshape urban life, envision an entirely different system and gradually make it happen. This exploration has produced a conceptualisation of participatory city-making as a framework that relies on procedural and effective principles based on the hacker ethic and participatory action research, as well as concrete methods, of which the taxonomy is part of.

While the proposed framework is a step towards an enhanced conceptualisation of participatory city-making, the challenging nature of the radical transformation it implies requires a whole range of additional tools, methods, and more refined principles, as well as further theoretical exploration. Additionally, it would benefit from its systematic application in the context of developing technologies with emerging and existing initiatives towards a shared ownership of the city and its urban processes.

In the future, the messiness inherent to its distributed nature will prove challenging for participatory city-making, while at the same time it is exactly this feature that allows for openness, randomness and serendipity—"everything that makes a city great" (Lindsay 2011). It is in these spaces of messiness that "cityness", as opposed to "urban agglomeration" can emerge, it is there that the act of making takes place (Sassen 2005). For this messiness inherent to the right to the city can be considered a "space for encounter, connection, play, learning, difference, surprise, and novelty," a space to "overcome their separation, come to learn about each other, and deliberate together about the meaning and future of the city" (Purcell 2014).

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A Hacking Atlas: Holistic Hacking in the Urban Theater



Douglas Schuler

Abstract This essay is intended to help further the understanding of contemporary social change and social activism, which in turn should assist people developing *civic intelligence* within both local and global communities. Civic intelligence is a social phenomenon that describes how well collectivities address their shared problems efficiently and equitably. It describes examples at a variety of scales from a neighborhood trying to stop a new trash incinerator from being built next to its school to the global climate change agreement negotiated in Paris in 2015. To accomplish this effort, the concepts of *hacking* and *holistic hacking*, and *hacking spaces* (and seven *types* of hacking spaces) are introduced and then employed in relation to an actual activist mobilization called *Shell No*, that was waged in Seattle by environmental activists over a 30-day period in Spring 2015.

Keywords Civic intelligence · Activism · Hacking · Holistic hacking
Hacking spaces · Governance · Social change · Cities · Enablers · Hackability
Coordination

1 Introduction

This essay is intended to help further the understanding of contemporary social change and social activism, which in turn should assist people developing *civic intelligence* within both local and global communities. To accomplish this, the concepts of *hacking* and *holistic hacking*, and *hacking spaces* (and seven *types* of hacking spaces, each described below) are introduced and then employed in relation to an actual activist campaign. Generally speaking, a hack is a single action or intervention; they are insufficient for bringing about significant changes. Holistic hacking describes the phenomenon in which a variety of hacks that are not planned or dic-

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tated by a single source are sufficiently coordinated that they help bring about a common goal. *Civic intelligence*, the focus of my work for nearly 20 years, helps to provide purpose and substance to our considerations of hacking and holistic hacking. Civic intelligence is a social phenomenon that describes how well collectivities address their shared problems efficiently and equitably. It describes examples at a variety of scales from a neighborhood trying to stop a new trash incinerator from being built next to its school to the global climate change agreement negotiated in Paris in 2015. The last piece of our analytic framework, hacking spaces, describes collections of people, roles, rules, norms, processes, etc., that can influence how city-making plays out. We discuss seven *types* of spaces specifically as they relate to cities. Each of the spaces, although not wholly autonomous, provides a sort of *governance*, formal or informal, that determines a portion of the maintenance of the status quo and the ability to help determine the direction of the whole. Each of the seven spaces describes spheres of action that interact with the others. The spaces describe the various sub-theaters within the broader urban theater. The spaces can be used generically in considering the city in the twenty-first century, but here we consider one mobilization, a focused climate action campaign called *Shell No*, in Seattle waged by environmental activists over 30 days in Spring 2015. Finally, the *atlas* here, as with more conventional atlases, is a collection of the various spaces, demonstrating how the interconnections of the various actions or hacks can become something resembling holistic hacking.

2 The City

People live and die, work and play, suffer and rejoice in cities. And the city is the seat of the economic and cultural engines that drive much of the human activity (and consequently non-human activity, the climate, etc.) on our planet, the urban and the non-urban. The city is a dynamic physical complex of streets, buildings, tunnels, bridges, and complex systems that supply humans with water and electricity and move our wastes invisibly away from many of us. The city is also comprised of an assortment of social and human (and other life) systems that interact with it. It is in a perpetual state of decay, repair, maintenance, and creation. As Lewis Mumford reminds us, “The city creates the theater and is the theater” (1996). This means that the city is open for appropriation, enactment, annotation, occupation, exploration, and *hacking*.

3 Hacking and Holistic Hacking

In general, hacking can be summed up as undisciplined, clandestine, unexpected, unorthodox, volunteer-based, fun, unauthorized, amateur, out of bandwidth, off the grid, skunkworks, not official, experimental, insurgent, out of jurisdiction, transgres-

sive, free, DIY, and provisional. Thus, hacking can be seen as oppositional to the bureaucratic, rationalistic, business-as-usual approach. For that reason, the idea of ‘hacking’ can serve both as a metaphor and as a pragmatic approach for rooting out opportunities for clever activism in the urban theater.

The urban theater metaphor needs to be briefly introduced and explained further. We use it primarily as a setting for action (similar to its use in military parlance) while acknowledging the importance of the imaginative, performed nature of city life. When the city becomes the theater, the play spills out beyond the theater walls and it is performed throughout the city; the city simultaneously becomes a theater where meaningful actions—sanctioned and non-sanctioned—are enacted and viewed. The roles of actors and audience members tend to shift, they are dynamic and somewhat interchangeable, and their actions are both scripted and improvised. (And, of course, ‘actors’ are not always human actors; within the city, the buildings, roads, traffic lights, communication systems, are also players....)

The connotations of hacking come in many flavors. One in general circulation goes something like this: illegally breaking into a computer system generally with the intent of causing mischief—stealing private information or trade or national secrets or causing damage of some sort. The original version basically meant messing around, sometimes obsessively, with computers, programming, and data—generally on tasks that were not on the formal agenda, tasks that were selected solely because they were interesting to the hacker. (See Weizenbaum (1976) and Levy (2001) for two somewhat different versions.) The meaning I employ here is related to ‘civic hackers’ (Townsend 2013) which generally means using digital approaches for civic amelioration of some sort, often in a non-corporate sense and often with data that been made available with today’s transparency initiatives and demands.

For the purposes of this chapter, we are restricting our usage to social or civic amelioration which often includes oppositional actions of one type or another. At the same time, although we are placing most of our attention here on ICT and digital media, we are opening up the idea of hacking to be any type of interruption that shares the attributes discussed above which often, although not always, employs technology of some sort. The general concept that of interrupting the flow is not limited to computing. Similar ideas crop up in a variety of fields including design (Hartmann et al. 2008), fashion (von Busch 2008), art (Guerrilla Girls 1998), technological pranks at sporting events,¹ and activism (tactical media, message corrections, guerrilla theater, detournement, etc.

Hacking also means plunging right into a project (often writing code) without the benefit (sometimes questionable) of a mock-up, design document, public hearing, or deep analysis. Hacking can be precise and planned yet it is often ad-lib, ad hoc. Hacking at some level is a matter of economy. An ‘efficient’ or successful hack means a high yield per input: more publicity or support for the hackers’ side and/or more pain for the opposition in the form of confusion, embarrassment or discomfort, or embroilment in a more complex, protracted, wider (e.g., becoming involved in legal

¹ See, for instance, https://en.wikipedia.org/wiki/Hacks_at_the_Massachusetts_Institute_of_Technology.

battles) or more costly enterprise. People hack because they’re strapped for resources (including time) that may never come. Also, there’s something in the nature of a hack that suggests—or at least allows for—experimentation and incremental and improvised adjustments, something that a full-scale plan (e.g., to land a person on the moon and bring him back safely) generally discourages.

Hacking is often conducted sporadically and perpetrated by an individual or small, often marginalized, groups. Often deemed a provocation or a symbolic act, de Lange and de Waal (2013) point out that artistic and other urban interventions (what we might call hacks) often “remain highly temporary and stick to oppositional politics.” They argue for an alternative approach to “urban design with digital technologies that focuses on the active role of citizens and uses the city itself as the test bed for experiments.” Of course, whether an action is an experiment or not is to some degree in the eye of the beholder. The political moments described by Becher (2012) are unlikely to be considered explicitly as experiments by the activists themselves. And many activist hackers might find the experimental perspective alien, sterile, or confining even though they are certainly involved in some type of informal or implicit evaluation or metacognition (Schuler 2015) regarding the impact of their actions.

A hack can also be a provocation; it is at least intended to suggest a deflection from the business-as-usual path that inertia suggests is the most likely. Humor is a natural hack since it can often be employed economically without necessarily needing vast resources. And while humor by itself is only one hack among many, its role in revealing the flimsy veneer of one imaginary can be invaluable in the construction of an imaginary (or myth or paradigm or vision) that embodies sustainability and social justice. It can play the important role of exposing the rhetoric or imaginary (Wright et al. 2013) that being employed to justify or rationalize the unexamined momentum of the status quo of the present or some version of the status quo of the past.²

3.1 Holistic Hacking and Civic Intelligence

So far, we have concentrated here on ‘hacks’—limited interventions that may require fewer resources—but with an eye toward holism, toward significant and durable social change. Holistic hacking suggests another level of hacking, a concept that is related to *civic intelligence*, the capability of people working together to address shared concerns equitably and effectively (Schuler 2001). Holistic hacking is intended to be focused on the common good; it is a version or extension of civic hacking. As the name suggests, holistic hacking is more systemic, coordinated, and purposeful than the interventions described above by de Lange and de Waal or by a random, non-coordinated, or economically or politically self-serving hack. The hacks become *holistic* when one hack helps increase the likelihood that other purposeful

²This can be exemplified by the curious, imprecise, and somewhat ominous slogan of current president Donald J. Trump: *Make America Great Again!* Just what period of time was he alluding to? And people who were oppressed during that unnamed period might not agree.

actions (including hacks) that get closer to the goal are now more easily enacted. Significantly, building the capacity of one's allies is one way of getting closer to their goals. Holistic hacking describes a purposeful application of hacks with the spaces that are relevant, positively or negatively, to a desired outcome or set of outcomes. The relevance can be potential or actual. Because the actors have similar goals but different philosophies, norms, strategies, and tactics, they will need to strategically adapt to each other and to changing circumstances if they are to achieve their goals. Holistically hacking the city allows us to bridge the gap between temporary probes and long-lasting effects. A series of temporary hacks could help lead to long-lasting social change—if the hacks were timely, purposeful, capacity-building, and coordinated. Holistic hacking can be done to interject new ideas or focus, and this can be in service of maintenance or upkeep of the city—the everyday *re-making* of cities as well as the more revolutionary *making* of cities.

The working hypothesis (and preliminary findings) suggest that a focus on social and environmental amelioration will promote different actions and outcomes than a putatively objective, norm-free enterprise, i.e., that there are general characteristics that distinguish collective intelligence (Malone et al. 2009) and civic intelligence (Schuler 2014, 2015).³ As an example of civic intelligence, holistic hacking will necessarily rely on the same enablers, the characteristics of civically intelligent actions to help lead to successful outcomes, that civic intelligence relies on. In other words, some subset of these enablers will be required for successful changes within any of the spaces that constitute the urban theater mentioned by Mumford (1996) in the next section. These enablers, of which nearly 50 have now been identified, have been organized into a framework containing five dimensions (Schuler 2014), namely:

- Knowledge, including a variety of knowledge-based enablers such as theory, knowledge of problems, skills, resources, self-knowledge, and metacognition (the ability to think about one's own thinking);
- Attitude and aspiration, including a variety of enablers that are typically seen as non-cognitive but are essential for civic intelligence such as values, social critique, civic purpose, and self-efficacy;
- Organizational capital, including the processes and structure of the collectivity that are needed to complete tasks effectively, such as personnel, work practices, and access to resources;
- Relational and social capital, including reputation, social networks, social capital, and opportunities; and
- Financial and material resources, including money, buildings, land, and the like.

The framework is used to depict the wide diversity of enablers that are involved in positive social change via civic intelligence. The framework is descriptive as it is really just a list of what sorts of resources (very broadly considered) are useful for civically intelligent activism. The framework can also be used prescriptively. An

³It is interesting to note that a study of civic intelligence must necessarily include a study of civic *ignorance* (Proctor and Schieberger 2008) which, as with civic intelligence, relies on a variety of interrelated processes to sustain it.

organization, for example, could use the framework for self-diagnostics. It could reveal weaknesses within the organization which could then take corrective actions to improve one or more of the enablers by making it more appropriate to the organization's challenges and opportunities.

Each major dimension of the framework will necessarily be engaged in any meaningful action. The important question to ask, however, is *how well* and *to what degree* the dimension was engaged. If, for example, a group created a website that contained policy proposals, but the developers had neglected to consult the policy experts within their own group, they would have shown a deficiency in at least three of the five dimensions: knowledge, organizational capital, and resources. This of course also holds true for the individual enablers. Finally, although the enablers are numerous, the list is still not exhaustive—and probably would never be broad enough to cover all circumstances.

4 Hacking Spaces

According to historian and urbanist Lewis Mumford, “It is in the city, the city as theater, that man’s more purposive activities are focused, and work out, through conflicting and cooperating personalities, events, groups, into more significant culminations” (1996). Social change is complex—it is an ecosystem where people and organizations with varying skills, tactics, and perspectives collaborate often with limited explicit communication and coordination; yet they are working ‘together’ toward similar ends. The process unfolds over time—and although there are many important patterns to be recognized (and respected), social change cannot be scheduled or engineered, taken for granted, or permanent. This chapter fits within that tradition by presenting seven *spaces* in which these unfoldings occur, within the context of the city theater. The concept of spaces is used by a variety of disciplines and is fundamental to geography. Its virtues include flexibility and universality. Aase in his article on Symbolic Space (1994) stresses that space must be considered contextually. In this article, the context can be seen generally in terms of urban activism—specifically environmental activism in Seattle during one month of Spring 2015. Harvey and Davidson (1973) stress the usefulness of the concept: “... space becomes whatever we make of it during the process of analysis rather than prior to it.” Here, hacking spaces describe a conceptual realm or category that can be fairly readily be demarcated from the other spaces in its universe, basically by the actions within the space, the players, rules, products or results, and goals.

These particular spaces were identified via examination of significant activities that take place within cities using the lens of spaces. We are differentiating between spaces generally by what takes place within them. In other words, different actors give different performances for different purposes using different rules. Generally, this will include norms, values, demographics, actions, and consequences. Contrariwise—when sets of actors and actions are sufficiently different (via demographics, norms, etc.) from other sets—they are likely to be constituting a different space. But

these spaces are not autonomous: activities within a space can shape (or create or destroy) other spaces or aspects within them.

The seven broad conceptual spaces in which urban hacking can occur correspond to the characteristics of an actual city and to the actual events and issues within that city and those that affect that city. The spaces have diverse sites, actors (including hackers), and areas of focus, modes of actions, and effects. (And the spaces have spaces within them.) The spaces are intended (and hoped) to be comprehensive in that the set of spaces listed here adequately describes (or at least suggests) all of the possible conceptual ‘homes’ for holistic urban hacking.

The spaces in this ‘atlas’ are abstract; they become relevant when they are instantiated and mapped to the specific relevant attributes of the city and the issues that are under contention. When considering actual locations within the city as a focus for physical action, there are many options: The location for a demonstration against a war might best be at federal or national state building, demonstrating against redlining might best be done near the entrance of the bank’s headquarters; demonstrating against air pollution—which although diffuse is generally far worse in low-income neighborhoods—might be more effective when others are brought to the neighborhood either in person, or virtually, via an online video or a virtual reality tour.

The spaces take particular significance when multiple ones are in play (see the Shell No example below) and when hacking in one space promotes successful hacking and actions in other spaces. How readily an actual city can be ‘hacked’—its hackability—will depend on the particular aspects of the city and the skills, creativity, and dedication of the hackers and the hacks they can identify and employ, as well as access to the space. An analysis of the various spaces could also be rich and potentially productive.

Can ‘hackability’ be operationalized, assessed, perhaps even measured, and calculated? Although the idea is currently underdeveloped, the spaces could be queried for measures of hackability. One important note on our hypothetical hackability index is that it is not intended to be an index of vulnerabilities, although an authoritarian government could think of it in those terms. The hackability index in many ways could be thought of as an index of openness and opportunities—and any closing of them or raising the cost of using them could be considered as threats to the open character of the city—and its various spaces.

Just as traditional maps of physical spaces can be organized via political, topographical, or other means that highlight some characteristics and downplay others, these seven spaces bring particular focus to some attributes at the expense of others. And, like maps of physical cities, the perspectives of spaces where political boundaries and natural features such as rivers are likely to be strongly related, the spaces in the hacking atlas are likewise strongly and densely interconnected. The hope is that the conceptual slicing and dicing of the city in a very broad sense can contribute to our social imagination, both practically and theoretically.

4.1 Information and Communication Space

While today's civic hacking has little in common with the idea of hacking a competitor's computer system or stealing personal data and identity, the legacy of this reliance on hidden data is often still present in today's usage: using digital data that has been kept out of reach of citizens, or, even, repurposing data for purposes that the people who collected the data did not foresee, or might even oppose, still remain. Information and communication can often provide the seed for other types of hacking. The space also includes vital elements of the economic side of the city. John Perry Barlow's comment that "cyberspace is where your money is" highlights the fact that financial information is stored in 'cyberspace' and online systems are responsible for massive amounts of financial transfers. Thus, cyberspace provides the target for both hackers that are providing information about corruption and money-laundering and also for the people who would like to add the money in your account to the money in their account.

How the 'hackers' within a social movement or urban campaign communicate with each other and with potential allies is important as well—and the security of these channels can be vital. This area of course is the focus of many articles and discussion thanks in part to new movements like Arab Spring (Lotan et al. 2011) and the Occupy Movement (Gamson and Sifry 2013). New DIY networks that can be set up and mobilized easily and autonomously without being connected to the Internet also offer opportunities for hacking in this space (Antoniadis and Apostol 2014). It is also important to note that the mass media is covered in this space [which is similar to *mediascapes* (Appadurai 1990)]. The mass media can act as a force multiplier for the hack, but, so too, can email, electronic petitions, or social media. And because the mass media often comes with its own agenda, it is often necessary to hack this as well. See the patterns on *Illegitimate Theater*, *Tactical Media*, *Indigenous Media*, or *Media Intervention* (all in Schuler 2008) for a variety of perspectives on media interventions. Civil society has been active in this space. Community networks (Schuler 1996) generally created and maintained by community developers and activists to support local community using the Internet numbered in the hundreds before commercial interests became dominant.

4.2 Governance Space

This space describes the formal governmental procedures that are intended to govern the city and the seven spaces within it. And while these procedures are not necessarily always obeyed (by either the *governed* or the *governors*), may be subject to bribes and corruption or other unequal application, or be inconsistent or unfathomably complex, the influence of this space is generally quite considerable as it is backed up by laws, judges, police, and prisons. For this reason, a hack that helps enlist a part of the government (e.g., the legal system) in the struggle can be considerably powerful. The

‘checks and balances’ that have been intentionally built into democratic systems (by early adopters of cybernetics and systems thinking)—as well as the polycentric reach and roles of governmental bodies (Ostrom 2015)—suggest that myriad points exist for holistic hacking and that the potential of enlisting formal governmental systems in social struggles is possible. The boundaries of this space (like the others) are not constant. The entire space can change fundamentally, although more frequently this change is more localized. It is subject to some renegotiation, readjustment, and realignment in which ‘ordinary’ citizens are granted some quasi-governmental status. This can be seen in institutions such as citizen advisory boards and public meetings. One important hack is establishing a citizen police review board—or changing it by adding more representative voices from the community it polices.

To be effective in this space, some important questions need to be addressed. Where are various types of decisions made—and how are they made—and by whom? Government agencies come in many shapes and sizes and have a variety of roles and responsibilities that connect with each other—and with citizens—in complex ways that are not well understood by the citizenry [or, even, in many cases, by the officials themselves (Buxbaum 2015)]. Knowledge of this space—where responsibilities and decision making are situated—while not hacking in its own right, provides important insights about where to hack. Hacking in this space includes any type of reconfiguration of the roles of government and citizens. Participatory budgeting—hacking the budget—is a major new development in this area because it opens up the role of budgeting to include people who played little direct role historically—citizens. See Stortone and De Cindio (2015) for an online instantiation of this process. The governance space also includes the idea of self-governance and protocols such as *Roberts Rules of Order* (Robert et al. 2011) belong here as well as new online versions such as *eLiberate* which supports distributed decision making using *Roberts Rules of Order* in an online environment (Schuler 2009).

4.3 Social, Organizational, and Institutional Space

While the space above is specifically related to the formal institutions of government and its relationship with people, this space is associated with civil society including social networks (both ‘traditional’ and online), advocacy, educational, community, social, and organized labor. The MAZI is an interesting case study of an ‘institutional’ effort to reach out to activists and support grassroots movements and bottom-up initiatives through a ‘research and action’ funding framework (see Research and Action pattern).⁴ Hacking in this space might mean starting a new organization, joining an existing one, or, even, devising a new type of organization as people did when they developed the ‘B Corporation’⁵ entity or a bottom-up ‘world citizen parliament’ (Schuler 2013). It might mean developing new partnerships, consortiums,

⁴See <http://mazizone.eu>.

⁵See https://en.wikipedia.org/wiki/B_corporation.

coalitions, etc., that are able to organize themselves to create larger actions on more fronts. This is a form of social network hacking—and it doesn't only pertain to online social networks.

Although much of the activity within the space seems to be more hostage to inertia than others, there is room for hacking. One way is to remind organizations of their founding goals or mission—either to help activate a new line of work for them or to embarrass them for their dereliction of duty. One interesting approach along these lines was demonstrated a few years ago when activists in 1998 formally requested the Attorney General of California to revoke the charter of a US corporation, Union Oil Company of California, which is the legal basis for a corporation's right to exist (Brooks 1998) for actions that were deemed to be illegal.

4.4 *Infrastructure Space*

Cities in particular are noted by various socio-technological infrastructures that maintain them. Energy use, surveillance, water availability, and quality, etc., are related to this space. This space can be hacked in many ways from hooking into the electrical grid without paying to setting up a free wireless network. These infrastructures are largely invisible, in the sense that people may use them routinely but rarely think about how they work, how they are maintained, etc. This allows city dwellers to pay attention to other things, but it also helps sustain a level of civic ignorance: How are citizens expected to contribute to infrastructure decisions—let alone develop alternatives—in a city if they lack basic knowledge? One hack here is simply making infrastructures more visible. The Local Governments for Sustainability (iclei.org) provides some window into this world although it is relatively static at this point, while an ensemble of more dynamic, real-time (and other) displays would be more illustrative and useful. The smart city movement, primarily an industry initiative, is positioned as a solution to concerns over sustainability. These ‘smart cities’ are to be managed to a very large degree via an intelligent use of big data. Although there is likely to be substantial potential with this approach, the momentum is generally away from transparency, citizen sovereignty, and self-governance and toward technocracy and inscrutability of infrastructure.

Numerous opportunities exist for new civic infrastructure, such as municipal broadband, community networks, or deliberation systems. Setting up a new electrical utility corporation could also be considered a type of systemic or long-term hack—one that could also be considered as a part of another space (such as organizational and institutional space). And any effort to improve infrastructure within a city can be an occasion for hacking. And although infrastructure space can (somewhat justifiably) be seen as big, expensive, impersonal, and severely limited in type, this is not necessarily the case. Many of contemporary participatory or social sensing projects (e.g., Airantzis et al. 2008) could be considered as possible predecessors of components of tomorrow’s urban infrastructure. It is well known that people who are marginalized due to economic or other factors are often concentrated in zones

within the cities that are environmentally degraded, unhealthy, dangerous, and isolated from civic amenities. An ‘infrastructure’ that monitored air pollution that was mobile and crowd-sourced could serve as alternative watchdog infrastructure that provided evidence that could be used to show that environmental law enforcement was needed.

4.5 *Physical Space*

The actual, palpable, aspects of the city can too be hacked. A demonstration or any other occasion where people take to the streets reconfigures the city if only temporarily. The Occupy Movement (Gamson and Sifry 2013) was a significant expression of this. Another ‘hack,’ also significant, that is generally motivated more by the need for survival is squatting and the erection of shantytowns, favelas, and informal housing worldwide. The ‘Ministry of Space’ in Serbia (Predić and Čukić 2013) through semi-seriously establishing itself with the quasi-official administrative rhetoric ‘Ministry’ becomes a ‘mirror institution’ (Schuler 2008), a provocative hack that could also probably be filed in either the Governance or in the Social, Organizational and Institutional Space dossiers. In the physical space, the Ministry has hacked marquees of shuttered theaters in Belgrade, Serbia (“No Play Tonight. Come Back Yesterday”) and ‘spontaneously’ transformed dismal and neglected urban backwaters into pop-up festivals of music, art, and conviviality. And this can take other forms such as tactical urbanism (Lydon and Garcia 2015), city repair (Cowan et al. 2013), and urban participatory design (DiSalvo et al. 2008). Some types of hacking of the physical space can be promoted by government. The city government in San Francisco, California, has identified ‘free spaces’ all over the city which people can lease from the city for \$1 annually. Of course, it is critical to note that physical (as well as other) spaces in the city are often contested and afford unequal access and privilege. This is often maintained through unvoiced norms but often also through laws such as prohibitions against sitting the sidewalk that criminalize poverty. Loukaitou-Sideris and Ehrenfeucht (2009) provide an enlightening look at the history of negotiation and conflict in relation to sidewalks in the USA. Thus, hacking this space often means using the space by people in manners or for purposes that are not formally or informally sanctioned. Henry LeFevre’s Rights to the City (1976) provides many insights with which to inform the holistic hacking/civic intelligence orientation. A vast amount of scholarly, political, and activist work has revolved around LeFevre’s work. The rights to the city basically focused on the physical/material side of the city, the physical space in our atlas. While this work has been extended in many ways, it could include rights to each of the seven spaces.⁶

⁶See the work of Antoniadis and Apostol (2014) on the ‘hybrid city’ for some ‘basics’ of the Lefebvre’s work.

4.6 External Space

Sometimes when hacking the city, it becomes necessary to hack the rest of the world as well. Cities are not autonomous islands or planets but areas that exist within broader environments. These broader environments include the natural world (sometimes forgotten and undervalued) and the inhabitants outside the city (also often forgotten and undervalued) as well as relationships to other cities, towns, and the natural world. This space, of course, is actually a metaspace, although it is listed as a single space for convenience. One way to look at this ‘space’ would be to see it as a space containing the six others—each of these would be related in various ways to similar spaces ‘outside.’ This is especially clear in the sense of the governance space; the governance space within a given city has links to other spaces—Seattle’s city government, for example, is related to county, state, and federal government as well as to other city governance spaces with a varied set of interrelationships.

Based on his belief that national governments are increasingly unable to promote progressive change, Barber (2013) presents a variety of current and potential relationships between cities in which innovations are spread more quickly and more widely. At the same time, the mayors of the world have established new networks that help them to compare issues and develop innovative approaches to the problems of cities. The C40 Cities Climate Leadership Group (<http://www.c40.org/>), for example, is a network of the world’s megacities committed to addressing climate change.

4.7 Imaginary Space

This space may be the most important as it focuses on the creation of ‘realities’ that are different than the current ones including ones that are actually *possible*; it drives the conceptual orientation or perspective that people carry in their minds as they move through their daily lives. This space ultimately helps determine how the city and the people within it are represented, basically through narrative imagination about the future—and the present. This is the space of engaged and purposeful make-believe (Walton 1990). Thinking about the city and its citizens as they are, lays the groundwork for the future: Is the city mysterious, paranoid, engaged, reflective, open, rambunctious, laid-back? This space encourages people to think about what could be and what part they could play in achieving that end. If, for example, they are interested in equity and environmental sustainability and they have sufficient social imagination and self-efficacy, they are more likely to become active advocates (Schuler 2014). If their worldview, on the other hand, consciously or subconsciously, rests on the notion that they are powerless, and change is impossible, then they are more likely to cleave toward the sidelines. If they believe that certain trends and certain types of futures are inevitable, then, again, there is no reason to act beyond the strictly personal and consequently they could decide to concentrate on maximizing personal happiness and material accumulation to the exclusion of everything else.

This is the space where the idea of play becomes very relevant. Play is rehearsal; it is an occasion for actively exploring possibilities. And the city can be playful; it can support play in an endless number of ways. Playful acts and hacks can be important including novel ones made possible because of digital technologies. The ‘Shadowing’ project in Bristol, UK, records shadows of people as they pass under a lamp post which are then reproduced for the next person who happens by. This gives the city dweller an unexpected chance to step out of ordinary reality at the very least but also to interact creatively with the system by interacting with the prior shadows or provide new interesting shadows for the next person (Nijholt 2015).

Hacking in this space includes imagining—and articulating—the futures that we’d like to see as well as surfacing the imaginaries that are maintaining or even strengthening harmful tendencies of the status quo (Wright et al. 2013). Neither of these efforts is easy of course. The forces that fight against new ameliorative imaginaries, narratives, and futures are vast; they are seemingly ubiquitous—and they are certainly well-financed. One of the most important aspects of city-making in the imaginary space is that the city that is being constructed is one that won’t be in existence for a number of years—if ever. One of the most common contemporary vision of this space is the sustainable city, a city that provides the urban amenities that its dwellers would like to see, to enable them to live within limits in an environment that is a socially responsible entity within itself and with its neighbors and the planet. The o500 project exemplifies the idea of imagination nudging us into the future.⁷ It demonstrates how large innovative projects are likely to have their origins in the imaginary space:

o500 is a work in progress that aims to foster a global perspective for inventing sustainable urban lifestyles that are compatible with the survival of the biosphere and our aspiration to fulfilled and happy lives. At the same time it is a concrete and immediate action plan based on real projects around the world.⁸

4.8 Discussion

Explorations of the city’s seven spaces should reveal myriad ways open to citizen engagement and, ultimately, prospects for bringing about positive social change through holistic hacking. Looking at these spaces helps us appreciate the multidimensional richness of the city including how the city is perceived, inhabited, used, imagined, experienced, critiqued, measured, governed, etc., and how cities have changed, are changing, and could change. The framework is abstract, but it takes more specific attributes when it is considered in a specific case. And how the seven spaces are instantiated are not universal—the challenges and opportunities that exist vary considerably according to their context; a hack that is merely frowned upon in one context may be punishable by death in another.

⁷<http://www.o500.org>.

⁸<http://www.o500.org>.

Each ‘space’ contains the particular structure linking disparate types of institutions and processes, but like a map, the representation within a space can only represent a portion of the entire space. Hence, uncovering hidden structure and relationships within the space can be crucial. Hacking can take place within a space (or multiple spaces), and it can actually help reconstitute the space (or spaces) and the relationships between them. Although the possibilities for future explorations must be realized in future endeavors, we can at least suggest a number of possible next steps. One of the most interesting that of actual ‘maps’ or other graphical depictions for the different spaces is suggested by the idea of spaces. This could help people explore the complexity without necessarily overwhelming them. The maps themselves could employ a variety of icons, some specific to a single space, some shared by many, if not all.

5 Case Study

The following discussion is based on a recent mobilization that took place in the city of Seattle in the northwest USA but has ramifications beyond. Although this chapter concentrates on city-making, particularly focusing on digital media, I have chosen to convey a broader view of hacking within the seven urban spaces. I have done this for several reasons. The approach that we took to this work was to look at an actual event that was significant yet fairly limited in terms of geography and duration. The objective was to identify an important mobilization and identify what hacks occurred within that—including how new ICT was involved. An alternative approach to exploring city-making vis-a-vis ICT would be to uncover an action that relied to a large degree on ICT. While this approach is certainly valuable, it seems at least possible that it may miss a large part of the reality that it is intended to describe. This includes the fact that movements consist of many moving and, presumably, coordinated elements, some of which takes place online but many offline. Moreover, and this was not demonstrated in this paper, the focus on actions that rely solely on ICT may also miss new constitutive developments or realignments that develop over time.

The hacking spaces framework proposed here relies on the idea that cities are dynamic systems with countless complex, interrelated elements. It does so, however, by presenting spaces that although not strictly autonomous appear to be subject to their own structure, norms, and processes that alter aspects of the city in a broad way that encompasses considerably more than the view of the city as aggregation of people and built structures. Hacking any city attempts to create a city that is an alternative to the current one. But the alternative one is necessarily based on the current one and connected to it; it is not totally separate, and hence, a digital hack that only affected the digital world would not be city-making in the sense that we are exploring. Without a viable connection to the ‘real world,’ the hack would be impotent. Moreover, the actions (including hacks) that lead to successful conclusions form a dynamic ecosystem. For that reason, in the Shell No example that follows,

the actions in the spaces that are being discussed are not only digital. On the other hand, because the focus of this chapter and of the book is on digital phenomena, noting the digital as well as the other connections among other actions and across the spaces is critical. The connections between spaces may be bridged via ICT or not (but it is commonly part of the overall campaign). The connections help to form a complete, coherent set of spaces, a universe, although still (of course) inadequately understood.

Cities are made through the activities of people and at the same time the city structures activities of the people. Within the paradigm of the seven spaces, people make cities by changing elements and relationships within those spaces. In the following section, we explore city-making by examining a recent mobilization through the perspectives of the seven spaces. The attempt is to raise a broad number of relevant characteristics without making claims for comprehensive or complete analysis.

5.1 *Shell No*

Climate change is ushering in a new era for the Arctic. The ice is receding at record rates (NSIDC 2012) allowing for unprecedented opportunities for oil extraction. Environmental activists believe that these new efforts endanger the environment and lead to more cataclysmic climate. In the Spring of 2015, Royal Dutch Shell Oil Company was preparing for a new initiative in the Arctic which included docking a giant drilling rig, the Polar Pioneer, at the Port of Seattle. From the point that the rig arrived (14 May 2015) until the point that it departed for its Arctic rendezvous (15 June 2015) environmental activists from Seattle and beyond engaged in holistic hacking, a multiplicity of hackings generally connected to each other—and generally mutually reinforcing—in a variety of non-coerced and semi-autonomous ways.

Information and Communication Space

Mass media, the modern-day behemoth, was an all-important consideration throughout the duration of the mobilization. All things considered the demonstrations were ultimately mediagenic. The media did not choose to come down hard on the demonstrations. Seattle is progressive politically and is more likely to be environmentally friendly and scientifically informed than other places in the USA. Also, although Seattleites tend to like order they're not strangers to demonstrations. While not focusing on the media alone, the Backbone Campaign, headquartered in the Pacific Northwest, helped ensure that the efforts were clearly recorded in a way that provided a strong message that was interesting enough to catch people's attention and be likely to be picked up by the mass media as well as social media.⁹ Their website stresses 'artful activism,' 'creative action,' and "building a vibrant and joyous nonviolent nationally networked, community-based progressive populist movement that makes a real and positive difference in people's lives." In addition, the Shell No activists posted to

⁹<http://www.backbonecampaign.org>.

YouTube and managed at least two Facebook accounts which were used for sharing information and ideas, loosely coordinating activities, building community and solidarity, and providing visibility to the cause. Finally, the economic component of this space was also in play. The Port of Seattle makes money from the organizations who use its facilities. And Shell, of course, is a huge corporation that employs people and lobbies government. And economic concerns present a wide variety of hacking opportunities, including boycotts and divestiture.

Governance Space

As mentioned above, these spaces intersect and interplay in many ways. For one thing, there are many relevant agencies, laws, permits, and the like that govern how—and if—the drilling rig must be managed while it is visiting Seattle’s waterways. The permit to allow it to even be there was, in fact, a major contention. It turned out that the discussion and vote on it by the Port Commission was done in secret and there was no public scrutiny (Brownstone Feb 15, [2015a](#)). Clearly having the laws and the roles of the relevant agencies online allowed much more visibility to this space than before.

The Shell No campaign action demonstrates another interesting use of the governance space. On the Polar Pioneer’s last day in Seattle, two dozen kayaktivists were arrested as they attempted to block the path of the massive rig (Brownstone Feb 15, [2015b](#)). One protester, Mike O’Brien, was a Seattle City Council member. O’Brien as an elected official brings to mind the governance space. But O’Brien apparently hacked several other spaces as well. By performing civil disobedience, he blurred the line between the governors and the governed and stretched the narrative of what’s the proper response to his extraordinary action. In a text message sent from the Coast Guard office while he was being processed, he articulated his objection: “That monstrous rig is headed to the Arctic to attempt to do something unconscionable. I had done everything I know how to do as a citizen, an activist, and as a council member to stop Shell from drilling in the Arctic.”

Social, Organizational, and Institutional Space

In addition to environmental groups such as 350.org and Green Peace, the sovereign nations, indigenous people from North America played strong roles throughout the month of protests. At a basic level, this hacked the legitimacy of the national state and the corporations which is enabled through corporate-friendly legislation. As the original inhabitants, indigenous people have prior rights to the land. However, due to invasion and conquest, they are often impoverished: The environmental damage wrought by modern technologically driven systems is not of their making. It is contrary to their fundamental ethos, yet they are often the ones hit hardest by climate change.

One seemingly unlikely group who played a prominent role was The Raging Grannies, a group of women who dress like ‘innocent little old ladies’ and were arrested, having padlocked their lawn chairs (with them in them) across the entrance of the port where the rig was docked. They’re certainly hacking the ‘innocent old lady’ paradigm. This group of Grannies was presumably living in the Pacific Northwest although they could have been from any number of affiliated chapters because,

perhaps unexpectedly, they are a global group and their website Raging Grannies¹⁰ include a ‘herstory’ and a ‘starter kit’ to help other Grannie groups get launched. In addition to people ‘of that certain age,’ there was also a strong focus at the other end of the age spectrum. Young people were often speakers at the rallies, and some were preteens, while some were in high school or college. Their generation is more likely to be affected by climate change than their predecessors, and in their speeches, they expressed bewilderment that the older generation has been so derelict in its responsibilities to future generations.

Infrastructure Space

On some level, the entire campaign was focused on infrastructure in a very large sense—the massive worldwide carbon-based enterprise which fuels the economy and unleashes the damaging effects on the planet’s climate. Locally, the 400-foot drilling rig presented a visible month-long reminder of this infrastructure, that while huge in itself, is infinitesimal compared to the incomprehensibly vast infrastructure that is being resisted. In marked contrast to the drilling rig, the activists themselves created an alternative structure that also floated in the waters of Puget Sound: A large barge, physically close to the training and embarkation area of the kayaktivists, was used as a music and dancing venue thus providing an opportunity for relaxation and community building under the ever-present shadow of the big rig.

Physical Space

The physical space of the city is of course important focus of the city. In the Shell No case, this physical space was unlike the typical physical space of cities in general—including Seattle’s streets and squares that had been ‘hacked’ in previous encounters—notably the demonstrations against the US invasion of Iraq in 2003 and against the policies of the World Trade Organization (WTO) in 1999. The physical spaces in the Shell No campaign were to a large degree water-based. A barge, for example, was anchored that served as a floating protest hub and home to music and dance as well. And the water-based space most importantly gave rise to a new breed of protester, the kayaktivists that encircled the rig and attempted to disrupt its northward transit (Fig. 1).

External Space

While the entire action we are examining took place within Seattle, virtually the entire purpose is tied to situations outside the city limits. The ultimate intent, of course, is to prevent catastrophic effects of climate change. But this can’t be accomplished at one go and obviously not by activists in Seattle alone. Other external spaces were involved or incorporated with the Shell No actions. One such transit through this space echoes the movement of the rig itself. Thus, the entire path of moving the rig from one place to another presents opportunities for actions—and cooperation between activist efforts, possibly utilizing the spaces in different ways as the rig moves on—when it enters Canadian waters, for example, and a whole new set of circumstances. Because ultimately the Shell No actions must be linked to other actions outside of the time and space discussed here, the lessons learned in Seattle

¹⁰<http://raginggrannies.org>.



Fig. 1 Hundreds of waterborne kayaktivists demonstrating against shell provide stark contrast to the 400-foot technological behemoth they are resisting. Photograph credit Arctic Drilling Kayaktivists vs Shell Polar Pioneer—Photograph by Daniella Beccaria (https://www.flickr.com/photos/backbone_campaign/17332349103, Attribution 2.0 Generic (CC BY 2.0))

would ideally be shared with other activists in other locations and the cooperative social networks between them would also grow both quantitatively and qualitatively.

Imaginary Space

Finally, the imaginary space is also crucial. According to Wright et al. (2013), “...there is a need to view climate change as a social and politically embedded phenomenon, fundamentally linked to patterns of production and consumption and the ideological assumptions that underpin the economic system and our collective sense-making processes.” In other words, climate change presents not only a physical (and ecologically material) threat to our existence but also a conceptual challenge to the way in which we imagine that existence. The Shell No campaign operated in new ways in relation to the imaginary space. One was their ability to encourage new ways of mobilizing people from under-represented sectors (indigenous people, youth, people of color, elderly) in creative, family-friendly events thus helping to legitimize ‘protest’ by making it more accessible and natural. One of the more prominent ways in which the mobilization used this space resulted in city-making in a way that was abstract yet likely has significant and material consequences. This is by helping to establish Seattle as a site of (inclusive) resistance which could serve as a model. Here, city-making can be city image-making for people within the city and outside the city. This could be part of a broader remaking of cities in general as they become

increasingly dominant—as well as specific cities, as Dickens did for London and the director Ridley Scott for Los Angeles.

The imaginary space, interestingly, may be the one that reveals changes to the city most clearly. The city itself may have an enlarged activist core and begin, even, to see itself—and be perceived by others as a leader of sorts, whose citizens are active as watchdogs, change agents, and cultivators of civic intelligence.

6 Hacking the Future

The nature of the city, currently and in the future, is of critical importance. The main objective of this chapter was to present the seven spaces and to demonstrate why they are important to city-making in an era of ubiquitous networked digital infrastructures. The assertion in this chapter is that changing the nature in one or more of these spaces in a given urban setting (or *theater*) demonstrates city-making. While the digital domain may quite possibly grow in importance in future campaigns or in some contemporary campaigns, its use in the Shell No campaign was generally supportive (critically so) rather than dominant.

The seven spaces presented here are intended to provide some analytical and design perspective for holistically hacking our future, in particular motivating creative civic intelligence work in the digital realm. The reality is, however, that new concepts or frameworks like new technologies will not do this work for us. That work requires the animating force of human beings, using creativity, values, courage, and intelligence, as well as skilled, reflective, and informed hacking. Also, as noted earlier, blocking these hacking access points, or raising the cost of exploiting them, is threats to democratic processes and the openness of cities as described in the Hackable City Toolkit (2015). One of the most important lessons about civic intelligence is that successful application of civic intelligence increases capacity for applying civic intelligence in future endeavors.

The month-long story of Shell's Polar Pioneer stay in Seattle provides an interesting and useful snapshot, an opportunity to highlight the idea of holistic hacking and the seven spaces in which urban hacking can be enacted. Over the course of the month, two dozen or so formal and informal groups met one or more times a day with a variety of agendas. The coalition was voluntary and informal, and the individual groups usually made their decisions based on consensus. Their actions were always peaceful—if not always legal. The questions as to the effectiveness of their actions are now being raised: “Who won?” is one such question. Clearly, the actions, however brief, attracted national and international attention, e.g., in the UK's Guardian newspaper, and the fight, of course, is not over.

Climate change is still making its global advances while humankind struggles with the issue, sometimes with unprecedented success such as with the Paris agreement in December 2015 but too often with business as usual or even denial. During the writing of this chapter, several months after the main event, Shell abruptly announced that it was ceasing its Arctic operations. After spending over 7 billion dollars (USA)

on their search, Shell stated that the company had not found enough oil to keep looking (Brownstone 2015c). While the Arctic may be safer in the short term, it is not obvious whether the activists can also claim a win. An organizer from 350 Seattle stated that “I think it’s impossible to know which degree we had an impact, but it’s safe to say it played into the larger calculus of whether it was worth it to Shell” (Brownstone 2015c).

But the Polar Pioneer may yet return to Seattle (Garnick 2015). The theater will presumably be available. What performances will be enacted there? Will the kayaktivists return, perhaps with new tricks (and hacks) up their sleeves?

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Of Hackers and Cities: How Selfbuilders in the Buiksloterham Are Making Their City



Michiel de Lange

Abstract How can citizens become active city-makers alongside design professionals, local government institutions and others, by creatively using digital technologies in collaborative processes of urban planning and management? This challenge is particularly daunting in the Buiksloterham, a brownfield area in Amsterdam North, that is assigned as an urban laboratory destined to grow from 200 inhabitants to over 10,000 people. The area was opened to selfbuilders: private individuals and households who build their own home, and collectives of about 15–50 people who build a shared apartment together. The research is based on ethnographic research carried out in the area. It provides a theoretical foundation for understanding the connection between bottom-up city-making processes and institutionalisation. It also proposes a research and design narrative about people-centric hackable smart cities. This contribution results from a long-running research project called *The Hackable City* (<http://thehackablecity.nl>), which between 2012 and 2017 in multiple separately funded iterations, investigated new modes of city-making through the notion of ‘hackability’. The project was a collaboration between academics, an architecture and urban design office, and various organisations in the domains of policy, urban services and the cultural field.

Keywords Smart cities · Smart citizens · Hacking culture · Urban planning · City-making

1 Selfbuilders and Hackable City-Making

How do new media and digital culture shape today’s practices and logics of city-making, and what does this mean for the role of citizens? Principles and practices of hackable city-making can be seen at work in the recent resurgence of selfbuilding in Amsterdam, the Netherlands. In the period after the financial crisis, selfbuilding

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emerged or re-emerged to be more precise, as an alternative way to develop the Buiksloterham brownfield area in the northern part of Amsterdam, from approximately 200 inhabitants to 10,000 people. Selfbuilding entails a range of practices and operates on different scales. I differentiate between private individuals and individual households who build their own home, and building arrangements organised on a collective scale. In the Buiksloterham area, the latter usually comprises of groups of about 15–50 people who join forces to build a shared apartment building together. In some cases, non-experts themselves are at the wheel, collectively hiring architects, constructors, consultants and so on. More often, however, it is urban professionals like architects or consultants who initiate such a project, allowing for varying degrees of consultation and customisation to selfbuilding groups.

In this contribution, I attempt to draw productive parallels between selfbuilders and hacker culture, in order to better understand how new media and digital culture shape the future of city-making. In general terms, hacking refers to processes of clever or playful appropriation of existing technologies or infrastructures and bending the operation of a particular system beyond its intended purposes or restrictions to serve personal or communal goals. The term ‘hacker’ originates from computer culture and refers to playful cleverness in opening up the ‘blackbox’ of complex systems, and a do-it-yourself spirit and collective practice driven by openness. As is argued in this volume, there are striking parallels between hackers, as computer hobbyists who write their own software for existing machines and shared that among each other and with the world, and current city makers who similarly contribute to their city by innovating with limited means. Like hackers, today’s city-makers use digital media to bend around, innovate upon and change existing urban infrastructures, systems and services. The notion of a ‘hackable city’ then, I argue, productively connects parallel yet oftentimes disparate developments in how cities today are being shaped by a variety of sometimes conflicting forces. City municipalities worldwide embark on smart city policies with tech businesses and knowledge institutions. They deploy digital technologies and big data to optimise services like traffic, energy, environment, governance and health. Yet at the same time, a wealth of bottom-up citizen initiatives is blossoming. These can equally be called ‘smart’ but are more people-centric. Such initiatives consist of networked groups who engage in issues like area development, neighbourhood liveability, community formation, cultural programming, taking care of their own energy provisioning or measuring and generating environmental data. Oftentimes, people employ sensor technologies, use open data or utilise social media to organise themselves around a shared ‘matter of concern’ (Latour 2005: 114–120). In an attempt to better connect these worlds, many cities have assigned specific areas as urban laboratories, or ‘living laboratories’, for studying and experimenting with new ways of city-making (Almirall et al. 2012; Bergvall-Kåreborn et al. 2015; van der Graaf and Veeckman 2015).

A comprehensive vision that is ‘productive’ in the sense of being both critical and affirmative towards these developments is lacking. The notion of the ‘hackable city’ is an attempt to do just that (see Ampatzidou et al. 2015; Gardner 2014; Mattern 2014; Townsend 2013). As we state in our introduction to this volume, the ‘hackable city’ functions, among others, as a heuristic lens to investigate how new media

technologies enable people to become active shapers of their urban environment, how urban institutions and infrastructures as ‘closed platforms’ can be opened up to systemic change by other than the usual suspects, and—crucially—to highlight the struggles this may involve. The notion of ‘hackable city-making’ is urgent and relevant from an academic point of view and from a societal perspective. First, a hotly debated topic in academia is how digital media technologies become increasingly important shapers of urban life and culture. Most notably, the ‘smart city’ as a phenomenon and discourse has attracted huge attention from various academic disciplines. This has also spurred questions about how to foster more citizen-centric smart cities (e.g., Albino et al. 2015; Allwinkle and Cruickshank 2011; Calzada and Cobo 2015; Caragliu et al. 2011; Diez and Posada 2013; Foth et al. 2016; Hollands 2008, 2015; Kitchin 2014; de Lange and de Waal 2013; McFarlane and Söderström 2017; Ratti and Townsend 2011; Sadowski and Pasquale 2015; Söderström et al. 2014; Townsend 2013). Second, researchers point to a crisis in expert knowledge systems like urban design and study how this waning of professional legitimacy shapes the work of professionals and the role of institutions.¹ Less attention however is given to the question how these professionals adapt, reshape and reinvent their professional practice to accommodate to such shifts (for a recent example that includes the voice of an architecture professional; see de Waal et al. 2017). Third, governments across the world are adopting ‘participatory’ policy agendas in an attempt to harness a purported do-it-yourself civic attitude for expenditure reduction and legitimising policy. However, critical voices argue that this often entails pseudo-participation or that it exploits people’s free labour cloaked behind hip-sounding labels like ‘co-creation’ or ‘sharing economy’ (Fast et al. 2016; Scholz 2013; Terranova 2000). Fourth, a variety of factors—ongoing rapid urbanisation in our ‘urban age’, climate change and natural disasters, the monetary crisis—have exposed the need to build resilient cities. The question is how this can be done in a way that respects public and democratic values. Put differently, how to steer away from the solutionist deployment of smart tech and instead develop a strong set of human-centred narratives for truly smart cities? With this contribution, I attempt to sketch the contours of this ongoing endeavour.

2 From Computer Culture to Selfbuilders

In order to turn the notion of hackable city-making into a productive term for understanding shifts in contemporary city-making, I turn to a small selection of key works of the literature about hacking as a cultural phenomenon. The discussion helps to extract and define three aspects that are relevant for our ensuing discussion of self-builders as city-makers, namely the particular *principles, ethics and practices* asso-

¹ Arguably, among the first to attack urban planning as a ‘science’ was Jane Jacobs, in her famous book *The death and life of great American cities* from 1961 (Jacobs 1992). Today, the emerging field of ‘science of cities’ attempts to rationalise what it deems the ‘pseudo-science’ of planning through the use of mathematics, data and modelling (e.g. Batty 2013, Bettencourt 2014).

ciated with hacking. Steven Levy in his book *Hackers: heroes of the computer revolution* (originally published in 1985) describes the rise of various subcultures based around computers, like MIT-based software hackers and Californian garage hardware hackers (Levy 2010). Theodore Roszak in *The cult of information: The folklore of computers and the true art of thinking* (1986) describes the rise of an ideologically driven counterculture of ‘guerilla hackers’ based around the democratic potential of computers (Roszak 1986: 158–162). In these two early accounts, hackers figure as active makers and shakers of computer innovations, and the relationships mediated through them (Levy 2010; Roszak 1986: 158–173). Levy describes how a group of students at MIT—driven by curiosity—successfully obtained access to very expensive early computers. Initially, such machines could only be operated by a select caste of specially trained people, dubbed the ‘Priesthood’ (Levy 2010: 5). This ran counter to the spirit of openness these students had in common through their shared love of electric model trains. Hence, they soon began to find ways to gain access to these room-sized machines and started experimenting to make it do all kinds of other things and to control it. These selfproclaimed ‘hackers’ became the vanguard of a new ‘symbiosis between man and machine’ (Levy 2010: 27).

Thus arose a new kind of hacker culture that is based, first, on a set of *principles*. According to Levy, these principles include: freedom of information (all information should be free); decentralised organisation (and mistrust of authority); fundamental meritocracy (judgement of each other is solely based on quality); aesthetics (code and computing can be a source of art and beauty); computing as change agent (believing that computers can change life for the better) (Levy 2010: 28–34). Below, we will see similar principles at work in how the making of cities has been claimed by non-professionals without (much) expert knowledge, in a spirit of openness and sharing of information.

Second, this set of principles is accompanied by a specific *ethic*: a shared attitude of finding intrinsic pleasure in tinkering, of balancing between pragmatic problem-solving and curiosity-driven problem-seeking, and considering messiness as a potential strength instead of a threat. According to Pekka Himanen in his book *The hacker ethic, and the spirit of the information age*, the hacker ethic consists of several values (Himanen 2001: ix–x, 139). The hacker ethic stands in opposition to Max Weber’s classical idea of the ‘Protestant work ethic’, in which work is seen as a duty and end in itself. By contrast, hackers assume an intrinsically motivated and selfdetermined stance towards their work. They are driven by passion and freedom (Himanen 2001: 18–19, 33, 140). Hacking is also opposed to the exclusive ownership of information on which making money in capitalism is premised (Himanen 2001: 45). For many hackers, money is only a means towards greater individual freedom. Real value derives from social currencies like peer recognition, social worth and openness (Himanen 2001: 51–55, 140; Raymond 2000). Himanen furthermore argues that hackers embrace key values of Manuel Castells’ ‘network society’, like privacy, freedom of speech and selfdetermination (Himanen 2001: 89, 106, 109, 113). This ‘hacker ethic’ is predicated on unobstructed access to information (in the form of code) and the freedom to build upon other people’s work. Today, we can see a similar selfmotivated and selfprogrammed ethics in many of the selforganised city-making

efforts. As is described in more detail further below, selfbuilders invest a lot of time and resources in their work, driven primarily by an intrinsic motivation to solve individual challenges and in the process combine ‘selfishness’ with lofty social ideals of sharing these solutions with the collective.

Third, hacking also is a *praxis*: a way of doing things by passionately engaging in an activity that is ‘intrinsically interesting, inspiring, and joyous’ (Himanen 2001: 6). For the hacker, things only are meaningful if you find out how they work and master them (Levy 2010: 3, 6–7). The way of doing something matters: a proper ‘hack’ shows artistry by being imbued with innovation, style and virtuosity (Levy 2010: 10). At the same time, hackers frequently operate with reused or repurposed generic instruments and without any grand design. Hackers are interested in understanding the complexity of systems and being able gain mastery over them, playfully tinkering with the resources available at hand. In the words of Richard Stallman, open-source hacker and founder of the free software foundation, ‘playfully doing something difficult, whether useful or not, that is hacking’.² Again, as we will see there are clear parallels with selfbuilding, which more often than not requires people to cleverly influence and gain control over the complex amalgam of physical resources, digital information, rules and institutions, while balancing individual and collective aims. Despite the fact that selfbuilding sometimes appears to be more a matter of ‘painfully doing something difficult’, we shall see that people derive satisfaction and pride from dealing with the challenges.

Hacking reconfigures the relationship between individual and collective interests. It serves to scratch people’s very personal itch (‘I don’t like the way something works so I’ll modify it according to my wishes’), but it also has a social side to it (‘I’ve come up with something clever and this could also benefit others’). This social element can be competitive in an attempt to impress and gain respect among peers (Levy 2010: 12), but it can also be communal in the spirit of openness, share-alike and community-building (Himanen 2001: 59; von Hippel 2005: 97–98; Levy 2010: 46). Hence, as a mode of production hacking can be positioned between the capitalist free market economy in which competition and profit reign supreme, and communitarian ideals of collectivising and redistributing resources in an equal way. It oscillates between organising individual creativity and *communitas*. Himanen suggests that hacking establishes a kind of third way. Hackers challenge the idea that corporations are best suited to drive innovation and wellbeing and reject capitalist control of information. Hackers also see the collective interest best served by meritocratic achievement and are suspicious of centralised authority representing the community (Himanen 2001: 60–61). Hackers like to engage in communal open innovation and care deeply about individual reputation (Himanen 2001: 40). Hackerdom highlights tensions between the individual and the collective and between reputation-based competition and communitarian openness. As will become clear, these dimensions are central to understanding new practices of city-making.

Selfbuilding is as much a cultural practice as a spatial one. Indeed, as we shall see, it entails the formation of subjectivities and individual and group identities, which

²Source of the quote: <https://medium.com/backchannel/what-is-a-hacker-51257cad8b54>.

bear striking similarities to early hacker culture. Hackers tend to have a playful and curious world outlook. They want to know how stuff works by tinkering with it, not as engineer who designs according to a careful preconceived plan or blueprint but in an improvising go-along way. Seeing oneself as a hacker usually entails having a slightly subversive attitude. Hackers do not accept defaults ('as is') but are interested in imagining spaces of potential ('what if'). Understanding hacking as involving a form of subjectivity stresses how important it is to understand contemporary modes city-making as deeply ingrained in people's selfunderstanding and selfevaluation. To study 'hackable city-making', therefore, means to study people's mediated way of being in the world and their strong affective relationships to the urban environment. The city hacker is both a *homo faber* and a *homo ludens*.

3 Approach

The findings described here are based on intermittent and non-intensive ethnographic fieldworks done in the period between September 2014 and the end of 2015. The methods consisted of unstructured and semi-structured interviews with over 20 self-builders and other stakeholders, as well as participant observation during multiple public and closed meetings in, or about, the Buiksloterham area that were organised during this period on various locations. As a new actor in the area, a designated 'urban laboratory', members of The Hackable City project team were regularly asked to present our work in progress and contribute to public or closed discussions about the development of the area. Hence, we ourselves became one of the visible actors and stakeholders in the area. In addition to participating in shaping the future of the area, these sessions allowed us to observe other actors and become attuned to their motivations, ideas, stakes and actions. Other occasions and settings for 'presence', a hallmark of doing ethnography, proved to be somewhat problematic since there area itself was still fairly undeveloped. Especially in the beginning of the project, there was not yet a real community physically 'present' on site with whom to engage. Questions that guided the initial explorative phase of the investigation were aimed to get a better understanding of what drives the people involved in selfbuilding, what structural issues they encounter, how they deal with them, how they balance between individual stakes and efforts and collective processes and how they deal with institutional stakeholders. The underlying assumption was that selfbuilding is as much a cultural practice as it is a spatial practice. Building your own home, I assumed, is not just about a goal-oriented habitation but constitutes a mode for selfexpression, identity construction and collective meaning-making. I attempted to capture as much of people's own *emic* terms and expressions, that is, the vocabulary that people use to describe their own actions, experiences and interpretations. These were quickly transcribed, further analysed and interpreted, with the aim of finding out whether and how this can be called a kind of hackable city-making and, by extension, what that could teach us about the role of digital media technologies in people-centric city-making. Through this prolonged involvement and various interpretative cycles, com-

mon narratives started to emerge. These, following anthropologist Clifford Geertz, are taken as stories people tell themselves about themselves. Although hacking itself was rarely if ever used in *emic* selfdescriptions, it did provide a productive *etic* frame (i.e. external to the group under study) to capture the zest of many of these emerging narratives. This approach contributed to the inductive development of the hackable city model described below and in the introduction to this edited volume (see also de Lange 2016; de Lange and de Waal 2016; de Waal et al. 2017).

4 Stories About the Challenges of Hackable Selfbuilding

Many shades of grey exist when it comes to the financial and organisational constructions under which collective selfbuilding happens. Some individuals or households are at the wheel themselves. They might also hire architects, constructors, consultants and so on, at certain stages. Notably, a majority of collective selfbuilding projects are initiated by architects, who create new procedures that allow for varying degrees of consultation and customisation. The stories that individual selfbuilders recount at times sound like adventure quests. Like hackers, selfbuilders are invariably driven by strong motivation and emotional commitment. Many respondents emphasise that only thanks to their own cleverness, stamina and the sharing of resources, they were able to overcome the many obstacles and hardship they faced in the complex maze of an unknown terrain. For example, in fall 2015, dozens of households camped out in the rain, cold and mud for 3 weeks, just to acquire a plot of land for building their own home. They did attempt to make the best of it, gladly providing the intrepid researcher on a soggy fieldwork visit with coffee and tea, and indeed seemed to assume a kind of casual pride to be able to endure these primitive circumstances in order to realise their desires.³ Selfbuilders depart from an ideal, use their imagination and venture into open spaces. Sometimes that comes at a steep price. The initiator of Schoonschip, a project to realise a housing neighbourhood of 30 water arks,⁴ tells:

For my work I visited the autarkic geWoonboot. Then I thought: hey, that's what I want too. I immediately envisioned an ideal of sustainable living on a real housing boat. That's the plan I started working on. I went looking for a group of people who share my ideals. Next, we searched for a good location. What I liked in the Buiksloterham was that there weren't too many rules and restrictions. I was really drawn to that openness. Initially, the council of the borough Amsterdam North did not want to lease out the waterfront for area development. They said: 'first we want to do the mainland'. Then we directly approached Alderman Maarten van Poelgeest, who is a fan of both sustainability projects and citizen initiatives. So he had to support us. We managed to get him to write a letter to the council. After that, a tender was being put out for that specific waterfront location, which was exactly what we needed. All this cost me a tremendous amount of time and energy. But I persevered. I even had to stop working for four months because I was on the verge of a burnout. In the end, it gives me a lot of energy and satisfaction to see that we, with our little group of

³ See in Dutch <https://nos.nl/artikel/705682-weken-kamperen-voor-een-kavel.html>.

⁴ See <https://twitter.com/SchoonschipAdam>.

selfbuilders, have become part of a much larger movement in the Buiksloterham. Things are really happening in a visible way and on a scale that matters.⁵

From the above quote, we also see that successful selfbuilders are capable of mobilising key figures or institutions in an early phase of the project. This suggests, as a more theoretical point, that we should nuance crude top-down versus bottom-up framings of civic participation and instead look at the capacity for strategic mobilisation (or ‘middle out’ as Fredericks et al. argue elsewhere in this volume). In this case, the embryonic group of people was able to present themselves as a collective to the Alderman. In this sense alone, doing things together is crucial. According to many of the people we talked to, new city-making is all about group formation and identities: shaping the identity of the neighbourhood and of the people living there. How do groups construct a feeling of togetherness and what makes them recognisable as a group, which allows them to ‘mobilise’ this collective identity and get investors and other parties to become interested in doing business with them? Such questions also play a role at the level of new services. Do you arrange services like water and energy provisioning individually, collectively or publicly? And how do groups manage trust and risks among themselves?

Obstacles and opponents come from all directions. Sometimes it is the big vested parties who, after the financial crisis, aim to continue in old ways by developing the city at a grand scale. Sometimes it is the municipality that is perceived as giving selfbuilders not enough or too much freedom, to provide insufficient guidance and support, or to superimpose rules and procedures that are either unnecessary or too ambiguous. One respondent talks freely about some of the challenges that selfbuilders face:

A requirement for acquiring plots of land is that selfbuilders submit a realistic plan and get good marks on a sustainability score chart. According to the municipality, we must solve questions of energy provisioning at the level of our individual plots. But this is often expensive. So we tried to tackle this by making complementary arrangements between neighbours: one does green energy, another does water retention, another one separate flows, and so on. That too did not pan out because municipality only looks at individual submissions. A third challenge is that collective investments in large infrastructures is hampered because everyone moves in different temporal cycle. Some have to decide tomorrow while others are still in the orientation phase. The list goes on and on: when collective selfbuilders for example want modular electric patch cabinets, to accommodate future investments in solar or wind energy, energy company Aliander says it’s impossible. If a building group wants to invest in heat-cold storage, the rules prescribe there have to be three units while one is obviously much cheaper.⁶

Sometimes quarrels arise from within or between competing selfbuilding groups. Many selfbuilders share variations of stories about the messy and frequently conflict-ridden dynamics of building collectives. Problems will inevitably arise, many confide. As soon as you have eight or more people together in a group, one will be a troublemaker. Moreover, frictions between neighbouring selfbuilding groups occur, even

⁵Source: personal interview on 11 March 2015.

⁶Source: personal interview on 12 December 2014.

between professionals. In one case, the initiator of a collective apartment building found out that the new neighbouring building collective on the south side wanted to increase the altitude of the building, thus blocking view and sun. ‘The rules to which we have to conform are ambiguous. I was lucky to find out in time that the neighbouring group followed a different interpretation of the rules and went up higher. This unexpected occurrence sparked a chain reaction in the whole block, in which everyone had to change their plans to accommodate. With digital tools we could have engaged in dialogue much earlier’.⁷

Nonetheless, by engaging ‘adversaries’ in the right way, they can become allies. In the end such parties may become partners for scaling up and institutionalising this new way of city-making. Another selfbuilder, building an individual house, tells:

Institutions like the municipality, Waternet [public water company], Liander [energy network company] are large and unwieldy. My future house lies at the south-side of the plot that I bought. There is this rule that the water and energy meters have to be installed within three meters from the front door. In my case that would mean in my living room! I had to negotiate with the water and energy companies. Fortunately, I found people inside these organisations who were helpful, so I managed to get these meters in my garage at the backside of the house. Of course, I shared all of this information with my neighbours, so they could benefit too. There are only a few idiots like me who want to find out everything for themselves.⁸

In the end, such parties may become partners for scaling up and institutionalising this new way of city-making. Selfbuilders perceive a momentum. This was fostered through community activities in ‘living laboratory’ Buiksloterham.⁹ During such regular meetups, selfbuilders meet people in organisations, whether municipalities or (semi-public) businesses. Frequently, these people would have similar visions of a more participatory and sustainable way of city-making. A number of public and private organisations joined a consortium of Buiksloterham stakeholders, which eventually led to the signing of a declaration of intention for a Manifesto Circular Buiksloterham. Despite the fact that there were hackers ‘on the inside’ too, these institutions faced thorny issues like balancing an impetus towards rapid innovation and following transparent and just procedures. As one of them noted during a conversation: ‘although we’d like to see government moving along more rapidly, this should not lead to Berlusconi-practices’.

A major challenge for many novices in selfbuilding is the availability and transfer of knowledge. Selfbuilders all face steep learning curves. ‘To some degree we all reinvent the wheel’, many acknowledged with a shrug. Synchronisation of knowledge is extremely hard because everyone begins at different moments in time and faces their own peculiar hurdles. At the time of the research, selfbuilders were sharing information and knowledge via a variety of platforms, including Facebook, WhatsApp, various websites, face-to-face conversations and public or closed meetups. This often made it difficult for other people to find existing information and

⁷Source: personal interview 9 Dec. 2014.

⁸Source: personal interview on 21 May 2015.

⁹These were organised by a specially appointed ‘area trailblazer’ Frank Alsema, who was later joined by Saskia Muller and Peter Dortwegt. See website <http://buiksloterham.nl>.

build upon this knowledge. Moreover, individual experiments and innovations are often not properly documented and non-transferrable (a known weakness of many Free/Libre/Open-Source Software projects). We found that several knowledge gaps exist. One is between advanced and beginning selfbuilders. Another is between self-builders and (semi-)professionals who have the vocabulary and understand the processes but who have rarely actually built a home from scratch themselves. A third gap exists between selfbuilders who engage in experiments and institutions who also experiment, like the municipal ‘team selfbuilding’ or public service companies.

5 From Alternative Narrative to Hackable City Model

Hackers are characters who speak to the imagination. They figure as protagonists in a quest-like storyline about urbanites who use their cunning—sometimes against all odds—to make their own city using tools available at hand. As we have outlined elsewhere (Ampatzidou et al. 2015), the notion also bears the suggestion of provocation and friction. Some people will associate hacking with disruptive or even illegal activities. Others will think of a libertarian Silicon Valley ethics of selfgovernance, own responsibility and technological solutionism. However, many authors have pointed out that hackers often like to work in groups and share their efforts, thus contributing to the common good. The notion of hacking employed here is one that deliberately uses these tensions to hone the discussions about the future of our cities. Who have the right to make the city? Instead of being a hermetic narrative that offers a singular solution to complex challenges, the story and the model are open to be ‘hacked’. It ties together multiple levels of individual hacker attitude, collective hacker practices and institutional hackability. It provides a frame to address the complex interplay between economic challenges (how do we build resilient cities after the financial crisis, and what are new business models), spatial and social questions (how do we deal with cooperative area planning, demographic shifts, new types of communities), cultural changes (how do we leverage contemporary do-it-yourself culture, the reshuffling of roles between professionals and amateurs) and governance issues (how can we shape the participatory society, what roles are there for institutions, and what public values do we want to sustain or strengthen). In the hackable city urban designers, institutions and citizens together build the city of the future in participatory, innovative and sustainable ways.

Based in part on the outcomes of this limited ethnographic research, we inductively constructed a model for hackable city-making, which has been described on more detail elsewhere (see de Lange 2016; de Lange and de Waal 2016; de Waal et al. 2017; de Waal et al. 2018). That happened in an inductive grounded theory-like way; that is, we combined empirical observations and conceptual reflections to form a theoretical model that could be further tested. The model captures in a simplified manner the complex dynamics between city stakeholders at three basic levels and scales:

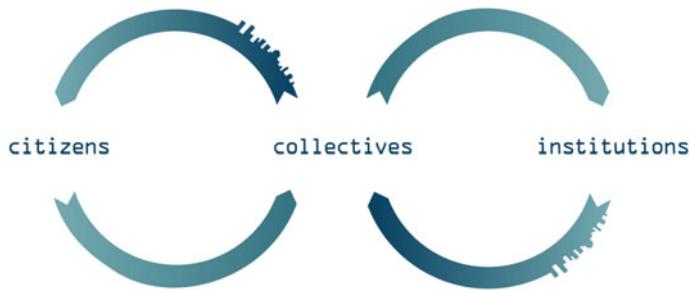


Fig. 1 Hackable city-making dynamics

- (1) An individual *hacker attitude* fuelled by a do-it-yourself ethics and professional amateurism (doing something very well ‘for the love of it’, being intrinsically motivated);
- (2) A collective set of *hacking practices*, including open innovation, collaboration and sharing of knowledge and resources;
- (3) The *hackability* of institutions, that is, the structural affordances at the level of organisations, rules and public governance to be open to systemic change from within or outside (Fig. 1).

This model is neither purely descriptive nor prescriptive. It acts as a heuristic that allows us to investigate how the city can be made ‘hackable’, that is, opened up to other people to shape the future of their cities. As we have seen, selfbuilding in Buiksloterham spans across these different levels. The individual level is made up of selfbuilders who each acquire their own piece of land and start building their own home. The collective level consists of group activities and events that transcend the individual plot. Connections between the individual level and the collective level are forged when people start sharing resources like generic information and specific knowledge about, for instance, dealing with infrastructure companies, to collaboratively start working on public green spaces. When enough people keep sharing, benefits can be reaped individually while still strengthening the commons. The institutional level is composed of the various parties and regulations responsible for shaping the conditions for selfbuilding and providing the infrastructures. The collective level, as we have seen, is a crucial hinge for getting individuals and systems to move.

6 Reflections: Hackable City-Making?

Failures, so we are told, teach valuable lessons. Let me then conclude by way of the confession of failure, to hopefully arrive at a number of productive take aways. The Hackable City project team used the ethnographic data and the model to develop a design probe that sought to intervene and test how hackable city-making might

work in practice using digital technologies. As was mentioned above, we identified several knowledge gaps. To bridge the information gap and lower the barrier to entry, we attempted to build a Wiki for selfbuilders. This was to become an open-source, community-driven writable platform for selfbuilders to share their insights.¹⁰ Disappointingly, it was not met with raging enthusiasm by anyone, and at some point, we decided to abandon the idea altogether. We assumed that it was not useful enough, because of technical glitches, time constraints and the fairly high level of literacy required to work with wiki software. In hindsight, I now feel that the problem of this design probe was actually the complete opposite. Instead of being not functional enough, it was too functional. It was primarily utilitarian and goal-oriented, instead of matching the autotelic identity-based motivations of selfbuilders. There was no ‘community curation’ (Wyatt 2011) and sense of ownership from the outset. Instead, it was erected for them by a third party. If I had to do it again, I might have suggested a platform or tool to tell meaningful stories instead of sharing chunks of information.¹¹

A second failure is of a more structural nature. The tragic turn in our narrative of heroic hacker/city-makers is that in the end the pioneers, the innovators, were superseded by business-as-usual city-making. Midway during the project, around 2015, markets had crawled back up and project developers and builders awoke from their dormancy. Amsterdam municipality happily embraced the restored ‘normal situation’ of doing business with fewer but larger developers, instead of an unruly and quarrelsome bunch of loosely organised civic hackers. Initiators of midsize collective selfbuilding apartments complained they could no longer get their foot in the door with the larger stakeholders. Apparently, the narrative of selfbuilders as hackers resonates in a time of crisis but is not compelling enough to last.

A third failure, if you could call it that, is the ease with which the ‘hacking’ terminology falls prey to blurry metaphorical parlance. It is important to distinguish between various kinds of ‘civic hacking’ and use the notion with some conceptual rigour. The kind of hacking discussed in this chapter differs from hackathons, appathons, hackspace and so on, which usually involve just coders or hardware tinkerers. While the ‘civic hacking’ discourse partially overlaps, we look at actual city-makers, people shaping the city. Oftentimes, criticisms of the ‘civic hacker’ phenomenon point to barely disguised underlying neoliberal forms of exploitation. For example, in a recent publication about precarious labour, well-known critical urban sociologist Sharon Zukin criticises hackathons for being a form of labour extraction and exploitation (Zukin and Papadantonakis 2017), echoing similar arguments made by others (e.g. Gregg 2015; Terranova 2000). Likewise, Evgeny Morozov and Francesca Bria state that ‘neoliberalism 2.0’ casts citizens as ‘hackers’, people who are able to do more with less in the context of austerity of public service expenditure (Morozov and Bria 2018: 20). While these certainly are valid points from a political

¹⁰Project intern Melvin Sidarta invested a considerable amount of his time to actually build this wiki.

¹¹In fact, at a later stage in the project newly joined team member Tara Karpinski developed a much more interesting app for selfbuilders to recount testimonials and success stories. See the report here: <http://thehackablecity.nl/2016/12/13/designing-and-testing-the-internationale-bouwtentoonstelling-app-2/>.

economy perspective, I want to push back a little, using two arguments. As a more general first point, such criticism neglects to give a voice to the variegated ‘emic’ perspectives, that is, the range of possible motivations of people themselves. Seen from the outside, civic hacking activities may appear as precarious or exploitative. Indeed, as was mentioned, selfbuilders in the Buiksloterham might be seen as guinea pigs that were only given leeway while the crisis lasted. To participants themselves, however, it can feel tremendously gratifying and well worth the contribution. Second, and more important for my point here, ‘hacking’ can act as a critical term that highlights these and other frictions and allows us to raise thorny questions. Hence, I propose that the concept of ‘hacking’ entails a form of criticality (Rogoff 2003) or ‘critical making’ (Herz 2012; Ratto 2011; Ratto and Boler 2014).

Hackable city-making as discussed here entails a selfreflexive criticality of the tools used, of the range of city-making practices and of the institutional protocols and governance. It also critiques the prevailing narrative of city-making as the prerogative of professionally trained experts, while refraining from claiming that these alternative practices are the definitive ‘solutions’ to question of resilient future-proof and participatory city-making. It questions instead of answers: who can build the city? In this sense, I argue that the value of ‘hackable city-making’ as a concept is that it reinserts political dimensions into new ‘smart’ ways of city-making, highlighting negotiation, friction, subversion and questions of in/exclusion (see also Perng and Kitchin 2018). A hack means a quick and often somewhat messy but working *makeshift solution* to a problem. ‘An ugly hack’ is a common phrase for something fixed in a haphazard make-do way. While this does not necessarily lead to the most high-quality or sustainable result, this way of working offers a perspective on city-making not as endeavours for eternity but as perpetually unfinished enterprises that are by nature always open to modifications and are deeply reliant on the factor time (for this fundamentally temporal reimagining of the practices of architecture and urbanism, see Bergevoet and van Tuijl 2013). The term thus is critical of itself: it acknowledges its own make-do and imperfect nature and understands itself as the product of friction. There is, then, a lesson to be learned by designers and policy-makers from hackers in terms of accepting ‘messiness’ as a given and daring to relinquish control. The terms ‘hackability’ and ‘hackable’ point to an affordance of systems, the condition of being open to modification or systemic change from within or from the outside by anyone willing to invest effort. To call city-making ‘hackable,’ then, means to take subversive and countercultural city-making practices seriously.

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Epilogue: Co-creating a Humane Digital Transformation of Cities

We live in an era of digital transformations, for good or for bad. The dominant narrative has since the Second World War been a positive one: digital technologies will foster positive externalities like efficiency, wealth, health, inclusion, transparency, environmental sustainability, global understanding and generally improved quality of life.

Increasingly, however, a negative narrative is on the rise from critical corners to the mainstream, not necessarily about the digital as such, but relating to some of the less positive externalities of everyone and everything being connected and measured: vulnerability, insecurity, surveillance, complexity, exclusivity, volatile economy, job loss, migration, stress and loss of belonging.

This should come as no surprise. Despite prevailing digital utopianism being heralded, why should change brought about by digitalisation be any different than earlier revolutions in this regard? The issue, however, is that in a paradigmatic transition as the digital one, where every custom and institution is challenged, we simply do not know in advance what is the better way forward, and even less is the chance that ‘we’ will agree. So, while the consequences on core concerns like safety, economy and well-being are simply daunting, the digital transformation is coming as a global force and it creates an outlook of uncertainty.

Cities are the most complex creations of humans. They contain everything, including more than half the world’s population, by far the largest chunk of the economic activity, and cities pollute more than anything else. At the same time, they are also about the most resilient part of our civilisation. Cities do not tend to go away when first founded. Unless an infrastructural revolution arrives.

The transformation of cities is the transformation of the contemporary human condition. There are certainly communities that are not urban, but they will follow in the footsteps of the cities as they transform—just think of running water, or the more accessible commodity infrastructure: mobile communication.

Taken together, the digital transformation of cities represents a profoundly complex uncertainty, characterised by dilemmas, and it is a looming challenge for the cities all over the world. The question is how to move responsibly forward.

For a long time, the dominant answer has been to plan and invest, like previous successes of infrastructure development would indicate: water, sewage, electricity, transportation, heating/cooling, telecommunications, etc.

The problem with this approach is that it does not seem to work well in the digital age, for several reasons. First of all, while it would be technically possible to build all-encompassing systems that cover every aspect of human life and activity, they would be far more complex than anything else—much more difficult than the proverbial rocket science. That would make them expensive, powerful, vulnerable and, for a long period, full of errors and inconveniences. That is a bad cocktail. The risk of getting it wrong and depleting resources with big bang investments is very high.

Secondly, the existing infrastructures are closed systems, governed by sectorised and siloed organisations. This technical and organisational architecture does not fit the cross-cutting nature of data. Creating a new system of systems will potentially reform every sector, including revenue streams, legislation and career paths. This creates enormous friction to change.

Therefore, currently, the only way to actually introduce such massively integrated systems that cover even the most basic functions is to roll them out in a top-down fashion. That can be done in some political environments, but not where there is a tradition for giving individual citizens and communities a clear voice in societal development matters. In addition, very rigid and closed systems tend to breed monopolies and provide poor conditions for innovation, because only a select few experts hold the privilege of proposing and developing improvements.

This balance between giving direction and giving voice, of top down and bottom up, of optimal operations and of innovation, is not a new challenge to societies, and it is certainly not restricted to the era of digital transformation. However, one of the great promises of digital and connected technologies is that they have the potential to foster collaboration and co-creation—hallmarks of an inclusive society where services and surroundings are shaped together by citizens in transparent deliberation. We can all have a role in making the city, we, the people.

The Hackable City is an updated ambition to bring these prospects further into reality, founded on a reflected understanding of contemporary and historical parallels.

Technology has always transformed societies and shifted power. Famous is the opening scene in Kubrick's film *2001: A Space Odyssey*, where the image cuts from a group of bone-wielding apes to a bone-shaped spaceship. Society is a reflection of the opportunities provided by technologies at hand.

However, as the contributions in this book illustrate, it is not at all evident how this societal interaction is best facilitated and orchestrated, and the best practice can certainly not be deduced from the technology, if only because of the inherent dilemmas of conflicting interests.

The goals and roles of those who have a stake in a community's development are incredibly diverse. To provide touchpoints to influence the system for all is a core mechanism of governance. Too few touchpoints mean totalitarianism; too many

mean anarchy. There is no universal optimal balance, as this is a cultural and political question, even down to the local level.

While this book clearly shows how the existing old systems and old ways can be hacked ad hoc by citizens and communities with the aim to appropriate and improve them, would not it be interesting if the systems were designed to make it easy and, even intended, to hack for good as a way to innovate and appropriate?

This is the next level of the Hackable City: the co-created city. It would require the infrastructures and systems of the city to have points where components can be added, modified, replaced and removed—with relevant levels of control for safety and data protection. The result would be more freedom, where acceptable, for both city administration, citizens, businesses, NGOs and academia to explore alternative ways to getting things done.

The open innovation literature has long lauded methods such as living laboratories as a way to empower stakeholders around a situation or system to improve it together. This is in a way similar to the ‘DevOps’ software engineering approach which aims at linking development (change) and operations (service) closely together. However, it requires not only agreement to allow innovation, it also requires systems that actually support such component interoperability in what has been conceptualised as the Internet of things (IoT) or Internet of everything (IoE).

The main barrier for such a situation is that there are no generally accepted standards on IoT data processing and management across domains and across sectors. And because there are no standards, public administrations cannot put them into the requirements when they buy new systems, so there are no suppliers that have developed such systems and services that are open for appropriation at an urban and societal scale.

It is not because there is a lack of standards; there are tens of thousands, from a long range of standards developing organisations (SDOs). But they are fragmented and often specialised for certain domains and purposes, and they are usually not free (because the SDOs earn money from the use and certification). This has the unfortunate effect that standard-based interfaces are not made available during innovation, which creates a considerable barrier for exploratory and co-creative approaches.

Some attempts are being made to open up cities to make experimentation easy and to support standard-based innovation and procurement, i.e. to move from hacking the city to co-creation and collaborative city-making.

A concrete example is the *Open & Agile Smart Cities* (OASC) initiative, which is a global network of national networks of cities that work to maintain so-called Minimal Interoperability Mechanisms (MIMs) based on emerging standards. Two flagship projects focus on citizen co-creation and easy experimentation (*Organicity*) and standard-based innovation and procurement (*Synchronicity*), both based on the OASC MIMs.

Because of the chicken-and-egg situation, where the supply side of the market (companies) cannot deliver systems that are open for appropriation and the demand side (public administrations) cannot define precise requirements for the systems they would like even if they wanted to (because it is not the job of a single city to

create standards), there is a very important role to play for projects and initiatives that strive to close the gap in the market.

Academia and research institutions are essential contributors to these efforts, with both analytical and creative capabilities. The innovation that has to happen in the digital transformation of cities resembles that of applied design research, and when it reaches urban scale, it becomes impossible to intervene only to analyse and understand—the research directly influences the reality it studies.

The disciplines within academia are as siloed as the departments and sectors in the cities, and in the same way for good historical reasons. But researchers, with their insights and skills, have an obligation to contribute to solving the global challenges we face as a civilisation, and the digital transformation of cities and communities is such a challenge. Therefore, academia must develop and refine methods that match the needs of the world it is a part of, to be an active collaborator and co-creator of the common future of us all.

It may start as hacking the uncertain complexity, but with a concerted effort, it is the safest and fastest way to mature contemporary digitally saturated infrastructures to support condensed human life.

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