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Open maps, closed knowledge: what the platformization of maps means for citizenship and society

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Abstract

Maps constitute ways of defining ideal knowledge and of making it legible - a powerful knowledge infrastructure. But like other infrastructures in cities, maps are increasingly "platformed," i.e. made more participatory by the capacity for volunteered data to be added or mashed up with other data. This 'platformization' of cartography introduces a set of parallel tensions that underpin the experience of making and communicating knowledge, as platforms expand. The broadest conflict is between infrastructures and platforms as modes for organizing knowledge, but within this, we can also see a tension between decentralization and recentralization, and between open and participatory models of collaboration and the particular forms of enclosure associated with platforms. In this short article, we detail the recent transformations of digital cartography through the two competing models of infrastructure and platform to highlight a series of questions that these complex assemblages bring when creating knowledge and experiencing citizenship in society.

Keywords

Cartography, cities, citizenship, infrastructure, knowledge, open data, participation, platform

Introduction

In recent years, the web has provided the social, economic, and technical context for "opening up" maps, exemplified with the rise of web-based cartographic projects such as OpenStreetMap (released in 2004) or Google Maps (2005). In this configuration, maps are not exclusively enclosed within the logic of states and their institutions, but rather adopt the logic of social media (van Dijck, Poell, 2013) to present maps as "open systems": they are *programmable,* by relying on application programming interfaces (APIs) to provide base

maps to external parties (Haklay et al., 2008); they are *participatory* (Plantin, 2014) by allowing users to contribute, for example by suggesting changes to the base map; they take part in *peer-to-peer* collaboration for knowledge production (Benkler, 2006).

These mapping platforms are seen to be agents of decentralization by bringing new actors, processes, and values, in a mapping sector traditionally organized around centralizing entities, such as governmental agencies or satellite companies. All of these actors that constitute the traditional "knowledge infrastructure" (Edwards et al., 2013) in charge of supporting the creation of maps, have now to share their monopoly on geographic information with more recent web platforms. It is not to say that new mapping platforms are replacing mapping institutions: what is rather at stake is that the new mapping actors (say, Google Maps) have now reached a spatial coverage and a degree of use that compete with traditional mapping actors (like the UK Ordnance Survey) -- with obvious differences in terms of access, enclosure, and citizenship.

The fact that mapping platforms increasingly organize essential spatial knowledge in society bears consequences for how we understand and communicate about the places that we live - that is, how we are able to enact digital citizenship (Isin and Ruppert, 2015) or develop data citizenship (Powell, 2016). This raises questions about not only what information is shared, but how access to it is provided. As a result, the tensions between infrastructural control and platform participation enfold other tensions between the openness and enclosure of knowledge, and between its public or corporate control. In this uneasy cohabitation between different modes of creating spatial knowledge, paralleling the modes of sustaining knowledge through either platforms or infrastructures. The key question in this article is therefore: How are relations of power that exist in the construction of spatial knowledge transformed by the tensions between platform and infrastructure?

We focus in this article on how such changes in the organization and dissemination of spatial knowledge in society affect how citizen envision and enact their citizenship. Mapping is a key example, as it is both a participatory cultural practice but also a key means of representing and controlling knowledge about the spaces and places where people live. We claim, therefore, that the recent history of digital mapping, and its alternance between the

configurations of infrastructures and platforms, can shed light on major transformations in how citizens create, know, and communicate about their world.

This article is organized as follows. We first describe the recent transformations of digital cartography, through the two competing models of infrastructure and platform. We then review existing scholarship interrogating how power and control over knowledge is organized in these two configurations. In the third part, we employ these different approaches to highlight a series of questions that these complex assemblages bring when creating knowledge and experiencing citizenship in society.

1. Digital mapping: platform and infrastructural models

1.1. Platforms built on existing infrastructures

The current infrastructure of cartography is supported by an ecosystem of people, practices, and expertise that participate in the creation and circulation of spatial knowledge, including geospatial imagery companies, national institutes, international standards, dedicated software, and GIS (Geographic Information Systems) programs in universities. Together, all these elements are integrated and enforced through standards to constitute a "[r]obust network[...] that generate, share, and maintain specific knowledge about the human and natural worlds." (Edwards, 2010). The key properties that define this configuration is the provision of maps as an *essential service* in society, the constant update and maintenance of maps to ensure *reliability* and *long-term sustainability,* acting as guarantee of the widest *accessibility* possible for mapping information to the public (Edwards et al., 2007). This does not mean that accessing cartographic information from mapping institutions is free (in fact, it rarely is), but that this access does not depend on the "users' identity or intended use." (Frischmann, 2012: 7).

Maps continue to work as major example of knowledge infrastructure, but since the development of OpenStreetMap (OSM) and Google Maps, they have also been adopting properties of platforms. The first is a community-based project created in 2004 that aims to map the whole world and to release the data under non-restrictive licenses. It combines the strength of a committed community of members with interests in geospatial and cartographic projects, with a participatory architecture that allows multiple contributions on the base map.

While the OSM project showed how distributed and collaborative content creation can apply to maps, Google Maps in 2005 provided the proof of concept that a base map could be massively used to visualise third party or personal data. The release of the Google Maps API the same year started a trend of mapping mashups, where users without a strong GIS background could create online geographic products. These two projects introduced maps into the world of web-based platforms, i.e. they made digital maps 'platform-ready' (Helmond, 2015): the strategic use of APIs reconfigured base map manipulation and data input to fit with existing web-based practices, and placed mapping platforms as the de facto standard to create an online map.

As a result, platforms organize the creation and dissemination of cartographic information along different properties than the one driving infrastructures. At the core of web-based mapping platform lies the concept of programmability, perhaps best characterized by management scholars: the architecture of platforms is constituted of a core component with low variability, complementary components with high variability, and interfaces for modularity between core and complementary components (Baldwin, Woodward, 2008). Applied to cartography, it means a base map (from Google Maps, OSM, or any other provider) can be accessed and customized (following structures and conditions set by the provider) to develop third party mapping applications, or simply to display a map on a personal webpage. As a consequence, creating and manipulating a map online has less to do with traditional GIS properties (Turner, 2006), and is closer to using other web-based social media (Farman, 2010). A diversity of terms emerged in the mid-2000's in geography to account for this new role for users, not constrained to the reception side anymore, but taking a more active role in creating maps: "Neogeography" (Turner, 2006), "Volunteered Geographic Information" (Goodchild, 2007), "Webmapping 2.0" (Haklay et al, 2008), or "Wikification of the map" (Sui, 2008).

1.2. Cohabitation instead of subduction

Mapping platforms are not replacing infrastructures, they are actively benefiting from them. One of the most important social roles of infrastructures is to provide an essential service that people can use as a utility (Frischmann, 2012). This is the main reason why mapping platforms such as Google Maps are so successful: they did not recreate the whole existing

mapping infrastructure (at least at the beginning); they instead rented base maps from existing sources (such as Teleatlas or Navteq) or accessed open base maps from authoritative sources (national cartographic institutes). The value Google added was to make these base map available and reusable following procedures common to web developers, typically through an API to access a base map and to develop an app.

What is most fundamental in the relation of web-based mapping platforms to infrastructure is that the properties of the former showed how organizing maps along an infrastructural model were increasingly limiting in a digital age. Large-scale access to base maps is a goal of public institutions, but very often denied in reality by prohibitive prices and fee structure, as well as strict copyrights. ON the contrary, OSM has showed the relevance of providing base map with open licenses. Secondly, web-based maps opened the creation and manipulation of maps to professions other than geographers (e.g. web developers, web designers) and went beyond the hyper-specialisation of national institutes toward one specific population and software: geographers or GIS practitioners possessing the skills (and licenses) necessary to use geographic information, relying on GIS as standard.

Platforms are therefore not simply replacing existing infrastructures. The transformation at stake is rather a question of control over the provision of cartographic knowledge to society. Whereas for Scott (1999) the state acts as centralized knowledge, now platform owners and state infrastructures appear among multiple possible sources of knowledge. As Leszczynski puts it:

> "In the West (the USA and UK in particular), rather, the state's role is changing from that of sole purveyor of geographic information and arbiter of cartographic truth to that of one of many producers and facilitator or institutional body of oversight." Leszczynski, 2012

Knowledge infrastructures are therefore not disappearing; they simply do not create a single obligatory passage point. The rise of new material forms of creating and publishing mapping data, based on participation and openness, accompany the end of the 'modernist era of mapping' (Goodchild, 2009) characterized by the state as the central authority for creating and disseminating maps as official knowledge.

2. Existing literature on power in infrastructure and platform

This cohabitation of configuration for cartography raises several tensions in terms of power relations: between experts and amateurs, openness and enclosure of knowledge, or between corporate and public entities. Scholars from two fields of inquiry — long-standing "infrastructure studies" and the more recent "platform studies" — have already worked on these questions. Reviewing them exhaustively is beyond the purpose of this paper: we rather focus on what each of two perspectives contribute to the question of power in mapping, and by extension, the transformation of power in relation to platforms. Infrastructure studies combine historical and sociological approaches to focus is who and what excluded from infrastructure; platforms studies scholarship — mostly located in media and communication studies, although also lively in management — focus on what is decentralized and recentralized through platforms. We contend that as platforms serve the goals of infrastructure, the kinds of power dynamics that characterized modern concentrations of influence are combining with dynamics of power that are more linked to control of emergent complexity and participation. Thus the more rigid frameworks of modernity may need to be reconsidered.

2.1. Infrastructure, modernity, exclusion

It is impossible to disentangle questions of infrastructure and power from the larger context of modernity. Infrastructures are quintessential socio-technical objects that embed the values that drive this philosophical-historical endeavor: "control, regularity, order, system, technoculture as our nature: not only are all these fundamental to modernism as Weltanschauung, ideology, aesthetic, and design practice, but they are also (I want to argue) basic to modernity as lived reality" (Edwards, 2003: 191). A variety of networks, whether of communication (Mattelart, 1997), energy (Hughes, 1983) or urban infrastructure (Graham, Marvin, 2001), at the local or national level, instantiate and organize the project of modernity, by providing essential services to allow society to go beyond contingencies and uncertainty of nature, and to reproduce social order based on the rational use of the national territory. If infrastructures are strongly linked to this notion of modernity, all the questions that explore the evolution and

limitation of the latter therefore apply to the former. Ethnographic work has therefore shown how tensions between what is visible and invisible, as well as the status of breakage and maintenance, differ for infrastructures in non-Western contexts (Larkin, 2008) (Chan, 2014). But the separation of nature and culture also establishes a brittle rigidity to modern, and Northern assumptions about infrastructure. Critiques from gender and race studies highlight how infrastructures reproduce existing discriminations, despite discursively valuing inclusivity, as revealed by the example of redlining (Graham, Marvin, 2001). Relatedly, infrastructures are based on labor that is made invisible (Bowker, Star, 1999), such as maintenance and repair (Jackson, 2014): uncovering such hidden labor reveals how technical systems reproduce and depend on particular social assumptions. Finally, studying radical otherness in infrastructures perhaps comes most powerfully from studying infrastructure projects that failed to exist (e.g. the "Russian Internet", Peters, 2016), offering counterexamples to decisions made to shape the history of Western infrastructures. The revelation of infrastructures as stretched, overextended, in need of maintenance and not always robust provides a capacity to ask: *Who is included/excluded - and how does this occur?*

2.2. Platforms, mediation, centralization

Inclusion is of course itself a modernist concern, contributing to the notion that an infrastructure can effectively serve all. With the rise of platforms, this perspective on infrastructures becomes more difficult to sustain. Critical scholars of digital platforms have therefore asked a different range of questions, beyond a focus on inclusion/exclusion, to interrogate the social and political role of this intermediary, and to look at how platforms actually determinate what is mediated and how participation and control change. Gillespie (2010) shows how the presumption of neutrality for platforms such as Youtube—presenting themselves as being only an "in-between" connecting other actors (such as advertisers, content producers, viewers)—is at the core of its business model and therefore shapes public expression in digital networks. Following this interest in analyzing the role of supposedly neutral and un-mediating platforms, others have used political economy to emphasize how value is created and circulates between content producers and platforms owners. Langlois and Elmer (2013) highlight how economic logic shapes affordances of platforms, and therefore shape communication: what they call "double articulation" highlights how the communicative mediation that constitutes social media platforms is "folded" within an economic logic. Van

Dijck and Poell (2013) similarly analyze how platforms create and extract values from participation, through processes of datafication (in which every interaction on a platform can be transformed into data) and commodification (in which these data can be monetized). This body of critical research on platform therefore goes beyond a vision of platforms as simply connecting people to analyze the circulation of data, value, and labor. Instead of inclusion, what is of concern becomes how decentralized participation is managed by a centralization of data and information control. So a new question emerges: *how is power decentralized and recentralized in relation to platforms?*

3. Access, Participation, and Decentralized Power

With these two frameworks in mind, and with an aim at integrating - but not reconciling - the questions about inclusion in relation to circulating power dynamics, we examine a few examples of geographical information platforms assuming role traditionally fulfilled by mapping and other information infrastructures. These help to illustrate how platforms develop modes of power associated with management of bottom-up complexity, and how they simultaneously decentralize influence and recentralize control.

3.1. Civic Dashboards

City control rooms, like those in Rio de Janeiro (see Kitchin, 2014), as well as city dashboards that present real-time indicators (Tkacz, 2015) use a platform logic to centrally manage many diverse types of information, smoothing out differences in the nature or meaning of the information and introducing control through connection. While dashboards for decision support have a long history within management, where they are meant to separate work and management, dashboards presenting real-time local information to city managers and to citizens are a more recent way of representing local civic knowledge (Kitchin, Lauriault, 2015). Dashboards pulling in disparate information (including real-time individually-generated social media information) while promising to automate decisions illustrate how the decentralization/recentralization dynamic of platforms connects with longstanding infrastructural tendencies: As Tkacz writes, “dashboard governance is not reducible to the military control room and its exceptional interventions. The dashboard is more pervasive, more mundane. The dashboard is along for the ride.” (2015). As Tkacz contrasts the ‘official’ government dashboard with the ‘people’s dashboard’ created by the

London-based Digital Action Lab, which attempts to enable crowd-sourced forms of 'data-worlding' in potential opposition to governmental control, we see both forms of dashboarding as illustrations of how decentralizing/recentralizing modes of power operate.

Of course, the questions of infrastructural access and inclusion have not disappeared, but instead become more nuanced. A new host of mapping applications take the logic of the real-time dashboard - especially the integration of different forms of proprietary/volunteered information and the participatory/remixing features of platforms to produce services that eventually become extensive and establish expectations of essential service and robust reliability. For example, the mapping and transit planning application *Citymapper* offers real-time traffic information and remarkably accurate calculation of travel times, by aggregating a series of open data sources (Transport for London) combined with large scale data processing capacities. Citymapper's management of real-time data flows and seamless presentation follows the same logic as the dashboards, while its effective interface has driven its expansion across several different cities.

In London, *Citymapper* uses data from Transport for London (TFL). The open data on transport use and in particular, the real-time movement of people that can be extrapolated from the cashless card-based transport system is available to all. TFL uses this data to maintain its physical infrastructure, but also, as this interview with Phil Young, Head of Online at TfL, as an infrastructure in itself. Young frames the data as the infrastructure itself, not seeking to make a strong distinction between the TFL website and other apps who use the data. He writes,

> "Across London, millions of people every day use apps powered by our open data to check the Tube, find a bus or see how the roads are running."
>
> "This same data powers our website, allowing customers to choose between using tfl.gov.uk or simply downloading any apps which are directly powered by us. We are committed to making our information freely available to help stimulate new products and services so that people have better information in the form that best suit them."[1]

[1] Transport for London Press Release, 14 April 2016, "More than 2,000 new developers sign up for TfL's open data in last six months." URL: https://tfl.gov.uk/info-for/media/press-releases/2016/april/more-than-2-000-new-developers-sign-up-for-tfl-s-open-data-in-last-six-months

TFL are not seeking to build a highly engineered service or to position an infrastructure based on this data as the main, extensible, reliable means of understanding movement in the city. Instead, TFL, a publicly supported agency, anticipates applications absorbing the data - aligning with a platform model but maintaining public ownership of data.

Decentralized participation has also shifted how data is mapped, and acted upon. Participatory civic platforms like FixMyStreet.com, built by the UK's MySociety, or crowdsourced crisis maps like Ushahidi, solicit information from citizens that is then re-presented on the platform. In these projects, the platform form becomes associated with the ability to give voice by collecting together and legitimating individual contributions. But it is the platform itself that renders contributions legible, and also that structures which data to attend to. Critiques of "FixMyStreet citizenship" by Gabrys (2016) and others (Powell, 2016) focus on how participation in platform is not equally distributed, meaning that attention is channeled towards locations where more contributions are made, rather than towards long-term projects. This highlights a significant tension between infrastructure and platform: "FixMyStreet" citizenship may crowdsource contributions to map where individual potholes need fixing or litter needs collecting, but it may not be able to identify large-scale, longer term needs. As well, these platforms reinforce civic contributions of a particular type - individual data points that can be aggregated and made calculable.

These examples highlight how the dynamic of decentralization absorbs participation and contributions within an open framework, but that there is an ongoing, and not entirely settled, relationship with the infrastructural tendencies that have characterized map-making and other forms of centralized information control -- in part because this recentralization is precisely what renders platforms useful and attractive -- as well as what distinguishes them from infrastructures. In the next section with look at this in more detail.

3.2. Recentralizing Control in Open Platforms

James C Scott's classic work on power and mapping discussed how centralized access to geographic spaces and linguistic knowledge spaces reaffirmed state control during the modern period. He contrasts the network that one might have to 'pass through' with the 'centralizing

aesthetic' that that 'defied the canons of commercial logic or cost-effectiveness' (1999, p. 76) but that reinscribed control by not only creating legibility but by increasing national transparency and information mediation by the state.

Scott writes, "a thoroughly legible society eliminates local monopolies of information and creates a kind of national transparency through the uniformity of codes, identities, statistics, regulations, and measures" (p. 78). As platformed modes of knowledge production that are based on accessibility and often also conceived as networks emerge alongside modernist (infrastructural) mapping, new passage points emerge. Whereas the state may focus on a specific set of simplified facts that permit 'a synoptic view of the ensemble . . . in terms that are replicable across many cases' (p. 79) networks and open platforms permit the layering of many different kinds of information. Open systems make allowances for many kinds of information, positioning the platform as a neutral surface upon which anyone can add information. The neutrality may be mythical, but the openness is not. In fact, the openness of mapping platforms is the very feature that makes recentralization of control possible.

The dynamics of decentralisation / recentralisation through platforms directly shape what open and closed map means. Platforms have interest in being "open enough" to generate a whole ecosystem of applications (e.g. Google maps mashups), but possess as end goal to simultaneously position themselves at the center of such ecosystem, to eventually become the entity that regulates data circulation (Plantin et al, 2016). This centralizing strategy is impossible if a platform is too dependent on other sources of data, for examples authoritative data or satellite data, as it was the case for Google Maps in its early days. This is one of the key motivation for Google to develop their own mapping capacities, based on data production (Google Street View imageries) combined with crowdsourcing (e.g. through the acquisition of the platform ReCaptcha, used to crowdsource image recognition).

Instead of simplification of knowledge as a means of making it replicable or orderly, knowledge construction through mapping platforms invite contributions of different types of knowledge. Adding and accessing this knowledge is rendered easier for platform users, who are free to interpret and use this information in any way that they wish. The platform owner manages access and draws meaning from open contributions, recentralizing control even as contributions are decentralized. In contrast to 'state simplifications' that distill and constrain

what knowledge is produced, platform owners have to maintain control of information that comes from wildly different sources and that has many different features**.** So the development of artificial intelligence and enhanced machine learning capacities accompany the growth of open platforms, and provide some indication of how platform operators maintain control. They do not, however, replicate the kinds of information control nor transparency that states enacted. Open maps and platforms remain accessible, and potentially intelligible, to a range of actors beyond the platform owner.

Conclusion

Platform models are expanding, and as platforms become more infrastructural, there are clear issues of power and responsibility. As we explored above, when platform companies seek to expand their services they consolidate the information that they collect, even if the method of soliciting this information is more open and participatory. Thus, platform owners are moving to construct their products and services as if they were infrastructures, but based on labour and knowledge contributed through participatory logics. This inverts the notion of the single, official passage point for knowledge and also the role of the citizen: if Scott's work highlighted the role of the state in defining and standardizing civic knowledge, the current problem is to locate the equivalent power for platform operators.

As a host of ordinary experiences become mediated by platforms and delivered as services (for example, autonomous cars who dynamically update and need to be maintained lest they crash and cause death) the collapse of infrastructure into platform and the operation of platforms in infrastructural ways, bring risks for public services - even when it makes 'citizenship' participatory. In this short paper we have proposed investigating the tensions and connections between collecting and presenting maps and other geographical knowledge infrastructurally or through platforms, in order to understand how some forms of power are maintained and how others emerge. We gesture here at some implications for citizenship, broadly conceived, but we hope that further work can take the directions presented here and develop them to investigate in more detail how changes in the collection and communication of knowledge frame and redefine how we are able to act in relation to things that matter to us.

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