



An artistic use of digital technology in public space alters people's perception of that space.
Source: Mike Von (modified from original), [Unsplash.com](https://unsplash.com).

Local Data and Global Ideas

Citymaking in Times of Digital Transformation

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Keywords: Citymaking; data; governance; citizens; participation

Abstract

As every aspect of life is transformed by digital technology, new challenges and opportunities arise for the design and governance of urban areas. So-called citymakers, the actors involved in collaborative processes of urban development, are increasingly using technology and data to support their efforts. They join forces with technology experts in global, virtual networks to exchange ideas and solutions, and transcend the local scale. Despite justified criticism of digitalization in cities today, it is clear that data and technology are expediting citymaking processes; at the same time, said processes may also contribute to more equitable urban data and technology governance. The present research combines different views on the matter from a preliminary literature review with observations of digital citymaking processes in practice. The findings are structured into two modes of operation between virtual and physical space, and related to formal processes of urban development.

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Citymaking in the digital age: Introduction and methodology

A lot has been written about the significance of digital technology for the way we plan, build, and inhabit cities. Two different, yet related strands of literature approach this intersection from different angles. First, planning theory observes the collaborative nature of the production of urban space – especially the role of civil society. Whether termed city-making, co-design, bottom-up, DIY, or guerrilla urbanism – depending on varying levels of formality and on the authors' perspectives – these processes highlight the proactive role of citizens. As well, they constitute a counterpart to the established practices of sovereign planning processes. At the same time, socio-technical research finds the role of citizens switching from passive users of technology or generators of data to active developers of technology and stewards of data. Here, the focus is on tech-savvy individuals and groups who use open data, software and hardware to generate local knowledge and act upon it. Even though the two perspectives overlap in many areas, there remains a fuzzy middle ground between them; this embodies a conceptual elusiveness to which we refer as processes of digital citymaking.



Figure 1: Sketch from a What/Next podcast interview with a civic technology and open government expert.
Source: Martin Bangratz for what/next.

Alongside this ongoing discussion, we can see more and more facets of these processes in the real world. Whether they collect and visualize data on communities that are missing from official records, use social media to gather ideas and support, or develop apps that facilitate communication with local governments, these initiatives have an impact on various levels of urban space. The following section will give an overview of literature, first from a citymaking perspective, then from a data perspective, and conclude with a synthesis, before moving on to the empirical observations based on a combination of following three approaches.

First, ten mini-case-studies were conducted by master students at RWTH Aachen University in the research module Digital Citymakers over the summer term of 2020. After workshoping search criteria and compiling a long-list of more than 100 cases, students chose ten representative projects. A number of key facts and common dimensions about each project was included for comparability, but the processes were each presented in a different way. A selection of these case studies is available [here](#).

Second, between April and September 2020, the research project also made use of the Chair of Planning Theory and Urban Development's new blog and podcast what/next. The authors conducted ten exploratory interviews with people involved in processes of digital citymaking, from citizens', planning experts', and public administrations' points of view. The series can be accessed at the [website](#) (Figure 1).

Throughout the year 2020, and especially during the lockdown period in Germany and many other countries, the authors also kept an eye on social media to monitor reactions by citymaking projects, many of which are keeping an active social media presence. Finally, the preliminary findings from these observations were presented and discussed in a virtual workshop with more than 50 experts from Germany, Austria, Belgium, Finland, and the US, in November 2020. Some results have been documented on a virtual [whiteboard](#) (Figure 2).

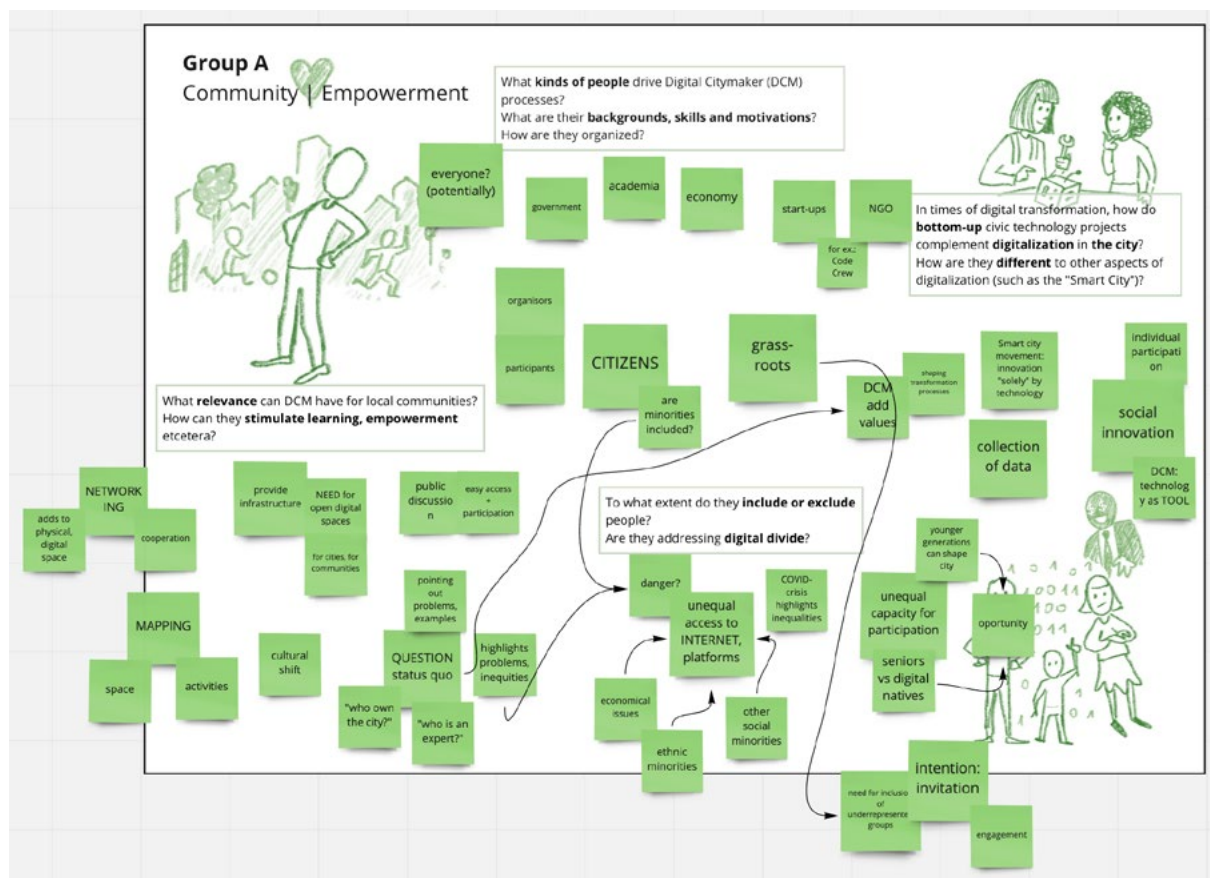


Figure 2: Screenshot of a miro board documenting one of four thematic virtual workshops at Pt.Seminar 2020. Source: PT / Participants of Pt.Seminar 2020.

Two paths towards digital citymaking: A brief foray into literature

In the paper, we follow two strands of literature that approach digital citymaking from different perspectives: the citymaking path and the digital path. Their overlap brings us closer to understanding and defining digital citymaking.

The citymaking path

Citizen engagement in urban planning can be found in cities around the world in just as many different forms, whether it be participation in municipal planning processes or taking action in citizen-run projects outside the official planning framework. The German term *Stadtmacher*, literally translated as *citymaker*, is sometimes used as a catch-all term that refers to the actors who initiate and run such projects, encompassing practices such as informal and temporary urbanism. The expression has been coined especially in the context of a network of citizen initiatives supported by the National Urban Development Policy, a joint initiative of the federal government, states and local municipalities (Nationale Stadtentwicklungspolitik n.d.), but also through the exchange platform *Stadtmacher-Akademie* by vhw (Bundesverband für Wohnen und Stadtentwicklung e.V.). In addition to increasing recognition as active shapers of urban development, intermediaries between citizens and government, and recipients of public funding (vhw 2021), citymakers are also drawing attention from dedicated research projects (e.g. Beck 2018; Bachmann and Waner 2021).

Citymaking initiatives are not just a way for citizens to shape space, but an expression of local democracy (Förster et al. 2021).

Urban governance is not left to elected officials and local administrations, but rather “involves a continuous process of negotiation and contestation over the allocation of social and material resources and political power” (Avis 2016: 5). Municipal governments may be the leading or at least the most visible actor in urban governance, but it is others such as private businesses, federal agencies and civic engagement that “determine the daily experiences of urban dwellers” (ibid.). Critical assessments such as the idea of post-democracy (Crouch 2004), the observation that government institutions are withdrawing more and more from their original responsibilities (Albers and Höffken 2015), and a general disinterest in party politics, have led some to speak of a *crisis* in representative democracy. Citizen initiatives often pop up in response to this inadequacy. Citymaking becomes a way for citizens to find their voice in the political sphere and place certain topics on the public agenda (Förster et al. 2021). There is hope that this active participation will revitalize democracy and, more specific to the planning context, legitimize projects (Glaab 2016).

The role of citizens is evolving from passive consumption of urban space or services towards active co-production (Willinger 2014: 148). Citizen initiatives become active in their own creative ways, solving problems they observe themselves, rather than those deemed

important by the administration. De Waal and de Lange (2019: 6-7) call this *ownership* in the process of citymaking, defined as the degree to which city dwellers feel a sense of responsibility for shared issues and also have the capacity to take action for these matters. This of course changes not only the role of citizens, but the entire planning process.

Willinger (2015: 28) proposes a new conception of urban governance, where the production of space is no longer thought of as “emanating from municipal planning, but as a mosaic of largely informal processes that develop from the initiative of entrepreneurial and civil society actors”. This conception recognizes and integrates projects of informal urbanism as “promising building blocks” of the city (Willinger 2014: 149). These projects follow their own rules rather than being embedded in a communal planning framework, which enables them to respond quickly and directly to local needs. In fact, Gebhardt et al. (2014) say, they usually achieve visible results faster than conventional planning processes. But they also go one step further, bypassing official planning processes and effectively demonstrating the processes’ shortcomings and promoting their reformation. Institutions, however, are still important and necessary for the provision of a framework and the reduction of risk for the responsabilisation of citizens (de Waal and de Lange 2019; Iverson 2011). In collaborative formats such as *living labs*, civil society, government, market, and academic actors collaborate at eye-level (eg. Bachmann and Wanner 2021).

The digital path

Digital transformation is affecting life in cities, altering the built environment but also “the conditions under which we can make sense of our world and our own actions” and “our capacity to act with agency” (Baack 2015: 1). Algorithms affect how we perceive reality (Renzi and Langlois 2015) and how future realities become manifest (Milan and Velden 2016). Data is not an impartial resource, but a political tool for agenda-setting, decision-making, legitimizing and monitoring in cities. Countless researchers and activists therefore call for equitable governance of data and technology (e.g. Sourbati and Behrendt 2020; Heeks and Shekhar 2019, Heeks et al. 2020; Milan and Treré 2020; Micheli et al. 2020).

Data governance encompasses questions of ownership and access to data, but also how value is derived from it and distributed (Micheli et al. 2020). These questions are not straightforward. Who owns, for example, credit card transaction data – the vendor? The customer? The credit card company? All three are involved in the transaction (Beckwith et al. 2019).

One of the key criticisms of datafication in cities is the way they reinforce existing inequalities, which have been documented by OECD (2018; n.d.). Spatial justice can refer to an equal distribution of urban resources including space and data (cf. Rawls 1971). But in the present context, it also stands for people’s capability to shape their city – in terms of spatial, legal, and economic accessibility, rights to participation and representation (cf. Sen 1979; Nussbaum 2003; Hananel and Berechman 2016; Rauhut 2018). Authors such as Taylor (2017: 1) call for *data justice*, referring to “fairness in the way people are made visible, represented and treated as a result of their production of digital data”. Their research reveals that the greatest burden of digital surveillance has been borne by the poor.

The default response by many governments appears as open data, even though its concrete benefits are not entirely clear (Schrock 2016). In fact, open data may have adverse effects on already disadvantaged populations (Raman and Benjamin 2011). One approach to technological sovereignty of local governments and citizens is to treat data as a commons (Cardullo and Kitchin 2018; Beckwith et al. 2019). This response permits the free use of data within a community but not for certain parties or uses outside the community. Beckwith et al. (2019: 215) propose that communities be given the power to determine these permissive boundaries in order to ensure the “contextual integrity of data”.

Grassroots initiatives and their supporters are developing their own responses with *pro-equity data initiatives* to create datasets by and/ or about unrepresented communities (Heeks and Shekhar 2019). However, even community-oriented data initiatives sometimes increase relative inequality (ibid.). Erete and Burrell (2017) find that community mapping of slums improved their visibility, yet they enabled external actors with existing positions of power to benefit more than members of the communities themselves.

Data activism is a practice that focuses on human agency with data and happens both in virtual networks through data repositories, such as Github, and local events, such as hackathons (Milan and Velden 2016, Schrock 2016). Since data is never really *raw* or objective but rather collected and interpreted with bias (Taylor et al. 2015), *data activism* helps to create “alternative ways of seeing the world” (Milan and Velden 2016: 63).

Civic hacking as a strand of this activism indicates the use, development and adaptation of technology in a way that challenges established social, cultural and political norms (Lievrouw 2011). De Lange (2019b) presents civic hackers as citymakers, which designates these individuals as more than just the technology experts who usually participate in hackathons or makerspaces. The term *hacking* is used in analogy to citymaking, not least because it sees itself as imperfect, makeshift, open, and “perpetually unfinished” (de Lange 2019b: 295). Like the open data movement, the concept is critiqued as influenced by corporations (Schrock 2016) and as co-opted (Morozov and Bria 2018).

Literature on HCI (human-computer-interaction) increasingly acknowledges the importance of local context for data and vice versa. Urban interaction design emerged as a sub-field of HCI situated in cities (Foth 2018). It focuses on the design of civic technology for citizen engagement (Cazacu et al. 2020, Saldivar et al. 2018). Taylor et al. (2015) critique the imagined generality of data and instead highlight their situatedness, always produced and interpreted in a specific local context. They call this the *mattering of data*, referring both to its materialization and its meaningful application in space (Taylor et al. 2015: 2869).

Arriving at digital citymaking

Where do these paths meet? There appears to be a two-way force: data and technology expedite citymaking processes; at the same time, processes of citymaking affect urban data and technology governance. The internet as a source of inspiration for projects and a tool for garnering local and global support has led to an increase in citizen initiatives (Gebhardt et al. 2014; Willinger 2015). Various authors have written on initiatives becoming digital, such as Foth (2017: 2) describing “digital placemaking” as an “extension of urban

guerrilla placemaking". Despite all justified scepticism, there is the hope that "desirable urban futures for the common good can be created if only the artful integration of people, place and technology is achieved" (Foth 2017: 1).

Some scholars like to refer to the *smart citizen* as a much-needed antithesis to the prevailing *smart city* paradigm (Cazacu et al. 2020; Albers and Höffken 2014; Vanolo 2014; Cardullo and Kitchin 2018; Foth 2018). In systems where citizens' data is used for commercial aims, Cazacu et al. (2020: 694) write, smart city approaches "must be opposed by initiatives that value civic privacy and offer more equitable, socially just, ethical and sustainable life alternatives in return for data." Many others express concern about the inequality of *Smart Cities* (e.g. Cardullo and Kitchin 2018; Baud 2016; Taylor and Richter 2015; Townsend 2013; Heeks et al. 2020). From an in-depth analysis of documents and interviews of urban digital strategies in Europe, Cardullo and Kitchin (2018: 813) conclude that Smart Cities "as currently conceived enact a blueprint of neoliberal urbanism and promote a form of neoliberal citizenship. [...] Despite attempts to recast the smart city as 'citizen-focused', smart urbanism remains rooted in pragmatic, instrumental and paternalistic discourses and practices." In this *neoliberal smart city*, citizens are once again framed as consumers rather than co-creators (Foth 2018).

The dominant model of data governance is that of a *platform economy* where urban infrastructures are turned into on-demand consumer services like Uber or AirBnB (Micheli et al. 2020; de Waal and de Lange 2019). These platforms are prone to biases in algorithmic decisionmaking, nudging and manipulation, and privacy issues (Micheli et al. 2020). This type of governance is undemocratic, say De Waal and De Lange (2019), as it is determined by non-transparent algorithms without public debates about their underlying values.

It comes as no surprise, then, that many are calling for alternative models of data governance in cities – or urban governance in the digital age, depending on their perspective. In these new models, citizens are framed as *urban prosumers* (Albers and Höffken 2014), using digital tools not only for consumption, but to make an impact on spatial and social processes (ibid.). Foth et al. (2015) and Shaw and Graham (2017) propose that citizens claim their *right to the digital city* (see also Lefebvre 1968). Beckwith et al. (2019: 205) argue that "new forms of citizen action" will be "enabled by an 'economy' of data [...] with both positive and negative values to the citizenry".

We consider these conceptions not so much as antithetical, but rather as coinciding, just as citymaking implies urban development as the concurrence of both formalized planning processes and more spontaneous projects. When bottom-up civic organization combines with the opening up of top-down structures and processes, the city becomes *hackable* (de Waal and de Lange 2019: 3).

Still, there is an evident power struggle between government institutions and private corporations as providers and users of data and technology. Digital citymakers could be regarded as a third, potentially stabilizing force between these actors. Lacking adequate support from, and integration in formalized structures, digital citymakers currently carve out this intermediary territory for themselves.

Who are digital citymakers? *Traditional* citymaking initiatives use technology as a tool to serve their aims, such as community groups crowdsourcing ideas or mobilizing support via social media. Many of them are well-versed in technology. But it is also possible for novices to teach themselves how to use new tools with the help of online tutorials; what is more important than technical skills is an attitude of learning by doing and starting without knowing the result. Another type of citymaking agent is described by de Waal and de Lange (2019: 10) as professionals such as designers, architects, and artists who redefine their role, from “grand designers” to “community orchestrators” or “urban curators” who “organize publics around issues or places”. What unites them is their intrinsic motivation to shape their own urban environments, and their technological expertise. De Lange (2019a: 284) describes citymakers as hackers who “use digital media to bend around, innovate upon and change existing urban infrastructures, systems and services”. Data activists are also working on topics peculiar to cities, such as “area development, neighborhood liveability, community formation, [...] energy provisioning, or measuring and generating environmental data” (ibid.). As Schrock (2016) notes regarding civic hackers, digital citymakers are uniquely positioned to act on issues of public concern because they are in touch with local communities. In some contexts, they may “transgress established boundaries of political participation” (ibid.: 581). Similar to *guerrilla* or *tactical urbanism*, civic hackers share information without asking for permission because they believe people have a right to know.

Digital citymaking processes stand for alternative modes of governance of both space and data. One parallel in technological and urban literature is a new-found interest in *the commons* as a way of looking at shared resources – in one case, it may be a public square (cf. Meyer and Reiche 2015), in the other, a collection of data about a neighborhood (cf. Foth 2017; Foth 2018; Beckwith et al. 2019).

In sum, digital citymaking can be defined as processes of urban development with the following characteristics:

- they involve civil society actors in an active role, with the aim to serve the needs of civil society (cf. Albers and Höffken 2014; Vanolo 2014; Cardullo and Kitchin 2018; Foth 2018; Milan and Velden 2016);
- they involve digital technology in at least one stage of the development process (cf. de Waal and de Lange 2019; Foth 2017) – to enhance the quality of the process itself and/ or the quality of its results;
- they are situated within, and intend to make an impact on, a specific spatial setting (cf. Taylor et al. 2015), but also participate in global networks and contribute to higher-level debates on governance (cf. Micheli et al. 2020; Beckwith et al. 2019);
- they were initiated without the explicit order of an external authority (cf. Petrin and Wildhack 2015).

Digital citymaking constantly evolves, both as a concept and a practice. It is a constructed label, encompassing processes and actions of very different actors who aim to change their city with the help of digital tools. There is no collective identity for digital citymakers, just as there isn't one for data activists (Milan and Velden 2016). The present paper

outlines their context in order to be able to ask research questions and add to the knowledge about digital citymaking.

Digital citymaking offers an alternative conception of digitalization in cities.

In the remainder of this article, we will share observations how citymakers contribute to more equitable urban data and technology governance and also, directly or indirectly, to urban development on different levels.

Observations in the wild: Digital citymaking from a practical perspective

In their first explorations of real-life digital citymaking processes, the authors encountered a number of observations that were broadly divided into four main categories (Figure 3). These are structured along (a) a spectrum of physical through virtual spaces, connecting modes of digital citymaking including (b) community empowerment and (c) data activism, and coupled with (d) roles and relations vis-à-vis established urban planning processes.

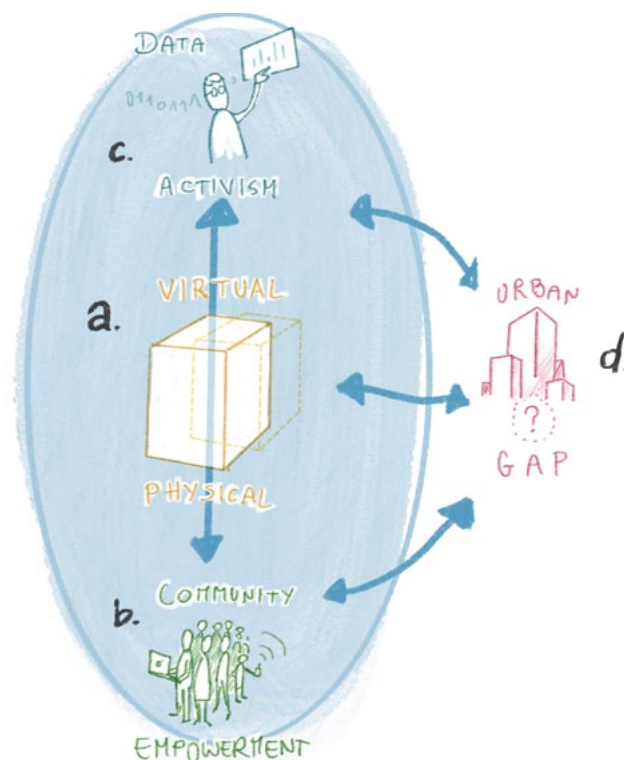


Figure 3: Structuring the observations about real-world digital citymaking.

For each of these four areas, further examples and theories contextualize the discussion in the sections that follow.

Virtual versus physical space

Urban space is both the starting point and ultimate objective of any citymaking initiative. Following the conception of Boesch (1989), space is not just the collection of physical *containers*, but also their *functions* and the *processes* of social interaction taking place within. Urban space is characterized by long-lasting structures, but also undergoes continuous changes. The transformation of space can be related to its meaning (perception, symbols, culture), to urban praxis (taking action, designing space), but also to collaborative planning processes. In contrast to the *real* or *lived* urban space, virtual space could be viewed as a part of the medial and mental dimensions of space (Förster and Thierstein 2008), or part of the perceived and conceived space (Lefebvre 1991). While some expected that digital technology would lead to decreased attractiveness and significance of cities, the opposite has been the case so far (Albers and Höffken 2014: 242). Creating or changing their own environment is a main source of motivation for initiatives; space is a crucial resource. Some create places for creativity and community such as Niehler Freiheit in Cologne, others use the infrastructure provided in places such as Berlin's CityLab or makerspaces across the world. Face-to-face meetings are needed to enable project-based learning and recognition for individual work.

A neighborhood or even just a public space is often the point of departure for citymaking processes, and accordingly, their impacts can often be seen on a small scale (cf. Petrin and Wildhack 2015). However, technology makes it easier to transcend the local level and scale projects to different neighborhoods, cities, and regions. As Cazacu et al. (2020: 694) put it, technology "becomes almost an activist in itself", because it links individual civic actions from different neighborhoods, allowing them to become city- and nationwide movements. It is clear that virtual worlds can have direct, tangible effects in the physical world. Artist Simon Weckert *hacked* Google Maps by carrying 99 smartphones along a street in Berlin. This caused the platform to identify them as a traffic jam. Real cars that used Google Maps for navigation were then diverted to other routes.

A sustainable approach to digitalization requires not just digital infrastructure, but also physical spaces for people to access and learn about new technology. For instance, *OK Labs* are local spaces for the *Open Knowledge* community in Germany. In their own words, citizens can use them to work together on projects that aim at improving local communities' life, usually based on open data. *Hackerspaces* have been around for even longer. Their projects are not necessarily aimed at improving a city for the public good, but they are still based on openness and sharing. *Makerspaces* and *Fablabs* are focused on the sharing of tools and knowledge between members (Ma et al., 2018). Municipalities also increasingly recognize the need to provide space for digital transformation, responding with places such as CityLAB Berlin, which describes itself as an "experimental laboratory for the city of the future" (Technologiestiftung Berlin 2021). Projects like this blur the lines between novel citymaking practices and traditional participation formats.

The coalescence of physical and virtual space is pushed to the extreme by recent developments in Virtual, Augmented, and Mixed Reality. Virtual space can be a representation of – often invisible – properties of a physical space, but it can also show glimpses of an

alternative future, influencing people's attitudes on urban development and other aspects of local governance. With the required software becoming easier to handle, even volunteer groups begin to use these to communicate their ideas. For instance, the team behind [senf.koeln](#) has developed an AR filter for Instagram, which allows users to visualize urban design elements such as bike racks through their phone's camera in real-time.

Community empowerment

A key characteristic of many digital citymakers is their self-proclaimed motivation to improve life for their fellow citizens. Interviewees invested their knowledge, skills, and time in projects in service of their local community. Beyond the development and provision of new technology or data, many also teach digital skills to fellow citizens, giving them the tools and know-how to take control of their own digital assets. Local citizens are best suited to know their own neighborhood's needs, to interpret data about it and develop solutions for it. Data is becoming a way for citizens to "think about and act on local matters", even for those who claim to be unversed in technology (Taylor et al. 2015: 2868). Communities use technology to make their concerns visible and create their own participation tools, shown in previous research by Erete and Burrell (2017) and a number of citizen-led crowdsourcing platforms. In the case of *citizen sensing*, experts or researchers develop technology in collaboration with local communities, enabling them to understand and address local issues (Balestrini 2017). By actively using technology in this way, "groups and communities also strengthen relationships among themselves, learn and share skills, and shape their cities" (ibid.: 19). While it is true that the people involved in such projects tend to belong to a rather homogeneous group in terms of demographics and expertise, they usually describe themselves as open and reach out through events such as open house days.

When the COVID-19 pandemic hit communities around the globe, the significance of digital media for maintaining support networks became more apparent than ever. The German neighborhood-based social network [nebenan.de](#) saw a five-fold increase in new user registrations during the first lockdown starting in March 2020 ([nebenan.de 2020](#)). Twitter users offered help or just shared ideas for others to copy, such as one user whose child who took their elderly neighbour grocery shopping via facetime ([zauberhaftisnich 2020](#)) or another who shared an idea to allow members of the community to reach out if they did not have access to digital tools (Turku 2020; Figure 4).

Digital Citymakers consciously develop and offer open-source alternatives to commercial technology. The aim is to provide local communities and cities with accessible infrastructure. The citizen initiative behind the citymaking project *Utopiastadt* in Wuppertal, Germany, built their own streaming platform *stew.one* to give local artists a stage during the lockdown. The open-source approach also means that new projects never have to be built entirely from scratch, but can be adapted from existing solutions.



Figure 4: Screenshot of a Tweet sharing an example of off-line help through on-line media.

Digital citymaking often takes place at a neighborhood scale, but the individuals involved in these processes are also organized in global networks. For example, the *Code for All* network connects volunteers on local and national levels who „use their skills to shape their cities and communities” (Open Knowledge Foundation n.d.). These groups exist in cities, countries and regions around the globe: *Code for America* with more than 80 local brigades (code for America n.d.), *Code for Germany*, *Codeando Mexico*, *g0v* in Taiwan... (Code for All n.d.-b). As of October 2021, the Slack workspace for *Code for America* has more than 5.600 members who organize in their local chapters but also collaborate nationally on certain topics such as mobility. One project organized around a topic rather than a physical location is *mundraub.org*, which shows the location of edible resources to support the foraging community. A similar idea was pursued with the IoT system *Fruits are Heavey* installed by DiSalvo and Jenkins (2017) to monitor fruit ripeness, which they found to promote volunteerism, sustainable life and commoning.

Data activism

The collection and use of data has had lasting effects on cities, even before the advent of computing and *big data*. Local governments require data to make informed decisions. It is difficult to develop unbiased data analytics, because how it is formed and collected cannot be separated from the underlying objectives for creating it in the first place (Williams 2020). This is why scholars such as Sarah Williams deem it important for citizens to create the data needed to encourage policy action – especially data that is missing from the official records. Technology is used to amplify the political impact of citymakers, to “show imaginaries of a different city, contribute to agenda-setting and exercise political pressure” (Willinger 2015: 29).

Digital citymakers are influencing public perception by visualizing data on urban issues. This can alter short-term decisions, such as mobility behavior, but also long-term decisions about infrastructure investments. For instance, *wheelmap.org* is a collaborative online tool that allows users to map whether a place is wheelchair accessible. This helps wheelchair users to plan their routes, but also puts pressure on business owners and policymakers to improve the conditions. The platform *Leerstandsmelder* shows vacant properties in

german-speaking cities and has been used to illustrate how digital citymaking serves as a seismograph for political mood and contributes to an alignment of the levels of knowledge between citizens and administration (Oßwald 2015).

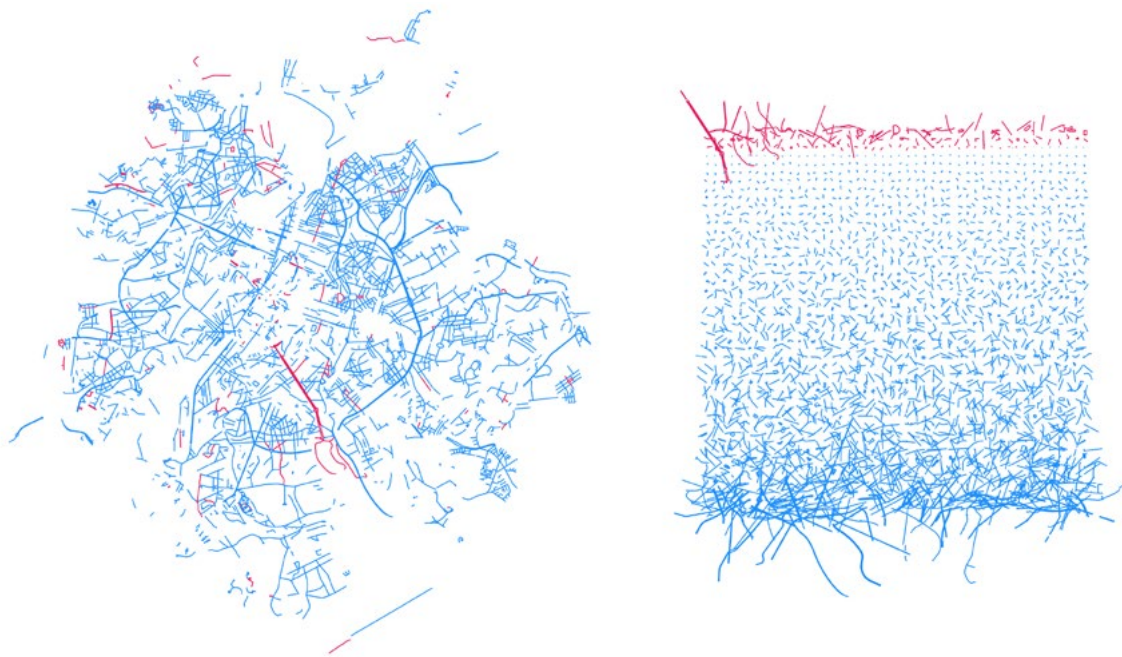


Figure 5: Visualization of EqualStreetNames data by Karim Douieb.

Digital Citymakers access, generate and manage data. Most importantly, they make data accessible for others by visualizing it. The *EqualStreetNames* project gathered and visualized data on the street names of Brussels by gender, revealing that only 6% of streets are named after women (Figure 5). About 70 volunteers worked on compiling this information from existing data on OpenStreetMaps and Wikipedia. The map has been used to advocate for changing street names to reflect a better mix of genders. The project's source code is available on GitHub and has been replicated in other cities.

Digital citymaking projects fuel public discourse around topics of spatial justice that are important on a local level – such as access to green spaces – and on a global level – such as climate change.

But they also encourage debates on data justice, such as representation in and access to data. It is important to note that raising awareness alone is not enough to achieve spatial justice (Cinnamon 2019).

The urban gap

Clearly, digital citymakers can and do contribute something to cities that no other actors are currently doing. So what is this gap they are filling? The same question has been asked about *non-digital* citymakers in the past, some authors urging cities to close the gap

between these new modes of urban development and the formal planning system (Petrin and Wildhack 2015). A similar gap is described between *top-down Smart Cities* and *bottom-up hackers*. De Lange (2019a: 284) sees living labs as a way to “connect these worlds”, where cities set up designated areas for experimentation with new ways of citymaking. It can be argued that digital citymakers play an important role as intermediaries between broader civil society, market and government agencies (cf. Beck and Schnur 2018), similar to the way the civic hacker is described as an “interstitial figure, perhaps even the ‘missing link’ between insular bottom-up movements and the top-down structures of government” (de Waal and de Lange 2019: 10). After all, they are close to their local communities, so the threshold to interact may be lower (Figure 6), but also have the necessary expertise and connections to administration and policymakers – and often build tools for the explicit purpose of enhancing communication between these parties.



Figure 6: Photo taken from a Tweet by @michalnaka showing an example of crowdsourcing a design choice in a neighborhood, using technology for low-threshold engagement. Source: Michal Naka.

City officials acknowledge that data literacy education is often more important than technical infrastructure. However, cities and institutions often lack employees with the necessary skills themselves. Digitalization in public administrations is generally lagging behind developments in the public sector. Digital citymakers have the skills, resources and willingness to help them catch up – the aim of the *Code for All* movement is to create “tools that help make more democratic, transparent and people centered governments” (Code for All n. d. a). Another advantage that digital citymaking processes have vis-à-vis formal planning processes is their responsiveness to immediate problems. They are free

to develop solutions to pressing issues quickly, without the need to follow protocols or wait for decisions. This makes them especially adaptable in times of crisis. When meeting in person was no longer an option during the 2020 lockdown, initiatives offered help by 3D-printing face masks, sanitary door openers, and even valves for intensive care units (Naka 2020).

Some local and national governments now encourage civic hacking, citymaking and similar endeavours (cf. Schrock 2016; de Waal and de Lange 2019). As one of the interviewees put it, cities are well aware of the creativity and expertise within the ranks of civil society and feel the need to tap into that potential. They attempt to do this by installing platforms such as Stadtmacher or open data portals, local spaces such as CityLAB Berlin, and events such as *Hackathons* for various locations (eg. Münsterhack, Makerthon OWL) and topics (eg. Wirvsvirus, ITS Moin Hack on Mobility and Logistics). *Hack your City* was an event that wanted to “give participants space to use technology to learn more about the city and actively shape it” (Haan and Höffken 2015: 17). Institutions beyond cities also offer support: Germany has produced a *Smart City Charta* and the United Nations installed the *UN Innovation Technology Accelerator for Cities*. UN Habitat also brings technology back to the local level with Block by Block, a nonprofit that uses Minecraft to let communities redesign their neighborhoods and public spaces (Block by Block 2021).

Despite much positive coverage, many informal projects are still confronted with mistrust by local governments, and find their processes and ideas incompatible with the prevailing understanding of planning (Willinger 2015). Some argue that these initiatives should not be integrated in the official processes because this would compromise their spontaneous and informal nature, but rather be understood as “selective, temporary complements to long-term planning processes” (Gebhardt et al. 2014: 115). Still, there is an argument to be made in favor of collaboration rather than just coexistence of formal and informal processes, because the benefits go both ways: when citymakers understand the city's processes and organizational structures, it decreases the power distance between them (Cazacu et al. 2020). Collaboration between community projects such as *Leerstandsmelder* and local administrations would also improve volume and validity of data (Oßwald 2015). Consequently, the role of urban planners would change to providers of interfaces between citizens and local government and enablers of co-creative citymaking processes (cf. Willinger 2015). It is all the more important for them to be conscious of the role of data and technology.

Where do we go from here? Conclusion and outlook

With this first look at literature and real-life practice, the authors have delineated the concept of digital citymaking. The evidence gathered warrants a deeper look at digital citymaking in practice and how it is contributing to, and shaped by different urban environments. As Heeks and Shekhar (2019) notice, the effects of datafication on communities has not been documented because a clear analytical framework is still missing. The present paper can lay a foundation for such a framework by describing a concept of digital citymaking that contributes to cities and their governance at the intersection of physical and virtual space.

The ever-increasing rate of innovation and unprecedented global challenges suggests that we should keep an eye on the dynamics of digital citymaking.

What ingenuity can we observe in times of crisis? How can new solutions emerge in an increasingly complex world? To what extent do they depend above all on the recombination of existing parts? Which products work in processes (e.g. circular economy) that incorporate learning by producers and consumers? How does analogue and digital citymaking interact – if the two can even be separated?

More threads may also be followed regarding resources and competences: Are communities or spheres of actors becoming more established and competent? Will they grow to a considerable size or impact on cities? Is this a relevant breeding ground for urban development, beyond state-sponsored projects that run out eventually? How open and inclusive are these communities? How do they progress and renew?

Finally, it might also be fruitful to consider the interfaces of digital citymaking in relation to sovereign planning authority for processes and developments by private companies. Who is able to design and develop which spaces? How strong is the impact of digital citymaking in different areas of spatial planning? Do digital citymakers take on a networking function between sectors such as mobility, public space, care, education and so on? Or are they very specialized, innovating in profound ways and generating focused knowledge?

All of these questions are likely to guide urban planners and researchers on their quest for sustainable and livable cities, for years to come.

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