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Smart Planning & Smart Cities

Jan-Philipp Exner

(Dr.-Ing. M.Sc. Jan-Philipp Exner, University of Kaiserslautern, Department of CAD & Planning Methods in Urban Planning and Architecture (CPE), Pfaffenbergstrasse 95, 67663 Kaiserslautern, Germany, exner@rhrk.uni-kl.de)

1 ABSTRACT

In the light of a comprehensive social and technological change, spatial planning is confronted with major changes in its basic conditions. It is faced with an increasing ubiquity of spatial relevant information of which the potentials and risks need to be discussed in the use for planning purposes. Besides the increasing pervasion of sensors in everyday life and the use of mobile communication devices, the networking and communication possibilities will play a major role in the conception of a connected and "smart" city. In addition to the above mentioned aspects and social networking capabilities, it seems that committed citizens appear increasingly as active stakeholders for planning purposes via inductive processes.

Based on the mentioned technological possibilities, topics such as Smart Cities are increasingly being discussed in the public debate in recent times. It is unclear if the term "Smart City" is based more on a scientific foundation or on marketing ideas. And what can planners do, to make the city more smart and especially to make it a better place for people to live? This paper embraces an examination of the various technologies an methodological approaches in relation to planning-relevant information and knowledge creation. Besides the proclaimed potential of making a city more efficient, there will also be a critical consideration of the problems of having a city, where all urban data is connected.

2 THEORETICAL FRAMEWORK

The topic of Smart Cities is increasing in the public debate in the past years and will have its effects on the working field of spatial planners. Due to the importance of ICT in this context, the most relevant aspects for planners will be shown in this paper. From the sixties to the end of the nineties, the use of ICT by planners was mainly dominated by the use of CAD and GIS applications for analysis and design purposes from experts, with the emergence of the Internet, a significant change has taken place. We are now facing a world, which represents a networked environment - and of course cities. In order to understand the various concepts for Smart Cities, besides the important technological developments, also the relevant social aspects have to be taken in consideration.

2.1 Technological background

The technological developments provide new ways, how planners can use ICT in their everyday work life. This is mainly due to the development of the Internet as a network for communication and also as basis for the deployment of sensors in the human environment. Sensors to produce spatial relevant data are becoming smaller and cheaper and with the rise of mobile communication devices, there is a new multi-sensor-device including communication functionalities.

2.1.1 Ubiquitous computing and the city as sensor network

The more the development goes towards an environment interfused with sensors which are producing spatial relevant data, the vision of Ubiquitous Computing is becoming reality as it was predicted more than twenty years ago (Weiser, 1991). The concept has foreseen the evolution of electronical devices (smaller and more powerful computers and mobile phones) in the last two decades. Especially the network abilties of the Internet strengthen this trend and are alonggoing with the development of the Geoweb. The basic idea for this were developed in the nineties (Herring, 1994). It represents a web structure that organizes itself and which references spatial data over the Internet and makes available to everybody. In the Geoweb, the boundaries between sensors, computers, and mobile communication devices are increasingly disappearing and in addition to this, the ability to capture spatial data via spatial sensoring arises. These networked information systems are the first steps to a daily routine for the citizens, in which all entities are linked together in space and interact with each other. All of this produced and connected data will also provide the way for the Internet of Things (IoT). Furthermore, this spatial relevant data could be made available for the public almost in realtime, which will make it possible, to gain totally new insights about the functioning of a whole city. In order to make use of this huge amount of data, new methods have to be developed. One

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concept which is going to be considered as very important from the scientific and business perspective is Big Data, which will play a crucial role in the future as tool to the generate knowledge out of data.

2.1.2 Humans and mobile phone as sensors and data producers for the city

The term of Volunteered Geographic Information (VGI) was introduced in 2007 and described the citizens as potential sensors. Goodchild explained in this context, that the „network of human sensors has over 6 billion components, each an intelligent synthesizer and interpreter of local information. It is User-Generated-Content (UGC) with spatial reference. One can see VGI as an effective use of this network, enabled by Web 2.0 and the technology of broadband communication" (2007, p. 218). The rapid distribution of mobile communication devices strengthens this trend. It forms the basis for the Sensor Web made out of the described elements. Furthermore, people can act as implicit as well as explicit sensors in their environment and generate a variety of data that is relevant for spatial planning which will be gathered by deductive and inductive monitoring methods (Exner, Zeile, & Streich, 2011). Based on the increasing amount of user-generated data, the question regarding the representative nature of information will arise and has to be deliberated wisely.

2.2 Social aspects

As mentioned before, the technological development forms the basis for the citizens' ability, to produce more UGC. This goes along with the development from the Web 1.0 towards the Web 2.0 which also contains a strong social perspective. In particular, the developments outlined in the field of mobile communication devices and social networking opportunities on the Internet offer many opportunities for spatial planning. With this progress, more and more people are seeing the ability for engaging themselves in urban Bottom-Up-Planning processes (Streich, 2012) and crowdsourcing for spatial planning purposes is getting more and more important (Papadopoulou & Giaoutzi, 2014). Though these developments are not new - even before the development of Web 2.0, social networks played an important role for human existence. They have always formed the hub for the development of cities in earlier times and are the origin of the city and society. Whereas most of the Smart City Concepts of big companies are focussing on efficiency, the social aspects were underweighted. „Markets, temples and palaces created social networks organized for commerce, worship and government. Over time the interactions within these networks became more layered and complex. It turns out that sociability, not (just) efficiency, is the true killer app for cities" (Ratti & Townsend, 2011, p. 45). In addtion, to find smart solutions for making cities smarter, technological and social aspects together will play a crucial role which could be seen by the development of new smartphone-based apps. Important at this point are the network-like structures, which have a catalytic effect on Bottom-Up-approaches and promote the endogenous creation of innovative solutions in urban areas. The aspects of mobility and networking previously described enable citizens new opportunities and encourage creativity in problem solving through Bottom-Up activities.

3 SMART CITIES

The topic of Smart Cities is increasingly discussed in the public debate but there is no sharp definition from a scientific point of view. An embracing explanation is a city, in which „ICT is merged with traditional infrastructures, coordinated and integrated using new digital technologies. These technologies establish the functions of the city and also provide ways in which citizen groups, governments, businesses, and various of agencies who have an interest in generating more efficient and equitable systems can interact in augmenting their understanding of the city and also providing essential engagement in the design and planning process" (Batty et al., 2012, p. 492). Due to this, the Smart City topic found it's ways on the agendas of big corporations like IBM, Cisco Systems, Siemens, Accenture, Ferrovial and ABB. They are setting their sights on the urban market and are foreseeing a multi-billion dollar market (Ratti & Townsend, 2011, p. 45). It is considered as a big future business field in the ICT-sector for developing tools which could improve the competitiveness and the quality of life for the citizens because the deduction from this is: „smart cities are competitive cities" (Batty et al. 2012, p.512). However, „a Smart City is something more than 'just' a digital or an intelligent city, where the attention is mainly drawn on the ICT components, as enabling connection and exchange of data and information within an urban environment" (Murgante & Borruso, 2013, p. 630).

Fig. 1: Smart Cities & Smart Planning (Own Source, 2014)

As seen on the previous quote by Michael Batty, there is no real clear defintion of Smart Cities and what they should provide. These broad definitions show that the requirements and demands on Smart Cities are not finally defined and the different entities (Cities, Companies, Research institutions e.g.) connect the term of „Smart Cities“ with their own respective goals (Wolfram, 2012). Basically, there could be a distinction into two main types. There is an array of cities which is focussing primarily on the effiency of the urban body in the fields of ecology (less CO2 pollution, less energy consumption, lower emissions, better urban transport e.g.) and economy (competitive, attractive for talented citizens cities e.g.). The other approach has a social perspective, which focusses on the citizens to provide them a better quality of life and to engage them to be a part of the participatory networks of the knowledge society. There are various types of smart cities whereas some of them contain charactersitics of both types, but the next sections shows representatives of each group.

3.1 Top-Down Smart Cities

Top-Down Smart Cities were primarily run by city institutions, often in a close cooperation with ICT-companies or other research facilities. There is a straight concept behind it, which is often focussed on measurable parameters like CO2-efficiency for example. One of the most prominent representatives is Masdar City in the United Arab Emirates, whose goal is the realization of an ecological and sustainable city in the outskirts of Abu Dhabi by the middle of this decade. After it is completed the city should be CO2-neutral due to the nearly exclusive use of renewable energy (Masdar City, 2012). To ensure this, a special condensed architecture has been implemented with the concept from the British architect Norman Foster. In order to establish this city, a completely undeveloped area was planned in the plain desert. The newly founded Masdar Institute of Science and Technology aims to provide the scientific backbone for developing new technologies, which are used during the city-building process and could act as a marketing instrument to attract talented students from over the world.

On the basis of the close cooperation with ICT-companies during this city-building process from scratch, these cities tend to act as forerunner and marketing instrument for the companies themselves. One well known example in this context is the city of New Songdo City in South Korea. This project is located in the hinterland of the metropolis Seoul, close to the international airport Incheon. New Songo is supported extensively by the domestic Korean companies in the field of ICT as well as from Cisco Systems in particular, who want to apply their concepts for networked and intelligent cities in this big urban research laboratoy. Like in Masdar, the approach was to create a city from scratch on a piece of a man-made coastal area. The goal for the city is to gain a population of 65,000 citizens by 2015, under the light of the implementation of comprehensive sustainability and high urban quality of life (Hatzelhoffer, 2011). Similar to the example from the United Arab Emirates, the concept was to design the new structures strictly

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according to the principles of efficiency. Furthermore, the equipment of the public space with various sensors to provide the basis for control and optimization abilities was an additional goal to that. The concept of an urban area penetrated with various kinds of sensors is called U(biquitous)-City in South Korea (Jang & Suh, 2010). Though, both cities are showing the example of a completely new planned city, most of the cities world wide are already existing which makes it much more complicated to apply such complex and comprehensive concepts for urban areas. There are examples like Smart Santander in Spain but in order to exploit the full potential, a closer look to Bottom-Up-Planning-principles in the context of Smart Cities has to be done.

3.2 Bottom-Up Smart Cities

The knowledge society and social networks are the basis for the second concept of Smart Cites which are mainly driven by local inhabitants. Bottom-Up Smart Cities are trying increasingly to make use of the inductive and innovative potential of the population to achieve new creative solutions. It is important to see: „What do the people want?“ instead of „What do city councils and companies think is the best for them?“. In this case, citizens are the driving force to makes a city "smarter". Due to the developments of ICT and the corresponding connection possibilities via social networks, the citizens have the ability to act by their own without any kind of supervison. It will be clear, that „the ability for all citizens to communicate with each other and with agencies and groups that represent them, has provided a new sense of urgency and possibility to the idea that smart cities are based on smart communities whose citizens can play an active part in their operation and design” (Batty et al. 2012, p. 492).

The creative potential of the citizens is significant and has to be taken into account. This could be realized when interested citizens can access urban data sets and services and develop their own creative ideas via ICT infrastructure and networks. As example for this, app competitons like „NYC Big Apps“ (City of New York, 2011) could be considered, because for this call, the citizens were encouraged to develope own smartphone apps with innovative solutions for the city (parking spot finder, bikeways navigation system e.g.). In order to gain a wide support by the inhabitants, it is important to form the dialogue with citizens and other stakeholder groups as widely as possible. This enables the development of a common understanding of problems and risks for their city. The reason is that „the value and importance of a city can not be alone measured in their efficiency and sustainability, but rather in the degree of its sociability” (Ratti & Townsend, 2012, p. 65).

4 SMART PLANNING

The question is, if and how planners could make cities smarter and turn them into Smart Cities and if the changing urban circumstances will have its special effects of the profession of spatial planners. The technological and scientifical influences are undergoing an important development (Batty, 2013) and could be considered as the foundation for the mentioned social aspects like Web 2.0 for example. The influences of ICT infrastructures contain some problematic issues which have to be discussed.

4.1 Potentials and risks of ubiquitous ICT-infrastructures for cities

Planners will be at a crucial role to foster smart cities through smart planning approaches and have to be aware of their important role at the intersection of companies, urban authorities and the citizens. As it can be seen on the agendas of many companies and city councils, most of the Smart Cities concepts focus on energy efficiency issues in order to improve ecological (less pollution) or economical aspects (less energy costs). With this as a background, the idea of a Smart City as competitive city seems to be clear. Furthermore, due to the wide range of ICT competitors in this field, the cities could be considered as technical laboratories which can produce innovative solutions to improve the people’s lives. Such Smart City concepts could also be used for image campaigns to present the city as a good and innovative location for attracting new companies and talented people. However, there are two sides to consider.

If Smart Cities are heavily based on ICT-networks, there will also be problems occuring with this circumstance. A complex connected mobility network for example has to be very robust in terms of system errors as well as cyber attacks. The more the city turns into a computer - the more the city turns into a computer, with all of its advantages and disadvantages. Even a small software problem in the meshing digital infrastructures could lead to huge effects for the citizens like traffic jams or heavy accidents for example.

The more automation of urban routines is introduced, the higher the risk potential by external influences. It has to be considered where to draw the line for blind reliance from the algorithms and besides this, whoever controls data can control urban routines. And the more the outsourcing process of such services by city councils is going on, the more the power lies in the hand of ICT corporations. If a company has wide data access rights in urban security issues, the question will be: Who watches the watchmen?

In additon to that, there are also open legal questions regarding defective automation routines of urban processes. Furthermore, an increasing dependence on the ICT service providers has to be seen as potential area of conflict. The aspects outlined above demonstrate the need for both technical and ethical consideration. What is often considered a problem, is that „planners of intelligent cities (…) actually make these technologies invisible, and hence put them in command rather than in dialogue with users " (Sassen, 2011). Besides the technological problems the issues of data privacy will arise in all different kinds of Smart Cities. Although Top-Down approaches for urban data gathering, such as Opportunistic Sensing, will produce useful data for the general public (like crowdsensing-based traffic measurements), there might also be a violation of the citizens' privacy (Exner, 2012). It has to be considered very wisely by a city, which of its sensitive data will be given into the hands of a foreign company for example. The revelations of Edward Snowden in 2013 just gave an insight into possible consequences.

4.2 Organisation of cities

The mentioned developments will have effects on all actors in the urban evironment and the question from a planners perspective will be how to work on an intersection between the various Bottom-Up and Top-Down-approaches in order to improve the urban living conditions for the people. It is a crucial point at which „mayors, architects, designers and technologists can play their most effective role in shaping truly smart cities – by marshalling and integrating the great engineering ressources of Top-Down approaches with the innovation of grassroot initiatives" (Ratti & Townsend, 2011, p. 48). Although urban institutions tend to be quite inflexible, it will be important for the coming decades, that, „just as the town was changed by information and communication technologies (...), institutions must adapt to a flexibility that significantly differs from existing organizations" (Batty et al., 2012, p. 512). In addition to this the Open Data movement has to be seen. It aims to provide public data free for everybody in order to foster Open Government, by giving more transparency and other beneficial developments for the general public. An important pioneer in terms of open geospatial data is the portal Data.gov.uk from the British government, which provides a wide range of spatial data. Over 3000 records with spatial planning relevance are available through this service (Geere, 2012). It was initiated by the British Cabinet and serves as a basis to discuss comprehensive municipal records, technical issues or the political line (Batty et al., 2010, p. 38). Another example is Vienna Open Data (Stadt Wien, 2013).

4.2.1 Urban Information & Knowledge Platforms as incubators for smart urban solutions

There is an adminstrative support for Smart City concepts with a growing number in the recent years. Two of the most prominent examples are Smart City Vienna (Stadt Wien, 2012) and Smart City Amsterdam (2013). These cities host a website in order to bring creative Smart City solutions together and of course use them as a marketing tool. But these concepts could be carried out further, because especially for the big ICT companies, the ideas are going towards something like an Urban Operating System, which will be developed and updated and could be applied to various kinds of cities, to create a significant margin by scale effects for them. An average computer user is very familiar with problematic issues of an OS (instabilities, possible market dominace by a company, viruses...), but there is another big problem. The city has to be seen rather as an organism than a machine (Geddes, 1915). Cities agencies won't be able to regulate everything Top-Down by rigid concepts and ICT-infrastructures. If they want to do so against the will of the citizens, it will lead to emotional debates about the democratic principles in the society. It can not be neglected, that a city has grown over a long time, so too drastic changes to turn a city into a Smart City could be very problematic. Cities, as well Smart Cities, „always remain a construction site, a chaotic urban laboratory for innovation" (Ratti & Townsend, 2011, p. 68). Hence, the best way is to have an infrastructure that is not only flexible for adaptation, but also could act as an ecosystem for various kinds of urban software.

These software platforms could act as a „thriving bazaar of government services, offering basic building blocks that others can use" and „many of these new services are application programming interfaces (APIs) -

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mini-platforms that form the basis of another digital product, allowing for endless permutations" (The Economist, 2014, p. 15). In the digital world, big corporations and big governments may play similar roles, as „platform managers and curators of ecosystems. Cities or even governments may offer services to other cities and countries in fields such as online identity and regulatory oversight" (The Economist, 2014, p. 15). There has to be a specific degree of standartisation in the urban ICT networks. These have to be chosen so that they are not proprietary and prevent innovative Bottom-Up-solutions and equally open to city adminstrations, companies and citizens. The ethical aspects have to take in account that Smart City platforms are not non-transparent "Black boxes" planned in top-down manner by a small group of "specialists".

A common platform as a hub for urban information is the London Dashboard (Centre for Advanced Spatial Analysis, 2012). This website provides various urban data sets for its citizens in order to make use of them for various purposes. It collects not only data by its own, but combines existing data streams (traffic cameras, wheather and even for example data from social communities). Another promising approach here is the LIVE Singapore! Project (MIT Senseable City Lab, 2011), where an Internet-based platform was designed, in order to "capture the recorded variety of communication tools and microcontrollers and sensors real-time data and thus the pulse of a city from moment to moment" (Ratti & Townsend, 2011, p. 65). There will be a basic infrastructure in the sense of an open platform which aims to adminstration, companies and citizens understanding it as a "tool box" in order to be actively engaged. This project is not officially referred to as a Smart City, but it has characteristic aspects to make a wide variety of urban data streams in real time available to interested users. For this case, it is important, that such a platform is easily accessible, in terms of its data and also in terms of the usability, that it isn't too hard for an average citizen to use it. Furthermore, its structure has to be modular due to the changes which often occur and must therefore be very flexible. Based on this, a variety of Top-Down- and Bottom-Up-processes could be designed by companies and citizens for example. Thus, the platform provides the ability for companies or individuals to realize their own creative solutions that make the city truly "intelligent". It is also important, not to design an isolated application with these platforms. Some problems might have been processed similarly somewhere else on the world an there is no need to invent the same innovative schoolbus-information app for the second time. An intelligent linkage to existing solutions for existing problems can be very beneficial and be seen with Citymart - a marked place for innovative Smart City solutions (Citymart, 2013).

4.2.2 Social aspects in smart urban areas

As it was stated before, besides the technological infrastructure it should not only be smart infrastructures, but also smart citizens be that shape the cities, because „rather than focusing only on the structure and control of networks, governments, technology companies and city planners should pursue more bottom-up approaches, to make cities smarter" (Ratti & Townsend, 2011, p. 44). Here, the participation of citizens (in this case the communication and collaboration between urban actors) and endogenous innovation potential of the city (innovative citizens, etc. social networks, education systems, triple helix, creative environments e.g.) play a crucial role. In smart cities also the manifestation of the concept of equality of sustainable cities is seen. This raises the question what makes a city really intelligent and how such an aspect can be measured.

Other important aspects are the ethical aspects of the ubiquitous information systems of the whole urban entity and its citizens. As mentioned before, questions about ownership and control of data have to be discussed. Especially the centralization of services in the hands of private companies could be complicated, and „centralization of smart-city infrastructure is risky, but decentralization doesn't always increase resilience" (Townsend, 2013, p. 265). The slogan "Knowledge is power" will be definitely more relevant in the upcoming Smart City discussions. There is for example the danger of misuse by a company and as well for an authoritarian state. Issues like data privacy and protection have to come to the public debate. And a totally new question about which data is to sensitive to provide for the general public. The example of publishing crime mapping data shows the problems of potential self fulfilling propehcies as well as stigmatization of city quarters and the different handling in different countries (Wendt & Exner, 2013). Hence, there is the general question about the long term perspective and goal of the city development. Is it generally for effciency purposes from which big corporations could benefit or with smaller, tailored solutions from which every citizens can profit directly. If these things were not taken into account, people would not be satisfied with their urban living conditions and probably move away. The city of Masdar for example is

facing the problem of attracting new people, because the majority of the people could not be convinced by this special Smart City concept (Sennet, 2012).

4.2.3 Cities as complex entities

Cities always have been and always will be complex and chaotic entities. Every city has its own history, geography, inhabitants and especially also the local political circumstances. There are recurring patterns in every urban area, which forms the basis together with new ICT technologies for a completely new scientifical view of the city and the development of varius urban simulation models as it is described by Michael Batty. The local particularities have to be considered every time. In the light of increasing automation processes for the control of urban processes, the ideas of Patrick Geddes of considering the city as an organism rather than a machine have to be brought to mind. The best potenials have to be extracted out of these ideas and so „Geddes would no doubt approve of how today's smart-city builders are applying technology to urban challenges and seeking to develop a new, rigorous empirical science of cities. But he also understood the limits of science, and the need to view cities with eyes that see not only facts" (Townsend, 2013, p. 282). The technological potential in ICT seems to be unlimited, built was the same case during the times of newly planned cities like Brasilia for instance. The accordance to these times is remarkable and „the description of the serene and masterful guidance of the city-as-machine-for-living we hear from Siemens or Cisco or IBM are strikingly reminiscent of Le Corbusier" (Greenfield, 2013). As well as the limitations for technological driven concepts, there will also be some for the Bottom-Up-movement. „The grass roots may be a source of new ideas, but what they need is someone who can design and deliver a robust infrastructure that is centrally planned to be safe, efficient, and reliable at a reasonable cost" (Townsend, 2013, p. 154). This means, there has to be some kind of incubator for innovative citizens solutions to make the city smarter. Furthermore, the smartness on a regional level is getting important as well (Roth, Kaivo-Oja, & Hirschmann, 2013) and the possible interaction with the urban area has to be observed.

Urban Information and Knowledge platforms could act as such, being a hub for the citizens, companies and authorties to inform themselves and to interact. The dashboard-idea is also very helpful, because it brings the chance for integrating existing data feeds in order to prevent from multiple and costly data gathering approaches. In addition, the concept of learning platforms with the Triple-Helix-Perspective is regarded as an important aspect in making cities smarter (Allwinkle & Cruickshank, 2011). In order to foster innovation, the Living Lab Concept could be considered as methodology, which is „a model for organising specific innovation programmes and innovation projects and conducting innovation experiments. " (Schaffers et al., 2011, p. 444). All these social, technological and administrative requirments ask for skilled people at the interface position, which could be the spatial planners of the future.

5 CONCLUSION

The question of how a city becomes a Smart City and how "Smart" planning may be, is difficult to answer, but a Smart City should first of all improve the living quality for the citizens and Smart Planning describes the necessary efforts which have to be done in the technological, social and adminstrative fields. There won't be any blueprint solutions, but the new developments in ICT provide a wide range of applications for cities. This opens the field for new scientific insights in relation to the functioning of the urban organism and besides searching for the most efficient way of functioning of the infrastructure, but also the necessary attempt to consider the city as a „laboratory for innovation" (Batty et al. 2012, p. 481).

Most of the prominent Smart Cities have concepts, wich focus mostly on optimization and efficiency, organized in a top-down manner and regarding the urban area simply as machine, which is controllable and adjustable. However, an intensive integration of the citizens for making cities smarter has to be done. This can be via participation through urban planning projects as well as by developing own creative Smart City apps, for example. There will be the challenge in the cities of the future to find the best way to combine the best from Top-Down- and Bottom-Up-approaches and convince the citizens of the fact, that they can be an active part of the city while contributing innovative solutions for the everyday life. The best way to create the best conditions for that is to have a common plattform to factor in the citizens. Though, whenever the inhabitants of a city will come in contact with such platforms, this "urban software" has to be „simple, modular, and open source" (Townsend, 2013, p. 286). The Smart Cities are not just built on smart infrastructures and smart ICT, but also the administrative authorties and citizens have to be smart and as an

intermediary, also planners have to be smart (Exner, 2012). The new challenges embrace almost the entire field of planning activities, such as infrastructure planning, planning discussion, urban design, and participatory processes and are underlining the nature of an interdiciplinary working field. For its role acting as a mediator of various interests, he also has to be specially skilled with comptences in the technological, social and adminstrative fields. Hence, smart planners „have to be at least as familiar with the work of Jane Jacobs, Jan Gehl and Holly Whyte as they are with that of Vint Cerf or Eric Raymond" (Greenfield, 2011).

6 REFERENCES

Allwinkle, S., & Cruickshank, P. (2011). Creating Smarter Cities: An Overview. Journal of Urban Technology, 1–16.

ASC. (2012). Amsterdam Smart City. Amsterdamsmartcity.com. Amsterdam. Retrieved February 22, 2014, from http://amsterdamsmartcity.com/

Batty, M. (2013). The New Science of Cities. Boston: MIT Press.

Batty, M., Axhausen, K., Fosca, G., Pozdnoukhov, A., Bazzani, A., Wachowicz, M., Ouzonis, G., & Portugali, Y. (2012). Smart cities of the future. The European Pysical Journal - Special Topics, 481–518.

Centre for Advanced Spatial Analysis. (2012). CityDashboard: London. Citydashboard.org. London. Retrieved January 1, 2013, from http://citydashboard.org/london/

City of New York. (2011). NYC BigApps 3.0. 2011.Nycbigapps.com. New York. Retrieved January 2, 2013, from http://2011.nycbigapps.com/

Exner, J.-P. (2012). Survey before plan 2.0. Planerin, 2012(5), 24–26.

Exner, J.-P., Zeile, P., & Streich, B. (2011). Monitoring laboratory spatial planning: New benefits and potentials for urban planning through the use of urban sensing, geo- and mobile web (pp. 1–18). Presented at the Proceedings 12th International Conference on Computers in Urban Planning and Urban Management (CUPUM) University of Calgary, Calgary.

Geddes, S. P. (1915). Cities in Evolution. London: Williams & Norrgate.

Goodchild, M. F. (2007). Citizens as sensors: the world of volunteered geography. GeoJournal, 69(4), 211–221.

Greenfield, A. (2013). Against the smart city (The city is here to use). New York: Do Projects.

Greenfield, A. (2011, February 12). Beyond the "smart city" | Urbanscale. Urbanscale.org. Retrieved February 20, 2014, from http://urbanscale.org/news/2011/02/17/beyond-the-smart-city/

Hatzelhoffer, L. (2011). Die ubiquitäre Stadt – Hype oder Blick in eine smarte Zukunft? StadtBauwelt, (190), 52–57.

Herring, C. (1994). An Architecture for Cyberspace: Spatialization of the Internet. Champaign.

Jang, M., & Suh, S.-T. (2010). U-City: New Trends of Urban Planning in Korea Based on Pervasive and Ubiquitous Geotechnology and Geoinformation. Computational Science and Its Applications–ICCSA ….

Masdar City. (2012). Masdar City. Masdarcity.Ae. Masdar. Retrieved January 1, 2013, from http://masdarcity.ae/en/

MIT Senseable City Lab. (2011). LIVE Singapore! Senseable.Mit.Edu. Boston. Retrieved January 1, 2013, from http://senseable.mit.edu/livesingapore/

Murgante, B., & Borruso, G. (2013). Cities and Smartness: A Critical Analysis of Opportunities and Risks (pp. 630–642). Presented at the 13th International Conference on Computational Science and Its Applications, Hoh Chi Min City.

Papadopoulou, C.-A., & Giaoutzi, M. (2014). Crowdsourcing as a Tool for Knowledge Acquisition in Spatial Planning. Future Internet, 6(1), 109–125.

Ratti, C., & Townsend, A. (2011). The Social Nexus. Scientific American, 305(3), 41–48.

Ratti, C., & Townsend, A. (2012, March 12). Die smarte Stadt der Zukunft. Spektrum, April, 62–67. Retrieved from http://www.spektrum.de/artikel/1142721

Roth, S., Kaivo-Oja, J., & Hirschmann, T. (2013). Smart regions: two cases of crowdsourcing forregional development. International Journal Entrepreneurship and Small Business, 20(3), 272–285.

Sassen, S. (2011, June 29). Open Source Urbanism. New York. Retrieved March 25, 2014, from http://www.domusweb.it/en/op-ed/2011/06/29/open-source-urbanism.html

Schaffers, H., Komninos, N., Pallot, M., Trousse, B., Nilsson, M., & Oliveira, A. (2011). Smart Cities and the Future Internet: Towards Cooperation Frameworks for Open Innovation. In The Future Internet (Lecture Notes in Computer Science. Vol. 6656, pp. 431–446). London: Future Internet Assembly 2011: Achievements and Technological Promises.

Sennet, R. (2012, December 4). No one likes a city that's too smart. Theguardian.com. London. Retrieved February 22, 2014, from http://www.theguardian.com/commentisfree/2012/dec/04/smart-city-rio-songdo-masdar

Stadt Wien. (2013). Anwendungen mit Open Government Data Wien | data.wien.gv.at. Data.Wien.Gv.at.

Stadt Wien. (2012). Smart City Wien. Smartcity.Wien.at. Vienna. Retrieved February 22, 2014, from https://smartcity.wien.at/site/

Streich, B. (2012). Stadtplanung in der Netzwerkgesellschaft. arcAktuell, 4/2012, 19–21.

The Economist. (2014). Platforms. The Economist, 410, 15–16. Retrieved from http://www.economist.com/news/special-report/21593583-proliferating-digital-platforms-will-be-heart-tomorrows-economy-and-even

Townsend, A. (2013). Smart Cities. New York: W. W. Norton & Company.

Weiser, M. (1991). The Computer for the 21st Century. Scientific American, 1–8.

Wendt, W., & Exner, J.-P. (2013). Crime Mapping for Urban Planning – a Useful Tool for New Planning Times? In M. Schrenk, V. Popovich, P. Elisei, & P. Zeile (Eds.), (pp. 213–221). Presented at the REAL CORP 2013, Rome. Retrieved from http://programm.corp.at/cdrom2013/papers2013/CORP2013_95.pdf

Wolfram, M. (2012). Deconstructing Smart Cities: An Intertextual Reading of Concepts and Practices for Integrated Urban and ICT Development. In M. Schrenk, V. Popovich, & P. Zeile (Eds.), (pp. 171–181). Presented at the REAL CORP 2012, Wien.