Mapping the City Archive: Visualizing Urban Data in The Networked City

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(PREPRINT VERSION)

ABSTRACT

Large amounts of urban data are available to inform and enhance decision making for businesses and citizens. The Planning and Building Permit Archive in Oslo is one such source of data, which can be mapped in different ways. The article discusses the different ways this mapping can take place, based on a set of visualizations developed by the designer Even Westvang in a project called SeePlan*. The article discusses what kinds of maps urban data can generate, and how the role and status of the urban data archive changes as it is mediated. Finally, the article suggests a changed context and role for urban planning, and in particular the way in which public participation in urban planning takes place.*

KEYWORDS

urban data; archives; participation; visualization; mapping

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Introduction

The city is continuously being reshaped and rebuilt through political and administrative decisions as well as through the actions of individuals and private businesses. This activity leaves traces that constitute an archive of the city – both of its physical form, but also of the processes and negotiations and controversies that preceded it. One such example is the Planning and Building Permit Archive of the Agency for Planning and Building Services in Oslo, where records are kept of the decisions and processes that lie behind all physical amendments in the city. From the smallest renovation of private apartments to large urban development plans, the archive is openly accessible as a result of national policies of transparency in public governance.

The main question we ask is: What use does this archive have if processed through digital and social media? This leads to a number of related questions. What would such digital ways of unpacking by means visualization, remediation and dissemination allow? What kind of maps could be made and what would they tell about the city? And when it comes to the archive itself, what impact and status would it have when redistributed and re-networked through digital and social media?

We have investigated such questions in the context of a project into the city, social media and performativity called YOUrban, and in particular in the project called *SeePlan.* In *SeePlan* we have looked into how the archive could be used by re-working it into new kinds of dynamic maps and visual representations, and by putting it into play through new digital media and communication platforms. A number of experiments in visualization and dissemination have been carried out, based on the affordances of the archive data and a selection of visualization tools and design strategies.

The overall aim of the *SeePlan* project has been to explore new ways of communicating and distributing, and thus making both more available and accessible, municipal building and planning data toward a wider public. A secondary purpose has been to examine how such alternative modes of visualization, mapping and mediation can be used as means and tools for revitalizing the forms and formats of participation in urban planning. A related concern, though perhaps more of an underlying thematic, has been to explore how such experimentation with visualization, mapping and dissemination tools has the potential to bring about new types of empirical material—new kinds of configuration of existent urban data—of relevance for urban research.

Related to issues of participation, from the start we would like to underline the fact that new digital media – locative, mobile, interactive, social and pervasive – in themselves open for new forms, formats and modes of engagement and participation. In Web 2.0 (O'Reilly, 2005), or types of social software, we encounter networking sites and mapping applications that are designed to work in social, collective and participatory ways. This trend has become even more significant with the advent of smartphones and corresponding new forms of locative and place sensitive software. All such developments make for richer forms of user experience, user participation, dynamic content production, processing of metadata, and the like (see Gartner, 2009). As such one can talk about the development of a "new age of participatory culture" (Verhoeff, 2012: 42), or what the media scholar Henry Jenkins has coined "convergence culture" (Jenkins 2006).

The advent of the semantic web and the emergence of new kinds of participatory cultures, including a range of new locative media practices and what these again open up to in terms of new types of mapping practices, makes it necessary to re-conceptualize the debates about the forms and modes participation in urban

planning. New types of urban data make for a range of new possibilities. This includes the potential for exploring new forms of visualization, mapping and communication, *and* the fast expanding field of participatory practices and cultures. We suggest these are threefold and are also interrelated. There is great potential in 1) new forms of content and data production, 2) new forms of mediation and dissemination—including new types of maps and visualization strategies, and 3) new forms of involvement and engagement related to processes of urban planning and governance. Our argument is that such forms of practice are becoming more infused into each other than before. There is need therefore to start looking into what kind of potentials and gains there can be found through design experiments and practice based research, and along with them thinking of such practices and processes as interrelated and co-constitutive.

The overall intent of this article is to illustrate these claims and trends by way of a selection of design experiments in visualization and mediation of urban data taken from the *SeePlan* project. We take these examples as a starting point for reflection on, and discussion about, the characteristics of what we here have sketched out as an emerging field of interconnected *urban learning practices* that are related to urban data production, visualization and mediation, and engagement and participation. Our main emphasis is on aspects of urban data visualization and mediation. However, we also examine how issues and concerns related to urban data i.e. the archive material that formed the basis for the mapping experiments of *SeePlan*) as well as participation (i.e. alternative contexts of use and dissemination) have not only played a co-constitutive role in informing the design processes, but also have been affected by the design solutions themselves. The overall affect, we would claim, has been that the new ways of representing and visualizing urban data in *SeePlan* make us see afresh both the underlying urban data archive and the contexts in which it can be put into use. A by-product of all of this is the emergence of new kinds of data and material for urban research, that is in its constituent parts, i.e. as 'urban data', as visualization and mediation, and as contexts of use and participation – and in the way these practice fields dynamically interrelate.

Computing the Networked City

An important background for our discussion is ideas about urban data, information and issues of representation as discussed in urban informatics. In recent years, new policies of open data have been introduced. Coupled with online distribution and new forms of display and dissemination, a range of new opportunities for accessing information and citizen participation emerge.

In the networked city and in a context of new media, the boundaries between urban data and the physical city are in many ways blurred. Virtual data become as important as buildings in reading the city (Ratti and Berry, 2007; Salim, 2012). Various kinds of data relevant to the perception and planning of the city is increasingly produced through real-time sensing, crowd sourcing and social networks, but also in public and government databases, for instance relating to public transport schedules etc. The amount of data available is enormous, and it is constantly increasing as more sensors are installed, as government and organizations makes data sets available online, as individuals, communities and businesses generate entirely new information sources, often generating data "as a by-product of everyday transactions" (Savage et al., 2010: 13).

Ubiquitous computing promises that data handling, sorting and displaying will no longer be restricted to technical spaces, but disappear into the "fabric of everyday

life" (Weiser, 1991) and thus release pressure of the potential information overload by making interaction with data more available to ordinary people. Urban computing takes this one step further and suggests a composite gathering, sharing and dissemination of real-time data in socially relevant urban contexts, in terms of "the urbanization of the Internet, and the digitization of the city" (Robinson et al., 2012) – enabled by ubiquitous systems of communication and computation (Greenfield and Shepard, 2007). This would result in the instrumentation of "the human experience of public space with digital information" (Moere and Hill, 2012).

"Urban informatics" has been coined as a term to describe the design and research field of mediating urban data that has been made possible by the proliferation of network technology and ubiquitous computing (Graham, 2004; Foth, 2009). It draws on classic informatics, but also social sciences, urbanism, architecture and design. According to Anthony Townsend (2009: xxiii) urban informatics pertains to "collection, classification, storage, retrieval, and dissemination of recorded knowledge of, relating to, characteristic of, or constituting city," as well as to "the collection, classification, storage, retrieval, and dissemination of recorded knowledge *in* a city". A particular focus of research and design within this field is on real-time data generation and mediation.

Citizen empowerment emerges as a theme in urban informatics, and notions of for instance "participatory urbanism" discusses ways in which ubiquitous technologies can facilitate "citizen action by allowing open measuring, sharing, and remixing of elements of urban living marked by, requiring, or involving participation, especially affording the opportunity for individual citizen participation, sharing, and voice" (Paulos et al., 2009).

Open Data

Urban computing relies on data from different sources. Such data may be real-time generated by sensors, crowd sourced from individuals or organizations, or come from government databases, such as those of urban planning authorities. Today's availability of massive amounts of government data is caused by the ease in which it can be disseminated over the Internet, but is also results of ideals of openness in government and public administration.

"Open Government" is traditionally associated with the idea of accountability, but with the advent of the Internet, and the possibility of sharing large amounts of data, the meaning has to some extent shifted towards the idea of making the information available to government bodies, or when produced by government bodies, available to the public on the Internet as machine readable "open data". In many instances, journalists, activists and interest groups have made extensive use of such new open sources. To make data available may in many ways be practical and informative, but it does not always relate to the transparency of government. In fact, achieving increased accountability through open data is often confused with the technology of open data, and there is no guarantee that open data itself leads to increased transparency of government (Yu and Robinson, 2012). Open government can be achieved without open data, and open data can exist in contexts of low accountability.

The notion of Open Data is linked to discussions of Open Source, Open Access and Creative Commons that derive from the low-threshold information sharing potential of the Internet. The adaptation of Open Data policies began in the 1990s, and in 1994 California adopted what is considered the first legislation to this point, releasing legislative information online. The first open databases[1] were in

general making information available in bulk, but provided access only through designed interfaces—"pinholes". The data was, however, 'scraped' or extracted by individuals and organizations[2] that made the information available in raw format to be queried in any number of ways through Application Programming Interfaces (APIs) (Yu and Robinson, 2012).

Over the last decade local and national governments in many countries have adopted Open Data legislation covering wide areas of government, as reflected in the EU directive on the Re-use of Public Sector Information (2003). Policies for open public sector information are reflected in services such as the US Data.gov and the British Data.gov.uk, both launched in 2009.

A primary motive for publishing data lies in enhancing national business competitiveness, but it is not always clear why particular types of data are released. Our perspective is that much of what is available as open public data requires further processing, mediation and contextualization in order to gain importance and become more accessible for larger groups of the population. This again can be said to create conditions for more dynamic and informed deliberation in, for instance, urban politics, governance and planning.

From the initial intentional releases of specific types of data relating to Open Government (legislative and fiscal data etc.), a shift has occurred, where individuals and organizations, designers and researchers utilize and freely combine data sources to produce visualizations and mash-ups. Neither in their effects nor in their representational or meditational results do such tactics and strategies necessarily fit into classic notions of government accountability.

Visualization and Participation

Both the complexities and available quantity of urban data represent a challenge, especially if the aim is to engage citizens in urban planning. The application of different kinds of computer based visualization techniques in various social settings is seen as a way to go about enabling citizen participation (Gordon and Manosevitch, 2011).

Visualization has traditionally been used in urban planning and design, particularly in the form of images of existing and possible future physical structures and spaces. As the planning paradigms of the Twentieth Century shifted from an emphasis on aesthetic and representational aspects of built environments to a modernist approach, close relations between urban mapping and surveying—to a large extent visual as they are—and the design and formation of the city became important and common (Aspen, 2010). This was related to the development of social statistics and foundational work in information and data visualization such as Otto Neurath's System of Typographic Picture Education (ISOTYPE) (Vossoughian, 2008). Since then data visualization has developed dramatically with the advent of computers, real-time data and various sorts of open data. However, until now such rapid developments have only had limited effect on existing regimes of information visualization in urban planning.

For any democratic process, the identification and recognition of opposing and conflicting positions is critical, and in physical planning the purpose is to arrive at outcomes in the form of policies and designs that has legitimacy. In addition, informing citizens to enable them to form informed decisions and positions is a requirement for democratic planning practice (Forester, 1989; Forester, 1999). It is not in itself sufficient to release data. In order for it to perform the roles presumed in

the notions of Open Data, it also has to be made easily available to various social groups and organizations (Barndt, 1998).

Today's tools for visualization of data have themselves undergone radical developments. They are being democratized and have become available to a much wider range of people than just professionals involved in planning (Moere and Hill, 2012). At the same time computer and net technologies provide access to previously unimaginable amounts of data. Also tools for analyzing and visualizing data are becoming available for larger audiences.[3] This has also led to wide spread experimentation with forms of visualizations and dissemination, and even to more systematic research into creative visualization or so-called "information aesthetics" (Manovich, 2001; Lau and Moere, 2007).

Visualization of 'invisible' urban data may be informative, and the active location of displays of data in urban environments may heighten citizens' understanding of urban features and challenges. Situated visualization of urban data and active display on screens and billboards in urban space potentially allow inhabitants to acquire meaningful "insights beyond the retrieval of facts (e.g., events, routes, time schedules)" (Moere and Hill, 2012). Such forms of visualization may become part of direct feedback loops between citizens and city administrators, in which for instance user or sensor generated data is displayed or combined with other types of data sources, creating new dynamics between observers and the actual displays.

Urban data may include information about public services, but also community or individually generated data that may in some cases inform urban planning. To display urban data in public spaces potentially increases its relevance to local inhabitants. As such data and information visualization has considerable potential to inform and involve citizens in decision-making processes on community issues as well as issues of urban planning.

ICT and Digital Media in Urban Planning

The application of new media, Internet, urban computing and new forms of visualizations to planning has developed along a number of tracks: as tools that enable public participation in planning through alternative ways; as means of dissemination for planning information and decisions; as a medium for citizens feedback in planning processes; and as tools for visual simulation of planning scenarios in order to facilitate participative deliberation. From a planning perspective, new media has been applied in ways that reflect traditional needs for dissemination and feedback from inhabitants and relevant groups. Digital media has also been used to create new—interactive—forms of visualizations as replacement for traditional graphic forms of architectural representation. What is new is the ability to create more extended forms of feedback between citizens and planners, the option of developing methods for real-time monitoring of urban environments, and further options, perhaps, for planning to be perceived as socially relevant.

From an informatics perspective, planning and associated public deliberation has been an arena for applying ICT tools, including methods for data visualization. In this lies potential for developing a "*neo-planning paradigm* in which urban planning is carried out through active civic engagement aided by Web 2.0 and new media" (Foth et al., 2009: 97). It is presumed that strategies of combining data sources in new ways, real-time collection of urban data, and new forms of interactivity can make for alternative views and understandings of the city (Moere and Hill, 2012). We have

found such a track especially interesting to follow up in relation to our own experiments with mapping and visualization in the *SeePlan* project.

Today Geographic Information Systems (GIS) is the primary technology applied in urban planning. GIS is an expert system with limited public availability, even though GIS data and maps are made public in many cities and also has been used in interesting ways in experiments with public participation through the use of Internet, so-called *public participation GIS (PPGIS)*. Examples of such systems include "Argumentation maps" or Argumaps (Rinner, 2001), which attempt to facilitate map based public deliberation. So-called Planning 2.0 is an effort to integrate GIS and public participation by the use of Internet, and its primary functions are to disseminate maps and information to citizens, and to create options for feedback from involved people and parties through direct annotating on maps (Abukhater, 2011).

Visualizing the physical outcome of planning is seen as a way to enhance participation in but also the comprehension of planning decisions, and several experiments in real-time visualization have been carried out. Notable examples of such forms of map and visualization based deliberation are projects like the MIT project The Luminous Table (Ben-Joseph et al., 2001), The MR Tent (Wagner et al., 2009) or The Harbor Game[4] (Delman et al., 2003). All of these are projects that seek to enhance participation and deliberation by using mixed reality technologies ('game tables' and big screens) as means for visualizing physical outcomes of physical planning decisions—simulation—or by the use of game-like features. These methods have proved to been technically demanding, and new developments in mobile technology seem to promise low threshold technologies, such as Augmented Reality applications for personal hand held devices as possible replacements (Foth et al., 2009).

Furthermore, massive multi-player online role-playing games have been investigated as arenas for e-participation and e-democracy (Foth, 2009). In terms of planning more specific, virtual worlds, such as Second Life, simulate urban developments and allow users to engage in dialogue and non-verbal deliberation (Gordon and Koo, 2008; Foth et al., 2009; Gordon and Manosevitch, 2011).

Community Informatics (Gurstein, 2007) seeks to address the double and interacting nature of community, as place-based geographical neighborhoods, but also as net-based communities of interests, both representing a number of socially relevant issues. Urban Community Informatics, Gurstein argues, is based on "the recognition of the deep and continuing role of community interactions and aspirations by urban dwellers even amidst the most urban of environments", seeking ways to empower communities, contrasting it to Urban Informatics, which he describes as "the use of ICT tools within an urban context to enable "urban" processes – shopping, meeting up, advertising, casual social interaction and so on" (2010).

Platforms for dialogue, visualizations of outcome and accessibility of information are some of the significant features of new media use in planning. In the *SeePlan* series of projects a number of different approaches to visualization and dissemination of urban data and information, and for facilitating new forms of use and engagement, have been explored. These are described below.

SeePlan

In the *SeePlan* series of experiments, conducted by the media scholar and designer Even Westvang,[5] we have looked into how the planning and building permit archive of the Agency for Planning and Building Services in Oslo could be reworked and

reprocessed for purposes of visualization, dissemination and alternative forms of use. The database was chosen because it represented a dense set of geo-referenced data, with a high degree of interest for the public. The archive does not only reflect recent historic developments, but also the future city in the making, making it attractive as an object of study for both urban researchers and the public. The archive is publicly accessible through a designed interface, and the data was 'scraped' from the portal by systematically querying case numbers, a process that took several weeks. In all 1,898,193 items of correspondence were identified covering a period of ten years, corresponding to roughly 100,000 individual planning or building permit cases. A major challenge was the correct identification of actors—based on names where spelling differed greatly—but in the current analysis 40,000 entities—private citizens, corporations and government bodies—were identified.

The *SeePlan* project has four components:

1. PlanAR - *Locating Data in Space*

PlanAR is a layer in the free augmented reality smartphone browser Layar. The cases identified in the database are geo-referenced,[6] and spatially located visual indicators provide links to the particular cases in the database. The links are superimposed on the real-time video capture of the device, pointing out buildings or locations where physical alterations have been planned or already carried out. In other words, when you walk through the city, future plans as well as the contents and planning history of recent developments are made apparent.

The special qualities of this particular visualization lies in the very immediate access it provides, based on location and point of view, to an otherwise inaccessible—expert—system for retrieval of supposedly public data. In other words, the *SeePlan* geo-layer allows local inhabitants to get insight into construction events and plans in their immediate surroundings.

Figure 1: PlanAR—Mapping the archive on the city through augmented reality. Case title and a sampled case file illustration emerges when a marker is centred, providing a direct link to the case file. The size of the markers reflects distance.

2. Planimator - Tracking Development History

This experiment is an effort to visualize the totality of the archive over time, inspired by the Chromaroma travel visualization game.[7] Geo-referenced blobs represent cases and their size reflects the amount of correspondence related to the case. Time is visualized as vertical movement, resulting in a time-lapse sequence of urban developments over 10-year period, where lava-like 'bubbles' of cases emerge and rise as time passes. This visualization provides a unique view of the dynamics or 'heat' of urban development over time, and one can identify both large government initiated urban development schemes, but also the smaller and much more numerous privately instigated developments.

3. Show Everything! - Tracking Organizational Life

Show Everything! is a simple scatterplot of all the incoming and outgoing correspondence in the building archive between 2001 and 2010, organized along a 'case start date' y-axis, and the ensuing correspondence marked as dots along the x-axis. This simple visualization shows how external conditions in urban development, and events like the recent international financial crisis, which caused a temporary stop to private sector housing construction, had an impact on the internal conditions of the Agency for Planning and Building Services. The response time of the Agency seemed to grow during the construction boom of the mid-decade due to increased work load, but shrank considerably again at the advent of the 2008 temporary lull in construction. Other internal factors are also identifiable such as holidays that show up as lighter strips. One also wonders at the fact that certain cases appear to be active beyond the 10-year span of the database.

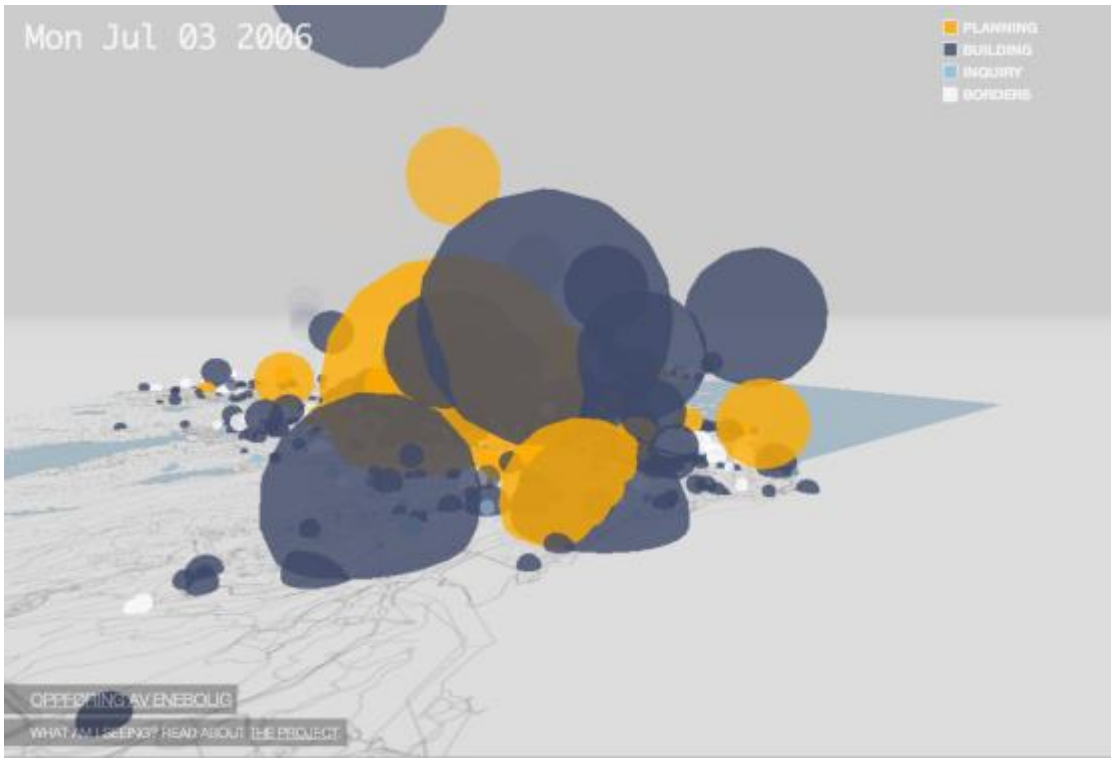

Figure 2: Planimator—Tracking urban planning over time. Bubble sizes reflect the amount of case corespondance and vertical movement reflects time. Planning cases (yellow) are fewer than building permit cases (blue). Also visible are land severances and mergers (light blue) and boundry adjustments (white). When clicking on a bubble, the case title emerges with a direct link to the archive case file. The animation loops the ten-year span of the archive.

4. DynaPlan - Actors and Networks

Methodologically difficult, but also particularly powerful, is the visualization of actors and the networks they form in urban development. In this sub-project, actors—individuals, developers, consultants, interest groups and public agencies—are identified, and their involvement over time is made apparent through their correspondence with the agency. By rolling the pointer over cases organized along a timeline, the correspondence between parties involved show up as linear links. This enables a representation that identifies actors in a particular planning processes, as well as the extent of their involvement at different stages of the planning and realization of the particular urban development area.[8]

Several sub-visualizations were produced in *DynaPlan*. Network and actor maps were also produced on the basis of geographic proximity, revealing actors involved in urban transformation of any given neighborhood and not just formally designated urban development areas.[9]

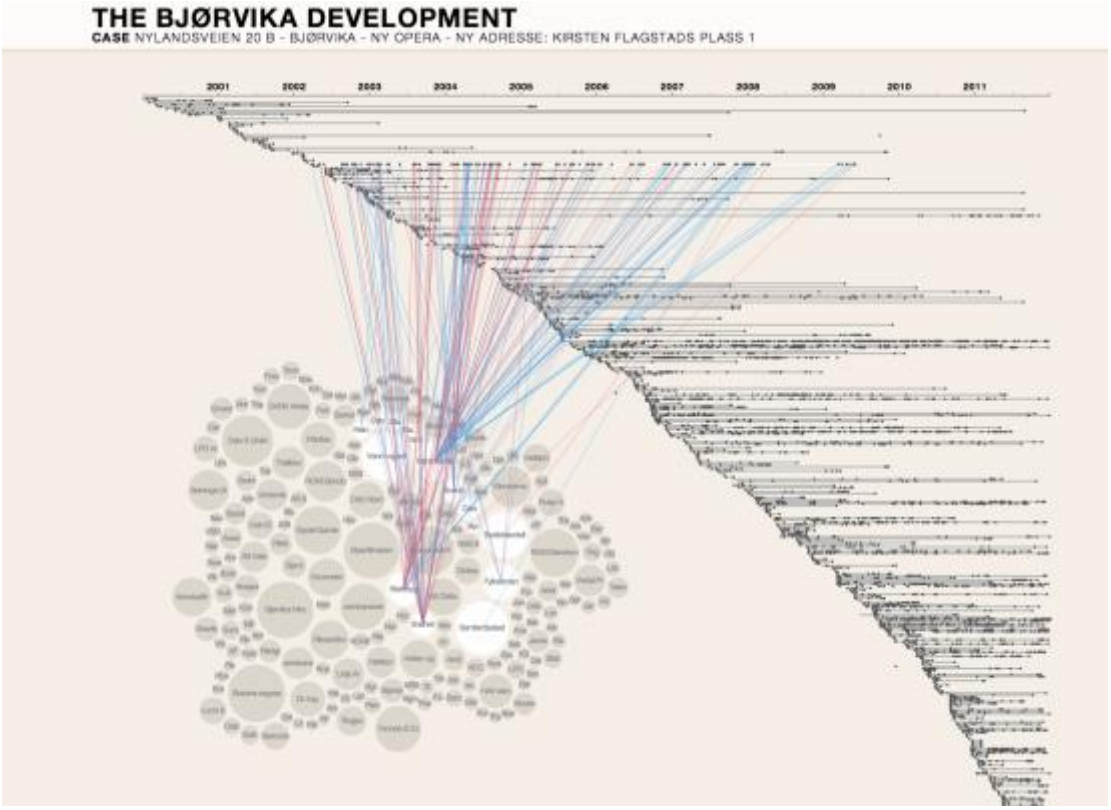

Figure 3: DynaPlan—In contrast to the Tjuvholmen case, the actor map for the Bjørvika urban development area is much more of a composite, revealing a different development logic. Holding the mouse over an individual case on the timeline highlights all involved actors and their correspondence over time.

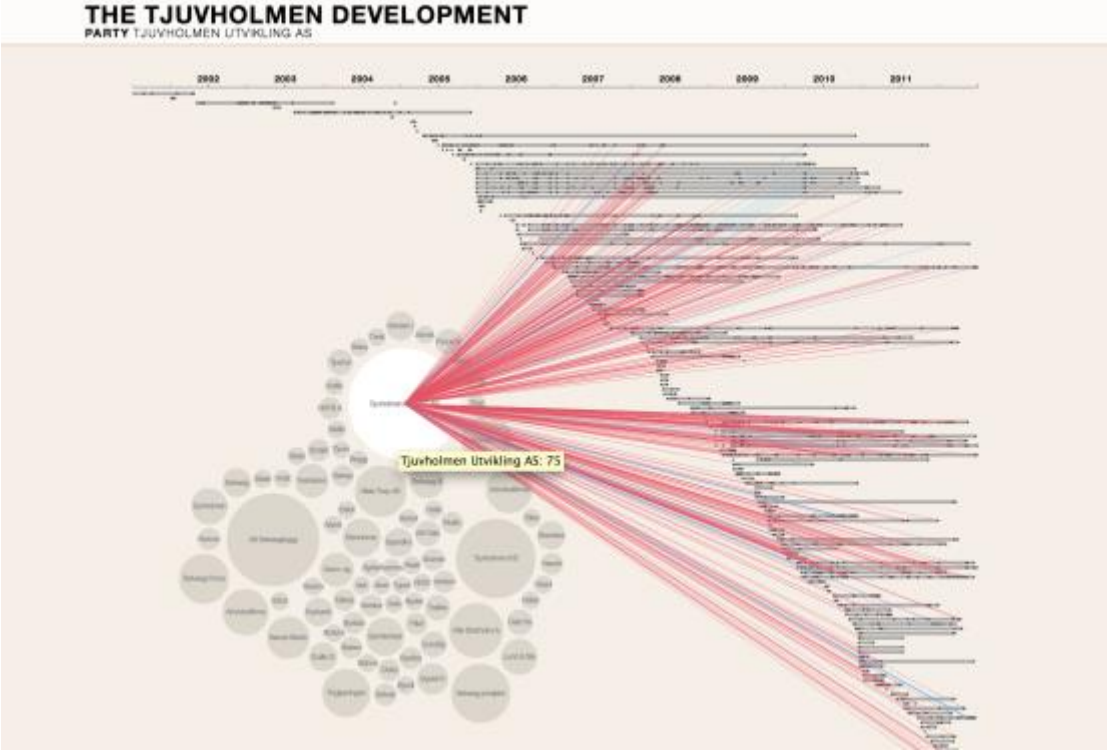

Figure 4: DynaPlan—Participants in the Tjuvholmen urban development are mapped, and the size of bubbles reveal the total amount of corespondance for each actor. Clicking an actor reveals their involvement over time by highlighting correspondence in relation to all cases (planning cases, building permit applications, etc.) on the right. The private development corporations (Tjuvholmen Utvikling AS and KS Tjuvholmen) and the main owner of these (AS Selvaagbygg) are dominant actors.

Outcome

SeePlan was not a test or a set of technical prototypes, but actual tools and real functioning applications that in each part project resulted in specific outcomes and responses. The series demonstrates how the same set of data can be visualized and disseminated in different kinds of ways. We argue that the strategies of visualization and dissemination that were used should be seen as closely related. Furthermore, both sets of strategies should also be seen as interwoven with contexts of production *and* use. We would argue that the production contexts should be seen as a set of design actions and strategies related to reprocessing and reformatting urban data. In addition, the use contexts should be seen as a selection of uses, both factual and potential—and both intended and non-intended. Furthermore, all contexts of use will have particular characteristics when it comes to socio-cultural, technological and meditational factors. Our perspective is that all such aspects of visualization and dissemination, and related contexts of both production and use, should be seen as interrelated and co-constitutive.

The various types and modes of visualization and dissemination in the *SeePlan* project make for different notions of participation as well as for different forms of engagement in or with urban data. Important dimensions in *SeePlan* and what we see as an emerging new field of interconnected urban learning practices are:

- The *PlanAR* application enables data from the database to be easily accessed from an individual perspective by the use of physical proximity as a basis for selection and points of view for presenting data from the archive. The archive data were reassembled and mobilized through ‘locative filtering’. This was accomplished by using augmentation technologies as an integral part of the

mobile app's graphic interface. In this way relevant kinds of data were mediated and made available for users on the move and on-site. This demonstrated a shift from the expert system with 'pinhole' public access to a more open user interface.

- Besides visualizing the archive's various building cases, one could say that *PlanAR* to some extent made public and evident in new ways the 'internal life' of the Agency for Planning and Building Services. This may be interpreted as an unintended type of transparency of government. The app makes it possible for people to view and access all existing building case data—such as the archived correspondence between involved actors and case officers. In these acts of bringing urban data back to the streets, new forms of transparency are conveyed. In this we see great potential for exploring new modes of use related to urban data and when it comes to public engagement in everyday matters of urban planning and city building.
- Beyond tracking individual cases and overall urban developments, our experiments in visualization and mediation forms—especially *DynaPlan*—made it possible to track actors and their involvement over time in a variety of cases, urban neighborhoods or entire urban development areas. This is made possible by visualizing the interrelations between involved actors—as reflected in the building archive sample. In terms of graphics this unfolds itself as marked lines between connected points—i.e. actors. Hereby networks of actors, and their relative influence or power in urban planning, is exposed. For instance one can see how certain government agencies are actively involved in planning processes, and to what extend big developers, construction companies and particular consultancies dominate the construction and development of the city.
- The mappings of actors and networks in *DynaPlan* represent new kinds of visual material on, or inscriptions of, the contemporary city. It shows that the city is not just as a physical reality, but a complex relational mixture of conflicts, arguments and agreements between various commercial, political, public and administrative actors in planning. Maps and timelines of actors and their relations and correspondence shed light on the conflicts and negotiations that precede physical form. *DynaPlan* gives representational form to patterns of relations and interconnections that previously could not be seen. As such the actor and network maps of *DynaPlan* open for new kinds of insights into, and interpretations of, the dynamics of city building and governance. This also illustrates that engagement with urban data – by way of design experimentation and use of the affordances of digital media technologies– is a way of unpacking hidden meanings of urban data.
- The visualization of actors and networks provides us with new kinds of material for researching and understanding urban development processes.[10] This in turn may inform wider discourses on urban planning and development, as well as affect issues and practices of public engagement and participation.

For the Agency for Planning and Building Services *SeePlan* represented unexpected ways of using the archive material.[11] For the Agency the database is a rich working tool that makes for sophisticated forms of analysis. Public access to the data is ensured through an Internet portal where one can make queries.[12] Yet, for the general public the portal to the database represents a 'pinhole', which gives limited access to underlying data and how, for instance, various actors relate and interconnect. As such

the portal makes for little insight into more structural or comprehensive issues of urban planning.

Agency Of the Archive

Through the use of digital media tools and smart phone technologies and by exploring a set of design, visualization and mediation strategies, the *SeePlan* series engaged with urban data in two respects. One central aspect related to making urban data more available and accessible for the public, the other to unpacking urban data as such. The latter is based both on explorations into alternative modes of mediation and visualization, and on new ways of reorganizing and reprocessing the basic data units of the archive. Both aspects, intertwined as they are in the *SeePlan* series, can be seen as a way of making the archive itself into an actant. Thus the archive is both put into play in new contexts of use and perception as well as mobilized—through acts of reprocessing and recombination of the archive data—in ways that make for new kinds of knowledge.

Both these two aspects also reflect strategies of networking, or, to be more specific, two different modes of networking the city. In the first instance all the affordances of digital media technologies, especially its mobile and locative features, are used as tools for redistributing urban data back into the streets (*PlanAR*) and back onto the city (*Planimator*, *DynaPlan*). Urban data are both made more available and accessible as well as, by being redistributed into the world, put into a range of new contexts of use that can make for new forms of participation and bottom-up—street level—kinds of knowledge building. In the second instance it is the urban archive material itself that is mobilized by being crafted, reworked and redistributed in concordance with new kinds of interests related to knowledge building and data visualization. In both instances the archive is transformed into an actant and put to work in the world. The archive is transformed from being a bounded database that is fixed in terms of what the data protocol 'determines' the contained data units to do, into a flexible and dynamic assemblage of data constituents that continuously are remolded in and through an array of new kinds of use contexts—from on-site augmentation in *PlanAR* to targeted actor-network mapping in *DynaPlan*.

In terms of mapping, the archive itself is made into, or can be said to make for, a large number of different kinds of maps. In general terms, the archive can be used for mapping the city when it comes to physical attributes and ongoing and future transformation—new built structures, redevelopments and refurbishments. Such amendments can be seen either as static representations—i.e. as traditional thematic maps—or as more dynamic and locative representations—for instance on the move and in the streets. However, the archive can also be used for displaying processes that lie behind or are involved in physical amendments—whether completed, ongoing or planned—such as actors involved—of major and minor kinds—, formal procedures and restrictions, and discourses and agendas of planning and architecture. As such the archive itself reflects "contested spaces", in which we can trace, at least to some extent, the material and subjective issues involved in the production of the city. Thus, the archive gives us insights into how the construction of the architecture of the city unfolds as "a protracted process involving multiple concerns" (Yaneva, 2012: 78), contributing to the development of "a dynamic cartography of events that make the social traceable, graspable" (Yaneva, 2012: 102). In this way *SeePlan* can be said to be "a step towards the invention of a visual vocabulary that will do justice to the idea of buildings as contested spaces. (Yaneva, 2012: 80).

Space is a limited resource, and spatial urban planning fundamentally has to do with negotiating interests. Planning in participatory context attempts, among other things, to enhance legitimacy of planning decisions by demonstrating fair and balanced processes towards results. One way of achieving such a goal could be to foreground controversies in planning processes, for instance by promoting a "second-degree objectivity [which] is attained by revealing the full extent of actors' disagreement and is thereby typical of controversial settings" (Venturini, 2010: 270).

To achieve such a mode of openness will always be a challenge, especially within planning where conflicting interests is the order of the day. The main challenge is to make more apparent the complex, multifaceted and often antagonistic discussions and deliberations that constitute processes of planning. In *SeePlan* we have demonstrated that one way of achieving more transparency could lie in exploring the potentials of new digital mapping and visualization tools. To what extent such new tools encourage new forms of participation in urban planning and governance, remains to be explored. But just demonstrating the complex workings of the formal planning system may in itself inspire concern and engagement.

SeePlan can be said to deal with what Yaneva calls 'automated' forms of visualization. As such *SeePlan* can be seen as contributing to the development of a "longitudinal methodology for studying urban controversies based on network analysis and real-time data mapping", i.e. of ways "to automate the mapping" procedures involved in planning (2012: 100). Such automation could contribute to increased transparency within processes of urban governance and planning. In this way it could thus accomplish some of the main ambitions of urban informatics

Conclusions

In today's situation, where authority and power is increasingly fragmented due to "information flows through networks" (Innes and Booher, 2004: 429), we claim that the procedures and practices of urban planning should be reconsidered, even though this can be said to threaten planning's traditional rational base (Townsend, 2000). Planning will have to learn to respond to the constituencies of the digital city and its new and continuously evolving information, communication and media technologies. Whether "real-time planning" should be considered a goal or not, this new situation makes for "a more dynamic and adaptive planning practice" (Ratti and Berry 2007: 143).

Urban computing promises increased social relevance when it comes to use and distribution of urban data. Improved systems of urban computing might compensate for the lack of social relevance in many contemporary participation processes. If such ambitious goals are to be achieved, though, one ought to look closely into how urban data can be made both more available and relevant. Based on our experiences from *SeePlan* this would imply that one heeds issues of: 1) data processing—i.e. the re-working, re-ordering and re-networking of existent urban data archives, 2) visualization and (re-)mediation—including the making of new types of maps and visual representations, and 3) dissemination and (re-)distribution—and subsequent contexts of use—as practices that are interconnected and co-constitutive.

Janet Abrams and Peter Hall claim that to design "is to invent strategies for visualizing information that make new interpretations possible" (Abrams and Hall, 2006: 12). We subscribe to this, but would like to add and clarify two more aspects. One is that the information concerned, or the archive and the urban data set in question, is not to be considered as given. Visualization, by way of for instance designing new kinds of dynamic maps, is also a matter of unpacking and opening up,

and thus transforming, the 'foundational' information or data. Second, this is also a matter of bringing information into new contexts of use and knowledge production through strategies of visualization and (re-)mediation. These might be more or less specifically related to issues of participation and engagement in planning or governance. Our point is that different kinds of use contexts could, and often will, inform both the kinds of visualization and (re-)mediation, and the actual unpacking of urban data, that is carried out. Here there are strong interrelations between urban use contexts, the design and visualization strategies involved, and the actual processing of urban data.

Another way of expressing this, and here Abrams and Hall seem to give us even stronger support, is to try to specify what kind of 'spaces' that are mapped in a project such as *SeePlan*. Referring to their own book *Else/Where*, Abrams and Hall claim that:

> The mapped "space" under consideration here [i.e. the book] ranges from information space (grasping patterns within vast quantities of data) to physical space (navigating the city, region or globe) to social space (representing power relations within and between organizations, whether corporate, cultural, political or covert) (Abrams and Hall, 2006: 12).

All of these three 'forms' of mapping relate to our findings from digital explorations into Oslos's building and planning archive. The information space mapped refer to the strategies of unpacking the archive itself, through for instance strategies of geo-locating and mapping the data back onto the city or the re-assembling of data into formats for visualizing actor and network relations. The physical spaces mapped relate to all the ways in which the building archive data are set to reveal conditions and relationships that affect and play themselves out in specific physical settings, for instance in the *PlanAR* augmented reality layer. The social spaces include all the kinds of interrelations between actors involved that can be made and visualized—and thus represented—based on the basic data units of the building archive.

All these aspects of space mapping illustrate that digital methods, and the strategies of design, visualization, (re-)mediation, etc. contained within them, have the "capacity to mobilize and materialize social and other relations" (Savage et al., 2010: 2). Herein lies some of the great potential in working with urban data systems through the affordances of digital media technologies. Both our approach and the concrete results and workings of *SeePlan* testify to the fact that digital technologies and methods are highly social. They are "socio-technical arrangements" with a "social life" that both can be designed for and researched in terms of "productivities and energies" (Savage et al., 2010: 3-4).

With reference to the increasing importance of digital technologies and data systems, Savage and colleagues talk about a striking "re-emergence of visualisation as key to social analysis" (2010: 11). Our design explorations in the *SeePlan* series support such a claim through the concrete making of an array of new kinds of visualizations. These are represented by specific maps and visual representations that portray previously unseen kinds of social patterns and relations, and of specific mapping tools that open for new kinds of uses and use contexts. All in all, we see this as an integrated part of a larger project of exploring and researching new forms of urban learning practices in the networking city.

Acknowledgements
This article is a product of the YOUrban (www.yourban.no) research project at the Oslo School of Architecture of Design funded by the Research Council of Norway. We wish to thank the Agency for Planning and Building Services in Oslo, which has been consulted during the development of *SeePlan* and has briefed on the results of the work.

Notes

[1] Such as THOMAS which was launched in 1995, and contains legislative information from the Library of Congress in USA (http://thomas.loc.gov/home/thomas.php).
[2] E.g. OpenSecrets.org from 1998 and GovTrack.us from 2004.
[3] E.g. IBM's Many Eyes (http://manyeyes.alphaworks.ibm.com/) and Google Fusion Tables (http://www.google.com/drive/start/apps.html#fusiontables).
[4] Havnespillet.
[5] http://vis.bengler.no/projects/seeplan.
[6] Most cases have unique lot numbers, many of which were geo-referenced using an automated reference to the public interface of the Norwegian Mapping and Cadastre Authority.
[7] http://www.chromaroma.com/
[8] There are two development projects available: Tjuvholmen (http://seeplan.bengler.no/timelines/tjuvholmen) and Bjørvika (http://seeplan.bengler.no/timelines/bjorvika).
[9] This visualization shows actors involved in projects in the neighbourhood of Kampen: http://vis.bengler.no/media/network_kampen_250m.pdf.
[10] In his PhD work on the Tjuvholmen harbor front development area in Oslo, Halvor Weider Ellefsen, at Institute of Urbanism and Landscape, Oslo School of Architecture and Design, has used *DynaPlan* as a tool for sketching out timelines of the various actors' involvement in the development process.
[11] Several meetings were held between the Agency and the research and design team during the development of *SeePlan*, and the final work has been presented to the Agency.
[12] http://web102881.pbe.oslo.kommune.no/saksinnsyn/search.asp?mode=all (accessed May 2 2013).

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Bibliography:

J. Abrams, P. Hall,"Where/Abouts," in J. Abrams, P. Hall, eds., *Else/Where: Mapping New Cartographies of Networks and Territories* (Minnesota: University of Minnesota Design Institute, 2006) 12-17.

A. Abukhater, *Planning 2.0—The Next Generation of Participatory Planning* (Vector1 Media, 2011) http://www.sensysmag.com/article/columns/19258-planning-20the-next-generation-of-participatory-planning.html Accessed February 8, 2013.

J. Aspen, "Urban Planning as Representation," in C. Hermansen Cordua, ed., *Manifestoes and Transformations in the Early Modernist City* (Farnham/Burlington: Ashgate, 2010) 271-289.

M. Barndt, "Public Participation GIS: Barriers to Implementation," *Cartography and Geographic Information Science* 25:2 (1998): 105-112.

E. Ben-Joseph, H. Ishii, J. Underkoffler, B. Piper and L. Yeung, "Urban simulation and the luminous planning table bridging the gap between the digital and the tangible," *Journal of planning Education and Research* 21:2(2001) 196-203.

T. Delman, T. Løssing and R. Nielsen, "Planlægning på spil: En undersøgelse af spil som redskab til borgerinddragelse i (by) planlægningsprocesser," *Nordic Journal of Architectural Research* 16:3 (2003) 43-55.

European Union, *On the re-use of public sector information*. EU Directive (Official Journal of the European Union (L): 98, 2003).

J. Forester, *Planning in the face of power* (Berkeley: University of California Press, 1989).

J. Forester, *The deliberative practitioner: encouraging participatory planning processes* (Cambridge, Mass.: MIT Press,1999).

M. Foth, "Preface," in M. Foth, ed., *Handbook of research on urban informatics : the practice and promise of the real-time city* (Hershey, PA: Information Science Reference, 2009) xxviii-xxxii.

M. Foth, B. Bajracharya, R. Brown, and G. Hearn, "The Second Life of Urban Planning? Using NeoGeography Tools for Community Engagement," *Journal of Location Based Services* 3:2 (2009) 97-117.

G. Gartner, "Web mapping 2.0," in M. Dodge, R. Kitchin and C. Perkins, eds., *Rethinking Maps. New Frontiers in Cartographic Theory* (London/New York: Routledge: 2009) 68-82.

E. Gordon and G. Koo, "Placeworlds: Using Virtual Worlds to Foster Civic Engagement," *Space and Culture* 11:3 (2008) 204-221.

E. Gordon and E. Manosevitch, "Augmented Deliberation: Merging Physical And Virtual Interaction To Engage Communities In Urban Planning," *New Media & Society* 13:1 (2011) 75-95.

S. Graham, *The cybercities reader* (London/New York: Routledge, 2004).

A. Greenfield and M. Shepard, *Urban Computing And Its Discontents* (New York: Architectural League of New York, 2007).

M. Gurstein, *What Is Community Informatics (And Why Does It Matter)?* (Milan: Polimetrica s.a.s., 2007).

M. Gurstein, "Towards an Urban Community Informatics." (Gurstein's Community Informatics, 2010) http://gurstein.wordpress.com/2010/08/28/towards-an-urban-community-informatics-movement/ Accessed March 11, 2012.

J. Innes and D. E. Booher, "Reframing Public Participation: Strategies For The 21st Century," *Planning Theory & Practice* 5:4 (2004) 419-436.

H. Jenkins, *Convergence Culture: Where Old and New Media Collide* (New York: NYU Press, 2006).

A. Lau and A. Moere, "Towards A Model of Information Aesthetics in Information Visualization," in E. Banissi, R. Burkhard, G. Grinstein, U. Cvek, M. Trutschl, L. Stuart, T. Wyeld, G. Andrienko, J. Dykes, M. Jern, D. Groth and A. Ursyn, eds., *Information Visualization: IV '07. 11th International Conference Information Visualization, 4-6 July 2007, Zurich, Switzerland)* (Los Alamitos, CA: IEEE Computer Society, 2007) 87-92.

L. Manovich, *The Language of New Media* (Cambridge, MA: MIT Press, 2001).

A. Moere and D. Hill, "Designing for the Situated and Public Visualization of Urban Data," *Journal of Urban Technology* 19:2 (2012) 25-46.

T. O'Reilly, *What Is Web 2.0: Design Patterns and Business Models for the Next Generation of Software* (O'Reilly Media, Inc., 2005) http://oreilly.com/web2/archive/what-is-web-20.html Accessed June 18, 2013.

E. Paulos, R. Honicky and B. Hooker, "Citizen Science: Enabling Participatory Urbanism," *Handbook of Research on Urban Informatics: The Practice and Promise of the Real-Time City* (Hershey, PA: IGI Global, 2009) 414-436.

C. Ratti, C. and D. Berry, "Sense of the City: Wireless And the Emergence of Real-Time Urban Systems." in V. Chatelet, ed., *Interactive cities* (Orleans: Editions HYX, 2007).

C. Rinner, "Argumentation Maps: GIS-based Discussion Support for On-line Planning," *Environment and Planning B: Planning and Design* 28:6 (2001) 847-863.

R. Robinson, M.Rittenbruch, M. Foth, D. Filonik and S. Viller, "Street Computing: Towards an Integrated Open Data API for Cities," *Journal of Urban Technology* 19:2 (2012) 1-23.

F. Salim, "Probing Streets and the Built Environment with Ambient and Community Sensing," *Journal of Urban Technology* 19:2 (2012) 9 47-67.

M. Savage, E. Ruppert and J. Law, *Digital Devices: Nine Thesis* (Manchester/Milton Keynes: CRESC Working Paper Series. Working paper No 86, 2010).

A. Townsend, "Foreword," in M. Foth, ed., *Handbook of Research on Urban Informatics : The Practice and Promise of The Real-Time City* (Hershey, PA: Information Science Reference, 2009**)** xxiii-xxvi.

A. Townsend, "Life in The Real-Time City: Mobile Telephones and Urban Metabolism," *Journal of Urban Technology* 7:2 (2000) 85-104.

T. Venturini, "Diving in Magma: How to Explore Controversies with Actor-Network Theory," *Public Understanding Of Science* 19:3 (2010) 258-273.

N. Verhoeff, "Navigating Screenspace. Toward Performative Cartography," in P. Snickars and P. Vonderau, eds., *Moving Data. The iPhone and the Future of Media* (New York: Columbia University Press, 2012) 33-48.

N. Vossoughian, *Otto Neurath: The Language of the Global Polis* (Rotterdam: NAi Publishers, 2008).

I. Wagner, M. Basile, L. Ehrenstrasser, V. Maquil, J. Terrin, M. Wagner, "Supporting Community Engagement in the City: Urban Planning in the MR-tent," *Proceedings of The Fourth International Conference on Communities and Technologies,* (New York: ACM, 2009) 185-194.

M. Weiser, "The Computer for the 21st Century," *Scientific American* 265:3 (1991) 94-104.

A. Yaneva, *Mapping Controversies in Architecture* (Farnham: Ashgate, 2012).

H. Yu and D. Robinson, *The New Ambiguity of 'Open Government'* (Princeton, NJ/New Haven, CT: Princeton CITP/Yale ISP Working Paper, 2012).