SMART CITIES: A NEW PARADIGM OF URBAN DEVELOPMENT

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1. Smart cities, more than a fashion?

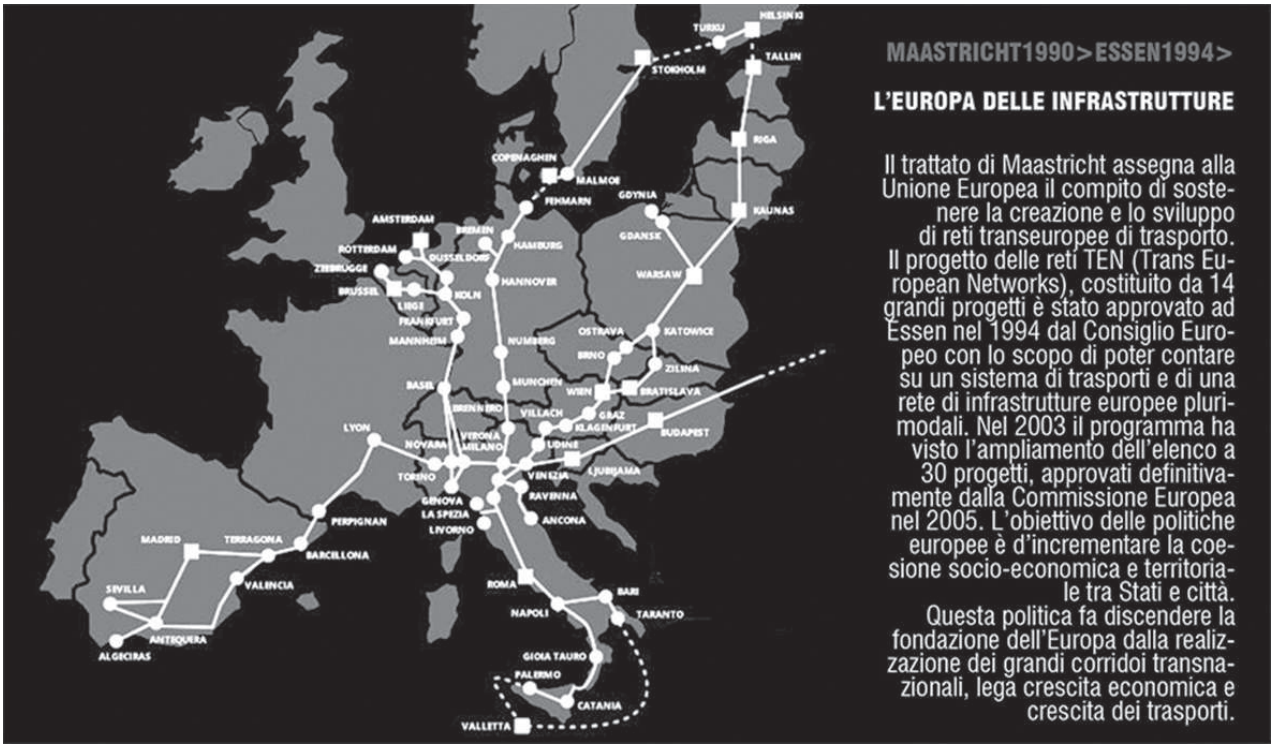
With growing complexity of the urban habitat, and the evolving empowerment of more and better educated people in democratic systems, social and political consensus about the right way to future urban development seems to erode. Experiencing the immense expansion of cities into uncontrollable urban fields and city regions, the somewhat romantic re-discovery of the urban village as a social environment and human scale life space is understandable. Visions and aims for future urban development divert, and with them principles and guidelines for their pragmatic and affordable implementation. Identity and authenticity have become key features of cities, aiming to attract investors and tourists, or talents to demonstrate urban quality and competitiveness. In recent decades, as a consequence of technological change, globalization and value proliferation, local knowledge became global knowledge and local identity eroded, making space for a consumer and developer-oriented global identities. Consequently interest-led visions about the right and desired pathway of urban development change, and the power of city leaders to implement such visions vanish. The development of new urban paradigms has become a passion of planners, architects, urbanists and environmentalists. Urban paradigms are urban dreamscapes, full of wishful thinking about better urban worlds. In the beginning of the 21st century the sustainable city, the eco-city, the compact city, the creative city, the slow city, the resilient city, and more recently, the smart city concept have received considerable academic interest and attention among media and local governments, searching for popular visions for urban development in times of globalization. Very much promoted by industries that are eager to promote and sell their high tech and ICT products, the new paradigm of the smart city has emerged in recent years, based on I-phone, I-pad, GPS and all similar technologies.

Being smart is on the urban agenda, on the agenda of city mayors, city planners, and city builders, in cities in Europe, such as Vienna or Berlin, and in China, were more than 80 cities have recently been selected as pilot cities for smart city development. Over the last century the character of urban planning has considerably changed. When, as a consequence of industrialization and massive rural-urban development in the 19th and 20th century, cities expanded beyond their middle-age walls and administrative boundaries, engineers planned the urban expansion by designing urban street-networks, building electricity grids, water supply and sewage networks. Without such enormous physical investments, the cities would not have been able to accommodate the growing number of new citizens and households. There were technical minds behind those city expansion schemes, and citizens were just users of the public services. Some known urban engineers like Hobrecht in Berlin or Cerdà in Barcelona, and many unknown engineers masterminded the town expansion schemes in this phase of urban development. Their merits are recorded in many histories of planning and urban development. The drivers of urban development were local governments, landowners, developers and

the construction industry, who benefited from the urban expansion and accumulated immense speculative capital.
Once the urban expansion process slowed down and urban regeneration became the dominant challenge of cities and city planners, the engineers lost their profile as the most important city builders. Others took over, mainly architects and urban planners. They organized the functional division of urban land, designed new garden cities and city quarters, urban parks, and waterfronts or managed urban reconstruction and urban regeneration schemes. Today planners design waterfronts, inner city shopping precincts, promote local economic and environmental development; they organize citizen participation or moderate development processes. Often they complain that their profession is gradually loosing influence, that politicians do not support their ambitions, and also that media do not appreciate and honor their contribution to maintaining liveability in cities. Their role is clearly diminishing in market–dominated policy environments. While social scientists and geographers have taken over the lead in planning, architects and self-styled urbanists are regaining power building icons and luxury residences in the city, not social housing.
In the beginning of the 21st century, like a hundred years ago, a new era of infrastructure development is evolving and a new group of professionals made of information and communication specialists is entering the stage of urban development. They are the new urban engineers, designing and implementing the new urban communication networks, without which the cities would not any longer be able to organize mobility for young and public services for elderly in the city. The technology driven products will certainly change urban life. They will force local governments to act. So far, it seems, only very few cities have recognized and are hardly prepared to deal with the new challenge and to provide the expertise they need to negotiate with the economic drivers of the new technology.
The emerging smart city paradigm will add another dimension to urban development, and with this paradigm a new type of urban planner will enter the stage, the smart grid planner. While traditional planners are discussing with citizens about how future life spaces should look like, the new planners are busily working behind the stage to develop together with powerful global ICT corporations a totally new urban infrastructure for the smart city, and the brains behind all that reside in Silicon Valley

2. What is a Smart City?

Though, what is a smart city? Is it an intelligent city, a clever city, or just a city, where new technologies are used to better guide traffic flows and avoid traffic congestion, to cope with the immense logistical challenges of e-shopping, to find shops, restaurants and entertainment sites, to increase the turn-over of street side businesses, to improve security in public spaces, or to better manage public services for all, particularly for elderly and handicapped, for minorities and foreign visitors? The notion of smartness can be added to many dimensions of urban (and of course also rural) life. Smart learning, smart shopping, smart tourism, smart health services, smart governance, smart mobility, smart co-working, smart energy consumption, even smart dating to find the right partner for smart living-together in smart houses and smart city quarters.
The concept of the smart city is still fuzzy. It is in the making by those who promote the Smart City concept as a chance to improve the quality of life, or use the paradigm to demonstrate their commitment to a better life in modern cities, and to sell their products and



services. There are many efforts to define the Smart City. One such definition is:

«[…] a city can be defined as 'smart' when investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic development and a high quality of life, with a wise management of natural resources, through participatory action and engagement» (Caragliu, Del Bo, Nijkamp, 2009, p. 7).

Another definition is: «[s]mart cities are defined by their innovation and their ability to solve problems and use of ICTs to improve this capacity. The intelligence lies in the ability to solve problems of these communities and is linked to technology transfer for when a problem is solved. In this sense, intelligence is an inner quality of any territory, any place, city or region where innovation processes are facilitated by information and communication technologies. What varies is the degree of intelligence, depending on the person, the system of cooperation, and digital infrastructure and tools a community offers its residents» (Komninos, 2002, p. 11).

In a study of the Centre of Regional Science at the Technical University of Vienna for a Viennese developer in 2007, smart cities were defined from quite different angles: «In association with economy or jobs, Smart City is used to describe a city with a "smart" industry. That implies especially industries in the fields of information and communication technologies (ICT) as well as other industries implying ICT in their production processes. Also for business parks or own districts comprising of companies within this field the name Smart City is used. The term Smart City is also used regarding the

education of its inhabitants. A Smart City has therefore smart inhabitants in terms of their educational grade. In other literature the term Smart City is referred to the relation between the city government administration and its citizens. Good governance as an aspect of a smart administration is often also referred to the usage of new channels of communication for the citizens, e.g. "e- governance" or "e-democracy". Smart City is furthermore used to discuss the use of modern technology in everyday urban life. This includes not only ICT but also, and especially, modern transport technologies. Logistics as well as new transport systems as "smart" systems, which improve the urban traffic and the inhabitants' mobility. Moreover various other aspects referring to life in a city are mentioned in connection to the term Smart City like security/safe, green, efficient & sustainable, energy etc.» (Giffinger *et al.*, 2007, p. 10).

In a 2013 background paper of the UK Department for Business, Innovation and Skills (BIS), Smart Cities are introduced as follow: «As consumers of private goods and services we have been empowered by the Web and, as citizens, we expect the same quality from our public services. In turn, public authorities are seeking to reduce costs and raise performance by adopting similar approaches in the delivery of public services.

However, the concept of a Smart City goes way beyond the transactional relationships between citizen and service provider. It is essentially enabling and encouraging the citizen to become a more active and participative member of the community, for example, providing feedback on the quality of services or the state of roads and the built environment, adopting a more sustainable and healthy lifestyle, volunteering for social activities or supporting minority groups. Furthermore, citizens need employment and "Smart Cities" are often attractive locations to live, work and visit. But the concept is not static: there is no absolute definition of a Smart City, no end point, but rather a process, or series of steps, by which cities become more "liveable" and resilient and, hence, able to respond quicker to new challenges. Thus, a Smart City should enable every citizen to engage with all the services on offer, public as well as private, in a way best suited to his or her needs. It brings together hard infrastructure, social capital including local skills and community institutions, and (digital) technologies to fuel sustainable economic development and provide an attractive environment for all» (BIS, 2013, p. 7). BIS has established a Smart Cities Advisory Group, comprising representatives from cities, business, academia and NGOs. It has identified a number of issues «where barriers to smart city implementation can be reduced and progress accelerated through provision of standards. The benefits of this approach will include sharing of good practice on development and implementation of new service models, identifying common solutions to technical problems, setting out the preconditions for interoperability of data and city systems and describing ways in which risks can be managed and mitigated» (BIS, 2013, p. 45).

In general, a Smart City is seen as a city which enables citizens and enterprises to apply new ICT's – particularly the iPhone and the iPad, respectively tools with similar functions – to economize time, improve individual mobility, facilitate access to information and services, save energy and resources, and participate in urban decision-making processes.

Smart City promoters argue that they aim to make life more convenient for all citizens, whether they are rich or poor, old or young, privileged or underprivileged. Over long, the advocates of the Smart City's paradigm claim, all citizens will be equipped with iPhones and iPads. Then they will have ubiquitous access to a plethora of related public and private services, provided by daily improving application software. Such software will allow them to get, wherever they are, and 24 hours

a day, all the information they require to use public transport, to find an empty parking lot or a car-sharing location; to find a doctor or a nurse, to make business, to meet friends as well as old and new partners, to find reasonably prized or designer hotels, to get access to affordable apartments, to sell whatever they wish to sell or buy consumer products they wish to buy at a cheaper price or in another quality, now or later. The new technologies offer an endless range of applications. The promoters of the Smart City can easily claim that using smart technologies will make life in the city better and more enjoyable. They can easily convince mayors and decision-makers that (only) smart technologies guarantee human survival in a complex world.

The Smart City slogan has become the new paradigm for those who wish to use or sell new information and communication technologies for better, more liveable cities. In general, smart, like creative, is very much a positive term, although it has some dishonest unscrupulous connotations in businesses, trades and commerce. Smart can be intelligent, clever, neat or vigorous. As a rule, everybody wishes to be creative; everybody wishes to be smart, or at least to have creative and smart children. Like creative, smart does not ring negative bells, has no political or ideological connation, and does not reveal any social class or economic context. A local craftsman can be smart, as well as a farmer, a lawyer as well as an architect or an engineer.

Not surprisingly the Smart City paradigm is in a process to conquer the minds of architects, and urbanists, mayors policy advisors, politicians and CEOs of large international corporations, as well as millions of young urbanites, trapped in the hassle and information overload of daily urban life. The concept is gradually entering public and academic discourses on future directions of urban development. The temptations of new mobility, information and communication technologies offered by the software and communication industries are too strong to resist. The technologies are in the hand of a few global corporations and their regional subsidiaries and partners, who cannot be influenced locally and regulated by single national governments. The Smart City is both a promise and a temptation. Whether they are young or old, citizens can expect that the easily accessible technologies can increase their individual quality of life, make their life easier or more enjoyable. The Smart City paradigm, clearly, has both a good and a dark side.

3. Smart cities on the move

All over the world, Smart City development, driven by technology corporations and policy advisors, is on the agenda of cities and city managers. Here are a few examples.

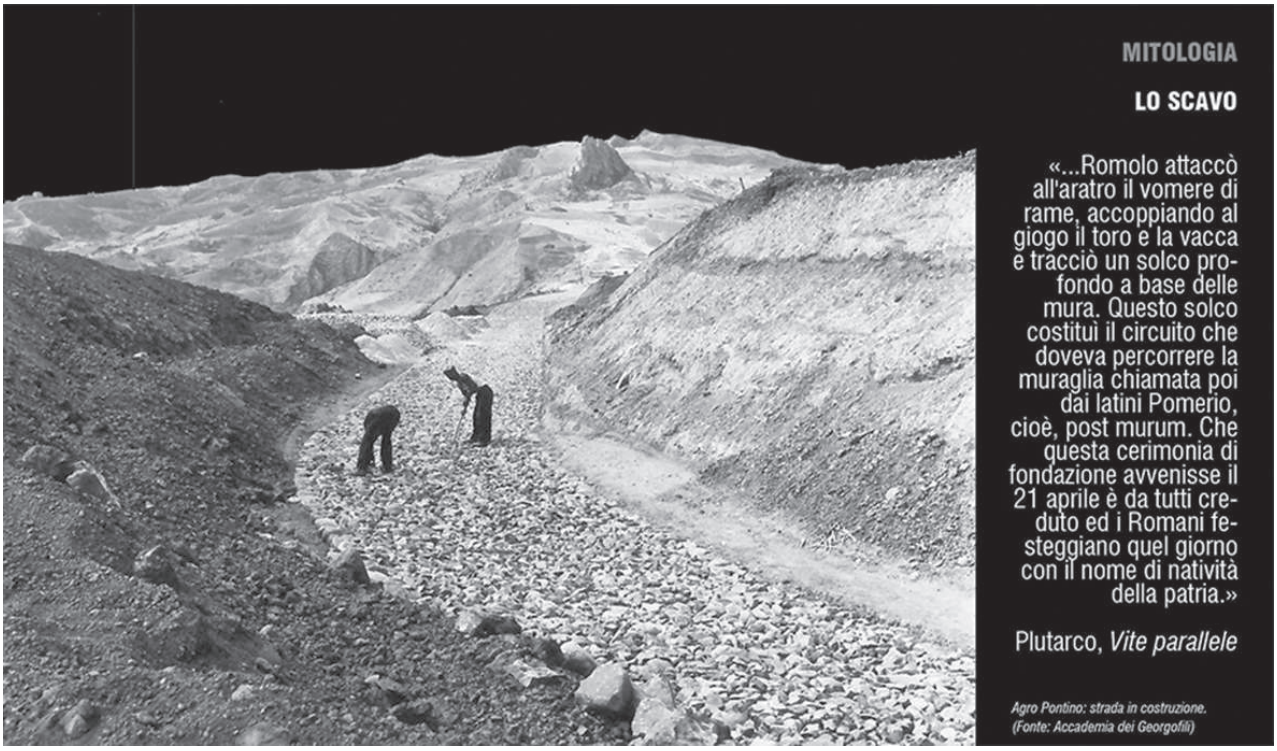
In spring 2013, the Mayor of London has established a Smart City board and asked experts including leading academics, business people and entrepreneurs to develop a 'Smart London' vision that puts technological innovation at the heart of making the capital an even better place to live, work and invest. The projects London aims to address are: job creation (using an online time-management and match-making service); reduction in traffic congestion (deploying innovations in data extraction and sharing across utilities); reduction in local air pollutant and carbon emissions (incentivizing consolidation and load sharing in the light freight sector); in doing so, addressing market failures, improving productivity and creating opportunities in two sectors – Smart Cities and Low Carbon and Environmental Goods and Service (see http://www.london.gov.uk).

Already in 2006 in Abu Dhabi, following the design of Foster and Partners, the Smart City of Masdar is being developed on virgin ground as a sustainable town

expansion scheme full of applied smart technologies to save energy and water, and to facilitate mobility. Masdar is a commercially driven enterprise interested to benefit from the internationally much monitored showpiece. According to a recent report of the Economist, however, the city has already lost some of its smart appeal ("Economist", 2013).

A subsidiary of the IBM Corporation, the IBM Citizenship, created the *Smarter Cities Challenge* to help 100 cities over a three-year period to address some of the critical challenges facing cities. This is done by sending-out IBM experts for three weeks to work closely with city leaders and deliver recommendations on how to make the city smarter and more effective. In Germany, Dortmund has been selected as a case study for applied IBM technologies and know-how. Future will show whether the efforts have really made the old industrial city, suffering much from structural change and the loss of its traditional industrial base, much smarter (IBM, 2013).

Not surprisingly, the IBM concept of Smart City has gained much popularity in China, too. Based on technologies such as the Internet of things and cloud computing, and embracing transportation, healthcare and public security, the concept appeals to the new middle class in the country. Nanjing has made the transformation into a "smart" city making ICT and other intelligent technologies an important priority. The remote oil town of Karamay in Northwest China's Xinjiang Uygur autonomous region is adopting cutting-edge technology to become a "smart city" in order to make life easier for residents and improve local administration. Wuhan, capital of Central China's Hubei province, aims to become a leading city in terms



of applying technology to improve the lives of its citizens ("China Daily", 2012). On one side initiatives to promote the Smart City concept in China are rather a means to attract investors and media coverage. On the other side, smart technologies may in the end be the only chance to manage the challenges of mega cities in the country.

In Berlin, at the Technical University, an Urban Laboratory is currently being established focusing on Smart City development. The research platform combines the expertise of all disciplines represented at the university and doing research in the field of Smart City. The strategy is to involve stakeholders such as local authorities, researchers, companies and industry partners, and form a sustainable planning committee, which then will develop detailed applied research action plans. The Urban Lab focuses on cooperation between national, European and international cities, research institutions, system suppliers and local stakeholders. The research network, which is under formation, includes the influential Fraunhofer Gesellschaft, the Siemens Corporation, the German Institute of Urbanistics, and the German Innovation Roundtable.

These are only a few examples for the numerous activities initiated all over the world to explore the potentials of new smart technologies for urban development. In the decade ahead, Smart City will become first a vision, then a label, and an agenda, then finally a routine for many cities aiming or forced to introduce the new intelligent urban infrastructure.

4. The Drivers of the Smart City

There are many drivers and promoters of the Smart City. There are above all the industries and service outlets conceptualizing, developing, producing and applying technologies for making life in the city easier, more convenient and more secure. Some of the large internationally acting corporations have discovered the Smart City as a future oriented business field. What planners aiming to bring urban quality into political arenas could not achieve, Siemens, BMW, Mercedes Benz, IBM, Phillips, General Electric or Veolia have identified a field worthwhile to embark. And with their image, their corporate know-how and marketing power, they have easy access to opinion leaders and decision-makers to sell their products and services. They are spearheaded or followed by think tanks, such as IBM, McKinsey or Price Waterhouse, and promoted by popular media and Zeitgeist journals. Architects and urbanists, and their academic and professional journals are their strategic allies, as the Smart City concept is opening new financial support for research and development.

Many communities of practice realizing that Smart City related technologies could help them to target challenges for which they neither have sufficient budgets nor the required manpower. This is valid for those who wish to tame traffic problems in cities and logistic challenges as a consequence of rapidly increasing e-shopping; smart technologies are also welcomed by the health sector, caring for the aging society without having sufficient manpower for health care. Those concerned with sustainability in cities, with energy consumption, waste disposal, air or water pollution, have realized that changing values, behavioral attitudes and values alone, is not sufficient to turn the wheel. They hope that smart technologies are the key to replace thoughtless consumption and unwillingness to change. The manifold applications of smart technologies are indeed the sunny side of the Smart City concept. This explains why citizens and decision-makers are easy to convince. Feeling that life is made more convenient and more comfortable, they become easy willingly enthusiasts of smart technologies.

No wonder that the European Commission, in 2012, launched an initiative to promote the Smart City concept in its member states, *The Smart Cities and Communities European Innovation Partnership* (see: http://ec.europa.eu/eip/smartcities/). The partnership proposes to pool resources to support the management of energy, transport and information and communication technologies (ICT) in urban areas. The energy, transport and ICT industries are invited to work together with cities to combine their technologies to address cities' needs. This will enable innovative, integrated and efficient technologies to roll out and enter the market more easily, while placing cities at the center of innovation. For 2013, € 365 million have been made available from the EU budget: cities in Europe can thus apply to receive financial contributions for local Smart City projects.

A US-based lobby institution is the *Smart Cities Council*. The initiative aims to promote smart cities around the globe. The list of lead partners reads like a Fortune list of the most influential global corporations: Alstom Grid, Bechtel, Cisco, Électricité de France, Enel, GE, IBM, Itron, Master Card, Microsoft, National Grid, Qualcomm, S&C Electric Company. On the website of the *Smart Cities Council* the mission is stated as follows: «The Smart Cities Council is an advisor and market accelerator. We promote the move to smart, sustainable cities. We contribute to our Partners' business success through advocacy and action.

The Smart Cities Council is dedicated to accelerating jobs and revenues for its members and the cities they serve.

– A different role. In place of a passive advocate, the Smart Cities Council acts as a market accelerator. Its Readiness Guide sets the metrics that define a city's progress. Its regional meetings allow city leaders learn in-person from some of the world's leading experts.

– A different vision. To the typical utopian theory, the SCC adds the practical concept that a smart city must be built on smart digital infrastructure (electric, water, gas, transport, etc.).

– A different kind of advocacy. To the typical dialog and networking, the SCC adds specific projects and tangible deliverables, where members move past talking to collaborate on Readiness Guides, policy frameworks, financing templates, marketing campaigns and other projects» (http://smartcitiescouncil.com/).

The mission is clear. It is about business, not about citizens, and not about the environment.

Siemens, the powerful globally active German corporation, is an important player in the Smart City promotion movement. On its website, Siemens writes: «[…] cities are a key growth market of the future. More than half of the world's population now lives in urban areas – and the number of city dwellers is increasing every day. With a portfolio comprising integrated mobility solutions, building and security systems, power distribution equipment, smart grid applications and low- and medium-voltage products, our new Infrastructure & Cities Sector offers sustainable technologies for metropolitan centers and urban infrastructures worldwide. Combining the expertise of existing businesses in our Industry and Energy Sectors, Infrastructure & Cities is well positioned to be a major player in an addressable market of €300 billion» (https://www.siemens.de).

Another driver of the smart city movement in Germany is the Fraunhofergesellschaft (Fraunhofer Society for the Advancement of Applied Research), a long-established and influential public-private partnership promoting technical innovation in Germany and abroad (http://www.fraunhofer.de). The institution employs around 20.000 scientists and engineers, in more than 60 research centers across Germany, the US and China. It has an annual research budget of about €1.65 billion, one third of which is from the public sector. It is one of the key institutions in Germany to continuously advance

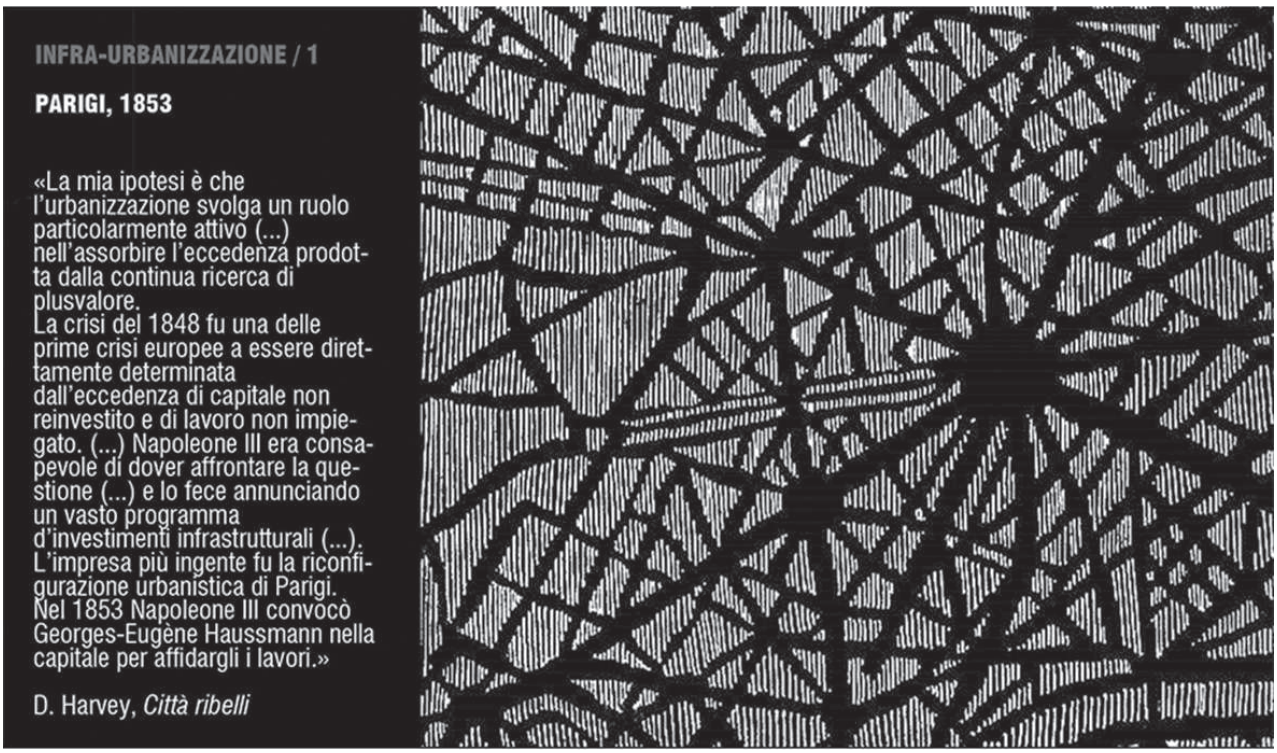
innovation in large and medium-size industries. It holds a crucial role in maintaining Germany's leadership in industrial innovation. The Smart City movement is a perfect field for expanding their services to cities. On their website, they communicate: «The Center for Smart Cities – A Concentration of Competencies for the City of Tomorrow: Over the past few years Fraunhofer FOKUS has been researching solutions for Smart Cities in cooperation with its partners in industry as well as in public administration. The newly created Center for Smart Cities houses leading experts in Information and Communication Technologies who are well-prepared to tackle today's real-world Smart Cities challenges. Our reference scenarios illustrate how our solutions (e.g., government mashups for transparent civic participation, smart metering for a more efficient handling of energy resources) improve the lives of citizens, public and private enterprises, and urban administrators» (http://www.fokus.fraunhofer.de).

The city of Frankfurt does not yet promote the Smart City. Nevertheless, under the slogan *Smart Cities – Smart solutions for life in the future*, the city launched the VDE Congress to be held next October 2014 in the city, which will focus on the new technologies as a «means to shape smart cities for the future». The congress announcement advertises the event as follows: «Great focus must be placed on developing intelligent solutions for living in cities and urban areas, particularly with regard to the fields of energy, mobility, communication, health and safety. More than 150 top speakers and around 2,000 participants from home and abroad will visit Germany for the "Smart Cities – Smart solutions for life in the future" VDE Congress 2014, making it the most important conference of the coming year […] the Congress will provide all aspects of Smart Cities for discussion. In addition to the technical and scientific conference program, there will be a star-studded evening addressing technology policy and an e-student day where 600 young engineers will exhibit the latest technology and innovation» (http://conference.vde.com/kongress2014/Seiten/default.aspx).

The event will trigger off new enthusiasm for Smart City technologies in the country and raise hopes for a continuous strength and technological leadership of the German economy.

5. The darker side of the Smart City

There is, however, a slightly darker side of the Smart City concept, too. It is not the access to this technology – in the long run, everybody will have affordable access to it, and the problems of computer illiteracy will be overcome in the next generation – it is rather the extreme dependency on technology, and on corporations dominating technology and related services. Sooner or later society will not manage any more to live without the ICT based services. Like addicts, or chronically sick patients who are extremely suffering from the lack of some substance, respectively the medicine they are relying on, citizens will become sick, if the access to smart ICT services will be cut-off. They will soon forget how to survive in cities, once smart ICT technologies are not available any more. The concentration processes, which characterize the global market of smart technologies, are threatening. New monopolies are emerging, which make it impossible for other players to enter the market. The large corporations of the ICT industry will use their power not just to increase their global dominance and profits. They already have the power to influence and manipulate local and national governments. Based on their almost unlimited financial resources, they can easily bypass any public control by the public sector or the organized civil society and their non-governmental organizations (Solnit, 2013). Only here and there counter-power is building up. As seen



from the EU initiative, even the public sector in Europe, being afraid of losing the momentum of innovation to Asia and cheered by the private sector, is promoting Smart City concepts with considerable pubic money.

6. Conclusion

The interest-led Smart City enthusiasm of the corporate, political and professional promoters of the concept, briefly sketched above, shows that cities are preferred laboratories of knowledge development and knowledge application. There are still many yet unknown social and economic implications of the introduction of smart technologies into city building. There is ample space for a new research agenda. The impacts on community life and personal mobility, on the local economy and the future of city centers, are strong once e-shopping is becoming more and more popular. The increasing role of logistics in city development is a challenge, and, last but not least, the qualification of the planners of the public sector, who have to contract-out the new technologies to private sector enterprises, providing the ICT technologies and all the hard and software: while the technical urban infrastructure, built at the turn of 19th century, has a long lifetime, the new technology is soon outdated and has to be replaced continuously. This brings about new challenges to city management and managers, to city utility corporations, being the key providers of the public segment of the new technologies, and to more and more constrained city budgets.
Promoted by local businesses and governments, smart

technologies will be welcomed and used by citizens in their daily life. But there will be a time after the Smart City (Campell, 2012), once the enthusiasm about the manifold means to use and cope with ubiquitous information will be slowing down. The public sector will have the obligation to carefully monitor the social and spatial implications of fashionable Smart City technologies, to be able to react to unintended implications. The gradual introduction and the potential flooding of more or less useful smart technologies in cities is unavoidable and cannot be stopped. The new smart technologies represent a timely segment of knowledge in a city. The wise use of knowledge provided by smart technologies is a challenge to cities and future citizens. Future urban planners have to be aware of what is gradually emerging in their professional field and planning schools will have to reconsider their curricula, to prepare their students for the new challenge.

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