1 The Advent of the Smart City, from Flow Management to Event Control

What is it that makes a city 'smart'? While the expression 'smart city' is American in origin, the reflections and experimentation to which it refers are not the preserve of a single country or culture; far from it. They are emerging everywhere: in Korea as well as in the United States, and in France and Spain along with the United Kingdom and Scandinavia. Though it may spontaneously spark off thoughts of metropolises at the cutting edge of technology such as London, New York and Singapore, it also concerns many other towns. IBM's Smarter Cities Challenge, which aims to promote the technological solutions conceived by the company to improve urban administration and services, embraces around a hundred cities, including a number of medium-sized ones such as Faro in Portugal and Syracuse in Sicily. This IBM initiative ignores the dividing line between rich and developing countries. Consequently, Ahmedabad in India and Medellín in Colombia feature among the list of towns

concerned by the Challenge.[1] An estimated total of nearly 39.5 billion American dollars of investment is due to be made in the field of smart cities in 2016, compared with a total of just 8.1 billion in 2010.[2]

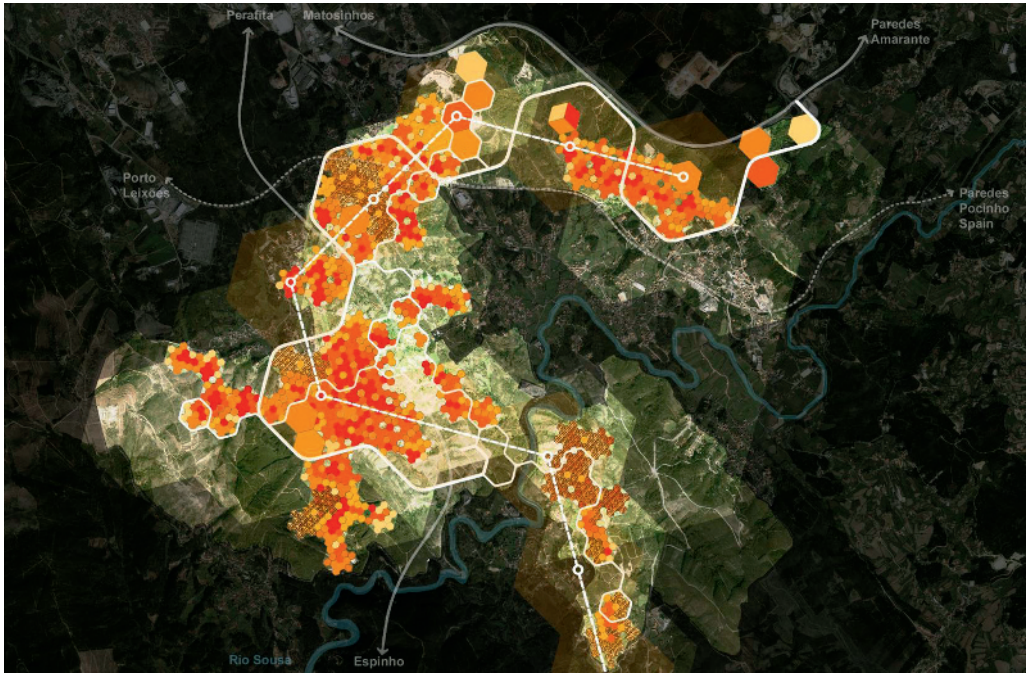
Defining the Smart City

The global success of the notion of smart cities is matched in scale by the ambiguities attached to it. And yet, the technical infrastructure that it involves and the general objectives that are assigned to it seem clear at first glance. The smart city relies on intensive use of information and communications technology. It works through the development of electronic content and the increasing hybridisation of the latter with the physical world, a mingling that is often described as 'augmented reality'. Its construction engages with a number of key issues, such as the possibility of reconciling the quality of urban life with sustainable development through close management of technological resources and infrastructure. A 2008 report estimated the reduction in carbon emissions that would be obtained by the development of information and communications technologies by 2020 at 15 per cent of the former year's figures.[3] In turn, a more recent study gauged this reduction, again by 2020, at more than 18 per cent of the 2011 total.[4] Besides smart grids and other highly reactive networks that should allow an optimisation of the urban metabolism, the smart city is meant to offer new opportunities to individuals equipped with mobile devices, and to allow new collectives to emerge, along the lines of organisations such as Wikipedia and OpenStreetMap that involve collaboration on a massive scale.

By this point, a string of ambiguities are already emerging. How far should the scope of the notion of the smart city extend? Should it encompass all the aspirations that are being expressed today, for a better quality of urban living based on the marriage of digital technology with the quest for sustainability and the sharing of experiences and knowledge? In considering this, two possible pitfalls need to be avoided. The first is in opting for an overly narrow definition of the smart city centred purely on the use of digital technology – an often covert technological determinism – in which we either attribute all sorts of socially beneficial effects to technology, or, on the contrary, hold it responsible for new pathologies, while at the same time denying that we want to reduce the range of possibilities to the consequences of technology

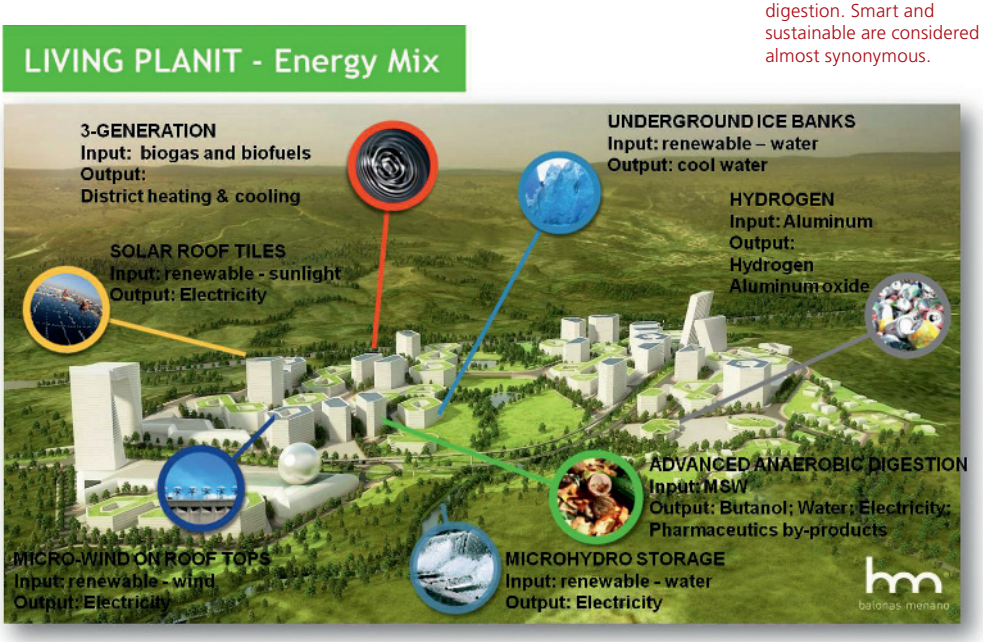
alone. The other pitfall is in choosing instead an overly broad definition: one involving a dilution of the undeniable impact of a series of technological developments, including ubiquitous computing, geolocation and augmented reality, all of which will crop up frequently throughout this book.

But the main source of ambiguity, or even disagreement, in relation to smart cities stems from the type of stakeholder seen as responsible for sparking off a dynamic that appears more and more as a new urban ideal – an ideal that is even dressed up as utopian in the writings of certain authors whose technophilia knows no limits. In contrast to the latters' enthusiasm, the most critical commentators on this ideal often interpret it as the result of strategies formed by large corporate groups such as Cisco, IBM and Siemens, which redirected themselves towards urban issues under the influence of factors such as the 2008 financial crisis that lowered the value of many firms' investments in information and communications technology. The exponential market growth of the smart city justifies this choice a posteriori. This very corporate vision usually goes in tandem with a close focus on projects such as Songdo International Business District



Living PlanIT, concept plan for PlanIT Valley, Portugal, 2010
Located in the north of Portugal and conceived by the company Living PlanIT, the developer of an urban-oriented software platform, PlanIT Valley seeks to offer a model for the city of the future and serve as a laboratory for smart technologies.

in South Korea, Masdar City in Abu Dhabi and PlanIT Valley in northern Portugal: new urban developments from scratch, which act as showcases for the service platforms offered by the firms. This reduction of the smart city to these new cities that belong to a genre founded on a close association of physical and digital infrastructures goes hand in hand with the denunciation of attempts to reduce the city to a well-oiled mechanism, a new avatar of these brave new worlds that periodically give rhythm to the history of urbanism. In a stimulating pamphlet very pointedly entitled *Against the Smart City*, published in 2013, the American urbanist Adam Greenfield had no trouble contrasting the complexity of existing cities with the inadequacy of an approach that, in his view, adopted the functionalist credo of modern architecture and urbanism.[5] The American sociologist Richard Sennett told a fairly similar tale in an article that appeared the previous year in *The Guardian*, on the occasion of a conference organised in London on the theme of the smart city; again, he contrasted the mechanical character of Masdar and Songdo with the creative spontaneity of metropolises such as Chicago and Mumbai.[6] Although he does not limit the question of the smart city to new urban developments started from scratch, Rem Koolhaas has recently taken up the same sort of argument.[7]



Living PlanIT, energy mix scheme for PlanIT Valley, Portugal, 2010
Among the ambitions of the project is an energy scheme combining various sources: solar, wind and hydraulic, along with anaerobic digestion. Smart and sustainable are considered as almost synonymous.

Even if they are partly justifiable, these attacks reveal a certain type of amnesia with regard to the importance and inventiveness of initiatives set up by firms in the field of urban technology. For example, electricity arrived in American and European towns in the late 19th and early 20th centuries under the initiative of companies such as Edison, Westinghouse and Siemens, who understood the potential of the newly emerging market more quickly than others.[8]

The example of electricity is interesting for another reason also: because the dynamic of urban electrification cannot be reduced to these companies' strategies alone. Far from it; for it brings into play an infinitely broader ensemble of stakeholders, politicians, municipal employees and clients, each with their own expectations and behaviours. Concerning expectations, imagination also has its place in this process, as witness the extraordinary futuristic visions of the French illustrator Albert Robida from the late 19th and early 20th centuries. Electrification would therefore appear to be a complex dynamic that cannot be condensed purely into the logic of capitalist profit, even though the latter did drive the movement forward.

As a specialist in the application of digital technology to the urban scene, the American researcher Anthony Townsend shows a clear understanding of this irreducibility in his inspiring book on smart cities, even though he also acknowledges the pioneering role played by large information and communications technology firms worried by the fall in private investments in their sector after the 2008 crash.[9] Besides Cisco and IBM, he notably cites the role of another category of stakeholders whom he describes as 'civic hackers': software developers working independently or for city councils, who use the massive quantities of data that have been made available by digital technology to promote more collaborative urban practices. He points to the 'Foursquare' app – which allows its users to exchange information and opinions on cafés, restaurants and shops – as an alternative approach to the smart city based on individual and collective initiatives. In his book, Townsend also gives considerable attention to the sort of imagination which he sees as bordering on utopianism.

Besides civic hackers, many other stakeholders are also involved, starting with the users of digital technology who are being called upon to participate more and more actively in the smart city. The discussion around the smart city cannot be summarised simply by the choice between big business and civic hackers. This is why I have opted to contrast the neocybernetic approach with projects that are more participatory in

inspiration, whether they be undertaken by municipal administrations (as in Paris), developers or groups of users.

Two other limitations of Townsend's book lie in his relative indifference to the concrete characteristics of urban space – the cities he discusses remain strangely insubstantial – and above all in a definition of city intelligence that remains fairly conventional, all things considered. Like most other commentators before him, Townsend struggles to imagine that the intelligence of cities could be beyond the grasp of the various brains that inhabit them. Of course, cities have always been intelligent in the sense that they efficiently bring together people who possess powers of reason. It would however seem that the increasing hybridisation of humankind and technology, which accompanies the rise of the digital, invites a more fundamental reconsideration of the question.

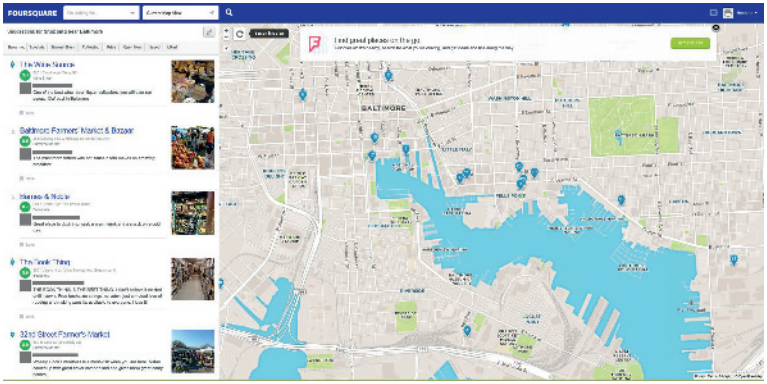
What is a smart city? This book adopts a hypothesis that is both simple and radical: where the intelligence of cities is concerned, the term 'intelligence' needs to be taken much more literally than may seem to be the case. Intelligence in the sense of the ability to learn, understand and reason. The underlying ambition of many current projects and experiments is to make existing cities intelligent, or even in some sense conscious. This ambition cannot be reduced to the scope of available technologies, as it goes far beyond what they prescribe. This certainly explains why Townsend pays it so little attention. By the same token, the smart city appears as the fruit of a dynamic that is only

Cover of Albert Robida's *Le Vingtième siècle: La Vie électrique*, Librairie Illustrée (Paris), 1892
On the eve of the 20th century, the French illustrator Albert Robida depicted all sorts of spectacular applications of electricity to everyday life, sometimes visionary, sometimes imbued with irony.

Albert Robida, *Téléphonoscope*, from *Le Vingtième siècle: La Vie électrique*, 1892
More than a century before the development of massive open online courses (MOOCs), Robida imagined the development of networked distance learning through the use of the *téléphonoscope*, a machine conceived as an extension of the telephone in the domain of image transmission.

partially technological. At the same time, the temptation of determinism, with its techno-optimist and techno-pessimist corollaries and their heady scents of utopia and anti-utopia, is foiled. The opposite risk of minimising the impact of technology is likewise set aside, since the essential novelty of the intelligence that is emerging before our very eyes stems from its partially non-human character and from an unprecedented association between humankind, machines and algorithms.

What is a smart city? Having outlined the various current stances on the subject, it appears to be both an ideal and a process. As an ideal, it consists of a city whose digital tools allow the optimisation of its functioning and sustainability, as well as of its inhabitants' quality of life and the types of relationships they can maintain with one another. In so doing, this city demonstrates a form of intelligence with no past equivalent. In the smart city, some mechanisms for learning, understanding and reasoning are internalised; they become intrinsic to the city itself, instead of residing in the minds of the humans who live in it.



Screenshot of the 'Foursquare' United States website, 2015
A local search and discovery service launched in 2008, Foursquare had some 45 million registered users by the end of 2013. Users can post reviews, recommendations and ratings of venues, thus promoting a more participative approach to the city.

This ideal presents contradictions which are not masked in this book. But they are softened by a development dynamic that declares them to have been overcome. Because the smart city also appears as a process. From this point of view, our cities are already intelligent, or at least rapidly becoming so, under the effect of a complex group of factors including, of course, the technological innovations, business strategies and civic hackers' projects so dear to Townsend, but also the actions of millions of anonymous stakeholders who are experimenting with a new relationship to the urban environment in which the human and the non-human are becoming more entangled by the day.

Self-Fulfilling Fictions

While specialists in urban matters still have difficulty conceiving of the notion that cities might be able to access an autonomous form of intelligence, science fiction has less trouble making that leap. Indeed, intelligent cities, and even cities that possess a form of consciousness, have long haunted novelists' and filmmakers' imaginations. One of the most radical versions of the intelligent city features in the American author Joe Haldeman's novel *The Accidental Time Machine*, published in 2007.[10] The story involves an artificial intelligence called La that governs the city of Los Angeles. La – which is also of course the acronym of the Californian metropolis – can take on all sorts of forms, although she normally presents herself to her interlocutors as a woman. She can appear in an infinite number of places at once, especially when local taxes are due to be paid by the city's residents. During this tense period, she appears, in a personalisable form, to all those who want to

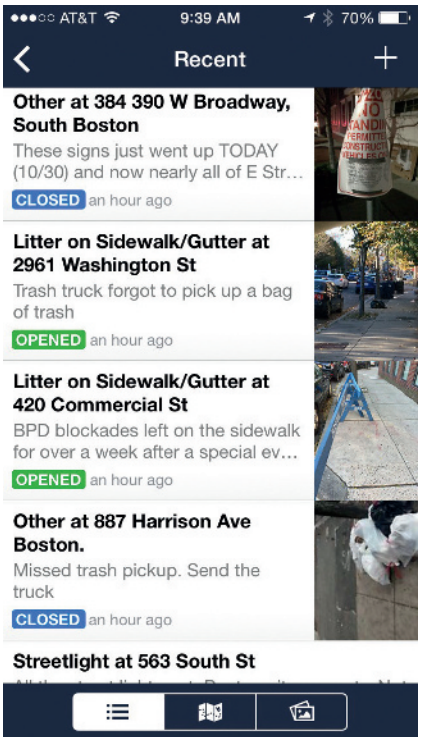
discuss the details of their tax notice with her. La is not just a machine. She also appears as the outcome of the millions of interactions between the city, its infrastructure and its citizens.

Two lessons can be retained from this tale, which frequently flirts with philosophical storytelling. The first relates to the emergence of a more and more individualised relationship – one might almost describe it as intimate – between humankind and the city. Numerous mobile apps seek to promote such a relationship. The American city of Boston thus put in place an app called 'Citizens Connect', as of 2009, which allows its residents to indicate problems with public areas to the municipal authorities, such as damaged paving or a defective traffic signal.[11] For its part, the French telecommunications operator Orange is developing an experiment called 'Ma Ville Dans Ma Poche' with the city council of Bordeaux, which will offer residents a single portal to access a whole series of administrative services, as well as businesses and leisure facilities.[12]

Above all, the city no longer appears solely as a collection of technological infrastructure, spatial sequences, individuals and groups that is considered to be equipped with a personality in a metaphorical sense alone, or through an idealisation that is often tainted by political preoccupations. Take for example Charles de Gaulle's famous 'Paris! Paris outraged! Paris broken! Paris martyred! But Paris liberated!' speech, which he gave on the occasion of the French capital's liberation from Nazi occupation.[13] On this point, Haldeman's scenario is similar to the visions of digital theoreticians, designers and artists who have proved themselves less cautious than the majority of urban specialists.[14]

Of course, science fiction is no longer necessarily the most favoured means for inventing the future. As the French digital media specialist Nicolas Nova pointed out in an essay on the limitations of this long-dominant genre, today the future is sketched out perhaps more through a mixture of technological anticipation and everyday reality than through novels, short stories and films that straddle centuries and take the reader on a voyage from planet to planet.[15] But is it really all that crucial to know whether such a mixture between techno-futures and the everyday still stems from the typical language of science fiction? It is perhaps more essential to observe the irreplaceable role that has been allocated to the imagination and all sorts of narratives in the development of information and communications technology. These narratives, whatever their status, need to be taken

seriously. They convey expectations and desires that constitute, more than in other domains, one of the driving forces behind innovation. Because it infiltrates everyday life and social relationships much more than traditional technologies have done, digital technology involves desire as well as the narratives that shape it. The latter dictate the direction it takes as well as the objectives that are assigned to it. In other words, the fictional universe that develops around and about digital technology possesses a strongly self-fulfilling character. In the case of the smart city, it allows in particular the adjustment of its two dimensions: the ideal, and the concrete process of transformation.



Screenshot of the 'Citizens Connect' application developed for the City of Boston, Massachusetts, 2015
Through this type of application designed for smartphones, citizens can experience a more personalised relationship to municipal services and contribute to the welfare of their city.

The development of ubiquitous computing is perhaps one of the best illustrations of this self-fulfilling character. This objective for computing to be at once omnipresent and invisible emerged in the early 1990s through visionary writings, such as the article by Mark Weiser, who was then director of the IT research centre at Xerox Palo Alto in California, on the 21st-century computer in the journal *Scientific American*.[16] This article, which was quickly followed by a whole series of publications on the same theme by Weiser and other major players in the field of computing, contributed to the launch of a genuine programme of research and development.[17] The latter varied widely and took on different names from one company to another: 'ambient intelligence' at Philips, whose terminology was taken up by the European Commission; 'pervasive computing' at IBM and Siemens. The programme was effective in many respects. Powers of calculation and digital resources are no longer confined to computers. They can now be found all over the place: in the numerous electronic chips that

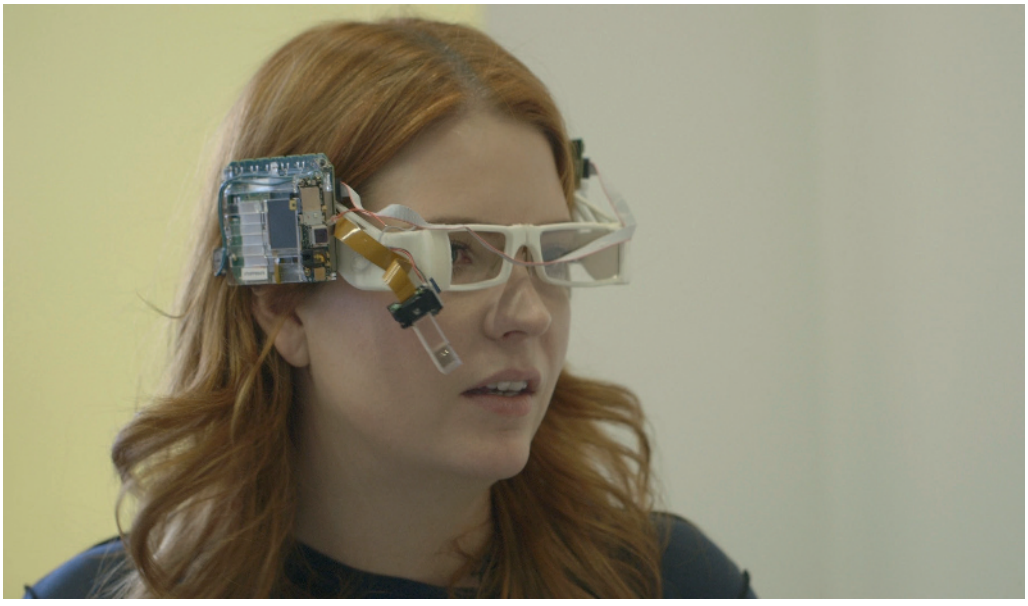
control the machines that surround us, in our household appliances, our cars, our mobile phones, our tablets, and soon in the networked eyewear and watches that firms such as Google and Apple are seeking to put on the market.[18] There are currently more than 50 billion connected devices sending data online. Created by the technology firm Umbrellium, the search engine 'Thingful' provides arresting maps displaying the localisation of some of the elements of what is often referred to as the 'Internet of Things'.[19]

Mark Weiser's article is not only interesting for its content, which announces evolutions that were still in embryonic form at the time, from the spread of Wi-Fi to the use of tactile tablets. It is also interesting for its form. It deliberately mixes the language of the manifesto with that of the research report. On the manifesto side, the most frequently quoted section is the incisive opening statement: 'The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it.'[20] On the research report side, the article goes through all sorts of innovations – from the electronic badge, to the tablet, to the programmable screen. But perhaps the most significant element, and the one which delivers the key to Weiser's intentions, lies in the description at the end of the article of the daily routine of Sal, a mother who works in Silicon Valley. As soon as she leaps out of bed, Sal can drink the coffee that her machine has prepared for her, having been warned of her imminent awakening by the

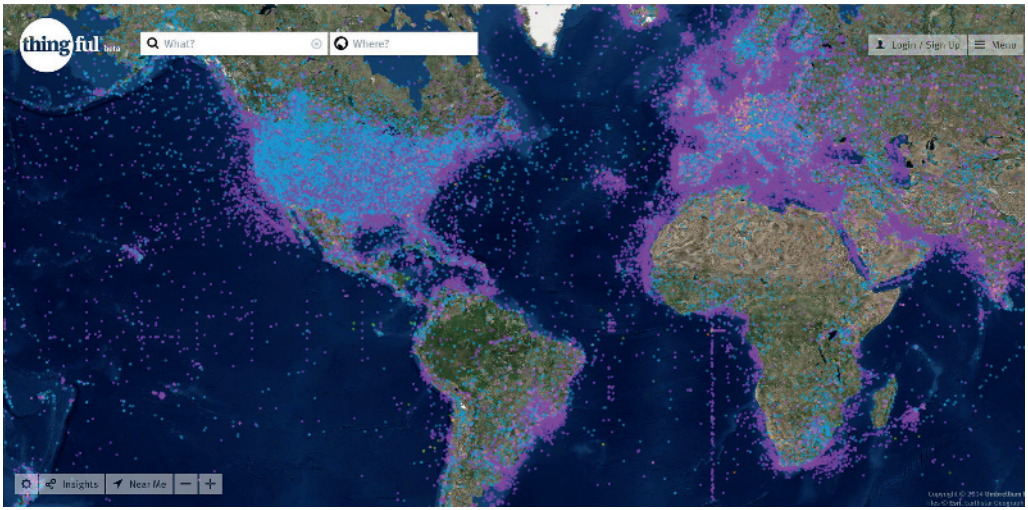
Pervasive computing according to Siemens, 2004
The proliferation of connected devices is among the consequences of the development of ubiquitous or pervasive computing. It allows objects such as bulletin boards to exchange information with mobile devices such as smartphones and tablets.

clock on her bedside table which recognises the preliminary signs that she is stirring. When she arrives at work, a screen indicates the available parking spaces. A little later, she corrects a text in the company of a colleague whose face is projected onto a screen on her wall. Her whole day is thus spent interacting with machines of varying size and function, which keep her informed, suggest how she should behave, and propose alternatives when her choices prove unwise. A recourse to fiction – a fiction mixing the everyday with technological innovations that were still surprising at the time – thus completes the demonstration, or rather summarises it.

According to the famous statement of another computer scientist who spent time at Xerox Palo Alto, Alan Curtis Kay, 'the best way to predict the future is to invent it'.[21] Since the beginnings of digital technology, fiction has played a particularly important role in this process of invention. In many cases, the narrative of future innovations is due to the computer scientists themselves. But novelists, scriptwriters and film directors have equally contributed to the formulation of some of the targets that have been set. Cyberspace thus owes something to the intuition of the writers William Gibson and Neal Stephenson, or rather it is part of the same metanarrative concerning the possibility of an online life which could



An early Google Glass prototype, 2011
Despite the lukewarm reception of the Google Glass, wearable computing devices are among the most promising directions of development of ubiquitous computing. In the near future, traditional screens may lose their hegemonic position as interfaces with the online world.



Screenshot of the 'Thingful' search engine, 2015
On 'Thingful' you can search the Internet of Things by locations, types of connected objects and ownership. With the proliferation of such objects, which are often wirelessly connected, the Internet is becoming both more and more spatially present and marked by the rise of people-to-machine and machine-to-machine communication.

absorb most of the energy from those willing to immerse themselves in its glittering, unpredictable fabric in the manner of a giant Las Vegas Strip.[22] The links between films such as *Minority Report* (2002) and innovations such as tactile interfaces, retinal scanners and augmented reality are well known. It is true that the aforementioned film's director, Steven Spielberg, had consulted all sorts of specialists in information and communications technology when preparing it. Digital technology feeds on fictions which possess a strongly self-fulfilling character.

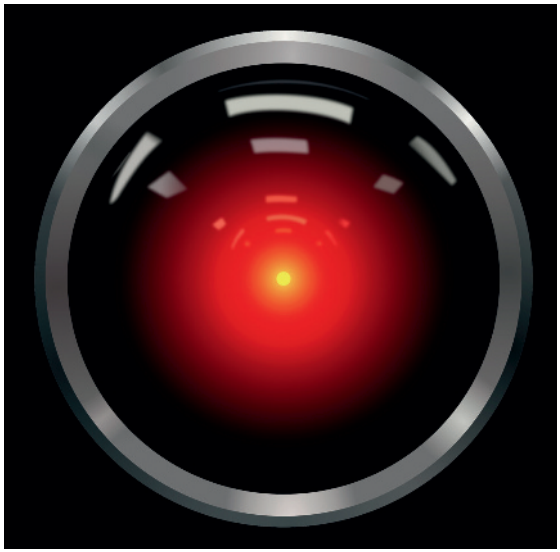
As the Canadian communication specialist Vincent Mosco has emphasised, such fictions hark back to a number of founding myths, such as the abolition of space or the ideal of a technology that is both omnipresent and invisible, of which Mark Weiser ultimately did no more than to produce a new version.[23] But these myths alone cannot have generated the profusion of stories that are both similar and different and which lead to predicting the future through inventing it. The very particular relationship between the digital and the imaginary, or fiction, could well be explained by some of its fundamental characteristics. Its intimate relationship with communications must naturally be called into play. But it is its capacity to transform the everyday according to our desires that is again the most determining factor. Most self-fulfilling narratives, beginning with Mark Weiser's, emerge at the intersection of these two dimensions: communications and the everyday. Besides mundane tasks such as preparing breakfast or driving to work,

digital-era activities involving communication or consulting new media punctuate Sal's day. The same ingredients are found in an evocation of the daily life of a group of residents of a smart city in the year 2050, which appeared a few years ago in *The Guardian*.[24]

The emergence of a form of non-human intelligence invested with functions of control and regulation is one of the founding myths of the digital era. This myth is for instance one of the driving forces behind the screenplay of Stanley Kubrick's *2001: A Space Odyssey* (1968). But the smart cities that are the subject of so many narratives today – from science-fiction novels like *The Accidental Time Machine*, to the business scenarios of IT companies like Cisco Systems and IBM, to articles in the daily press – are not intended to resemble the HAL 9000 computer which coordinates the space mission to Jupiter in Kubrick's film. And that is just as well, given that HAL's psychological vulnerability leads the mission with which it is entrusted into catastrophe!

Unlike the Big Brother-type centralised electronic brains of 1960s and 1970s science fiction, what are now being imagined are much more complex forms of intelligence. The analogy with giant centralised computers has been replaced by other models – the cyborg, the network and indeed the swarm – for reasons that have at least as much to do

Captain John Anderton, played by actor Tom Cruise, using a tactile interface in Steven Spielberg's *Minority Report*, 2002
Minority Report is typical of the strong relationship between fiction and the development of cutting-edge digital technologies. The self-fulfilling nature of these technologies is to a large extent responsible for these relationships.



The 'eye' of the HAL 9000 computer in Stanley Kubrick's *2001: A Space Odyssey*, 1968
The red camera eye of HAL (for Heuristically programmed ALgorithmic computer) remains to this day one of the most powerful images of the seduction and dangers of artificial intelligence. In the case of smart cities, such a centralised system has relatively little chance of being implemented, despite the strong neocybernetic stance of some of those involved in their development.

with the range of available technologies as with sociotechnical imagination. This state of available technologies needs to be brought in alongside the self-fulfilling character of narratives relating to the smart city. Although the smart city, in its most ambitious version, seems still to be a distant ideal, the process leading to it is already well under way. From this point of view, we might consider that we are already living in smart cities.

The Sentient and Sensory City

Before turning to the subject of intelligence, we should perhaps start by bringing in the new capacity of cities to detect, measure and record what is happening within them – in technical networks as well as in streets and buildings, and in people's homes as well as in the offices of public administrative bodies. Sometimes visible, but more often hidden, countless chips and sensors allow objects and vehicles to be located, consumption levels and transactions to be recorded, and temperatures, pollution levels, population densities and flows to be measured.[25] In the Spanish city of Santander, for instance, there are some 20,000 sensors for 180,000 inhabitants, monitoring parameters such as temperature, luminosity, ground humidity and available parking slots.[26] Paris's 120,000 trees have each been fitted with a radio-frequency identification (RFID) chip, which allows the technicians responsible for parks and gardens to know their history and keep track of the interventions they have received. Again in Paris, the water consumption of individual apartment blocks is read remotely by the municipal agency in charge of supplying the capital. This allows Eau de Paris to identify leaks in the system more easily and to alert its clients in case of excessive consumption. In a large number of towns, vehicular traffic is monitored in real time through technology ranging from induction loops that allow the passage of vehicles to be noted, to wireless sensors, to video cameras. In Singapore, this monitoring enabled the introduction of one of the first dynamic pricing systems, which consists of making drivers pay in proportion to the desirability and, more importantly, the congestion levels of the thoroughfares they use. In the longer term, it is possible to envisage cities where automated driving is imposed, to improve

traffic efficiency even further. Google Cars can already go driverless, and several US states have authorised their use on public roads.

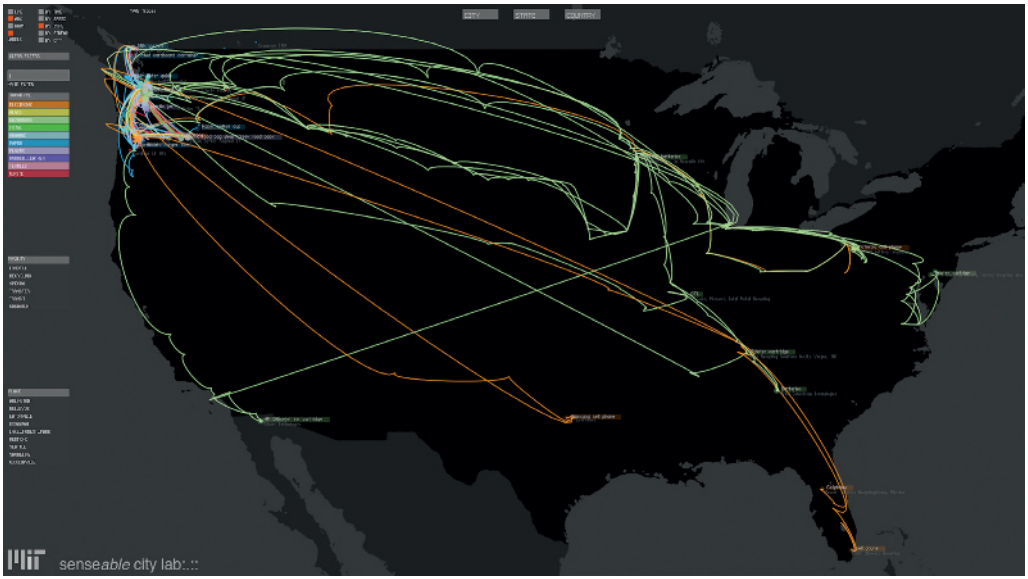
More and more information is produced by urban dwellers themselves, whether by using smart travelcards like London's Oyster, Paris's Navigo or Tokyo's Suica, or by paying for their purchases with credit cards or mobile phones. From one year to the next, their activities and the information gathered about them are being monitored more intensely and above all more widely, in a constant to-ing and fro-ing between experiments and large-scale implementation policies. While their movements, their purchases and their consumption of water, gas and electricity have already been being recorded for a long time, attention is now also being paid to the waste that they are producing. With a view to improving household waste management, the SENSEable City Lab at MIT has thus monitored the circuit of waste produced in Seattle, from aluminium cans to plastic wrapping, identifying them through electronic chips.[27] The city of Seoul in South Korea has meanwhile launched an ambitious programme that consists of making its residents pay for their rubbish to be collected according to the quantity they have produced, through the use of RFID technology. The system notably involves rubbish bins that bill their users on a pro-rata basis, according to the weight of the waste they put into them.[28]

Electronic road pricing gantry in Singapore, 2005
Road pricing to regulate automobile traffic in congested metropolises has become common. In Singapore, vehicles are identified by an electronic device known as an In-vehicle Unit. In Stockholm, where a congestion tax has been implemented permanently since 2007, identification is based on automatic number-plate recognition.

Google self-driving car prototype, 2014
The future of urban automobile circulation could very well lie in the development of automatic vehicles like those tested by Google.

Cities are inexorably transforming themselves into information systems, with information often available in real time. Within these systems, relationships between physical infrastructure, service offers and users are being reconfigured, to work towards improved reactivity and greater flexibility of use. In many cases, the ultimate aim is better optimisation of scarce resources such as parking. For example, from San Francisco to Nice, a whole series of cities are trialling 'smart' parking systems in which sensors allow drivers to be informed of available parking spaces near their current location.[29] However, the main objective of the smart city is the quest for improved environmental efficiency, whether that be through reducing its energy consumption or the volume of waste it generates. This is the justification used by EDF, France's foremost electricity supply company, for the introduction of its Linky meter, which represents a first step towards more intelligent management of electrical supply and demand.

One of the key issues at the heart of this atmosphere of rapidly expanding urban information consists in being able to associate and, if possible, combine different types of measurements and recordings. With this in mind, the city of Nice, in collaboration with Cisco Systems, launched an experiment for a 'connected boulevard' where various sensors collect real-time data on traffic circulation, street lighting, environmental quality and cleanliness. The aim was to create a shared information platform allowing both administrative bodies and private developers to offer innovative



SENSEable City Lab, MIT, 'Trash Track' project, Seattle, 2009
The experiment led by the SENSEable City Lab reveals the sometimes extremely complex itineraries of discarded objects on their way to recycling or final disposal. It contributes to the development of a new field of research on how to improve the ecological footprint of cities.

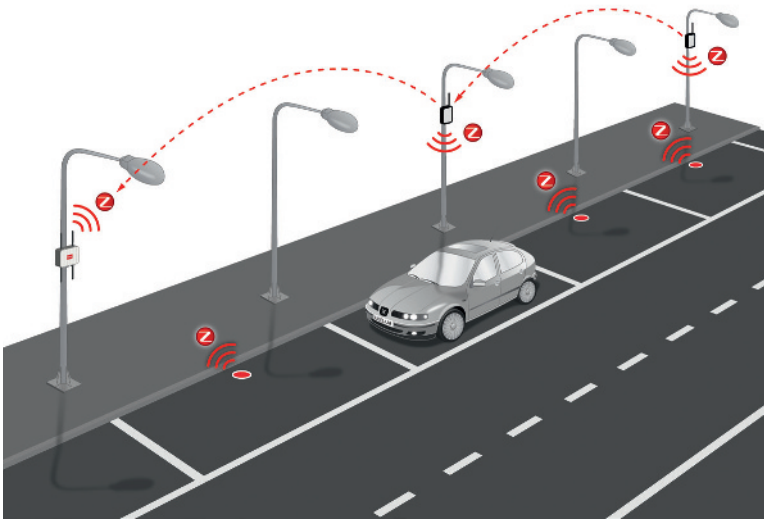
services at the interface between the physical and digital worlds.[30] These integration perspectives can be found in major projects for new smart cities where the emphasis is simultaneously on sustainable development and digital technology, such as Masdar and Songdo. Behind these flagship projects, it must nevertheless be admitted that many plans for developing urban intelligence are still lacking in coherence, and seem to have come from a catalogue of separate initiatives that are as yet rather poorly co-ordinated. The digital strategy proclaimed by the French city of Lyons, among other examples, mixes together very different themes – encouraging energy transition, proposing new mobility solutions, aiding business creation – while seldom making clear how they may be linked.[31] This undoubtedly stems from what is still the very experimental character of many developments. It is as though this were the time for expansion, rather than for the consolidation that is nevertheless necessary once a certain stage has been reached.

There are many more examples of 'smart' experiments and achievements. They rely on the capacity to detect and record, often in real time, what is going on in the urban grid. In a certain number of cases, these recordings can directly generate instructions for the automatic control of technical infrastructures, in the manner of thermostats and other temperature

Smart food waste disposal in Daegu, Susenggu, South Korea, 2015
With these food disposal units similar to those tested in Seoul, each user of the system pays according to the disposal costs of their food waste. Besides financial fairness, the aim is to make citizens feel more responsible for their behaviour and its impact on the environment.

controllers like the Nest thermostat that adapts dynamically to the behaviour of its users.[32] Sensors are then paired with activators responsible for initiating the execution of such instructions. In this sort of situation, it is hard to see in what way the city is truly becoming more intelligent than the great regulated technical systems that have already existed for quite some time. But automatic control is a long way from exhausting the range of possible scenarios. In a whole series of other cases, the aim is to inform operators and/or users by proposing a range of choices and allowing them to understand the consequences of each.

Operators and/or users: the distinction between these two categories of stakeholders is becoming more and more hazy in the context of the smart city. This is a rather widespread characteristic in the digital realm. As many commentators have noted, Web 2.0 has blurred the old dividing line between amateurs and professionals.[33] There is no such differentiation on Wikipedia, for example. Similarly, the application of information and communications technology to the city, with a view to making it more sustainable, demands increasing investment on the part of users, who are called to become ever more closely associated with the management of the new services that are offered to them. In smart grids, the new networks of energy production and distribution that are claimed to be intelligent, the final users are taking a growing role – whether they are likely to influence the energy offer, if they are producing hydraulic, solar or wind power themselves, or the demand, by keeping a closer eye on their consumption than before. This is one of the objectives of the new Linky meter. The same ambition was at the origin of the Green Button Initiative launched in 2012 in the United States in order to provide utility customers with data regarding their energy usage.[34] Recycling of household waste likewise relies

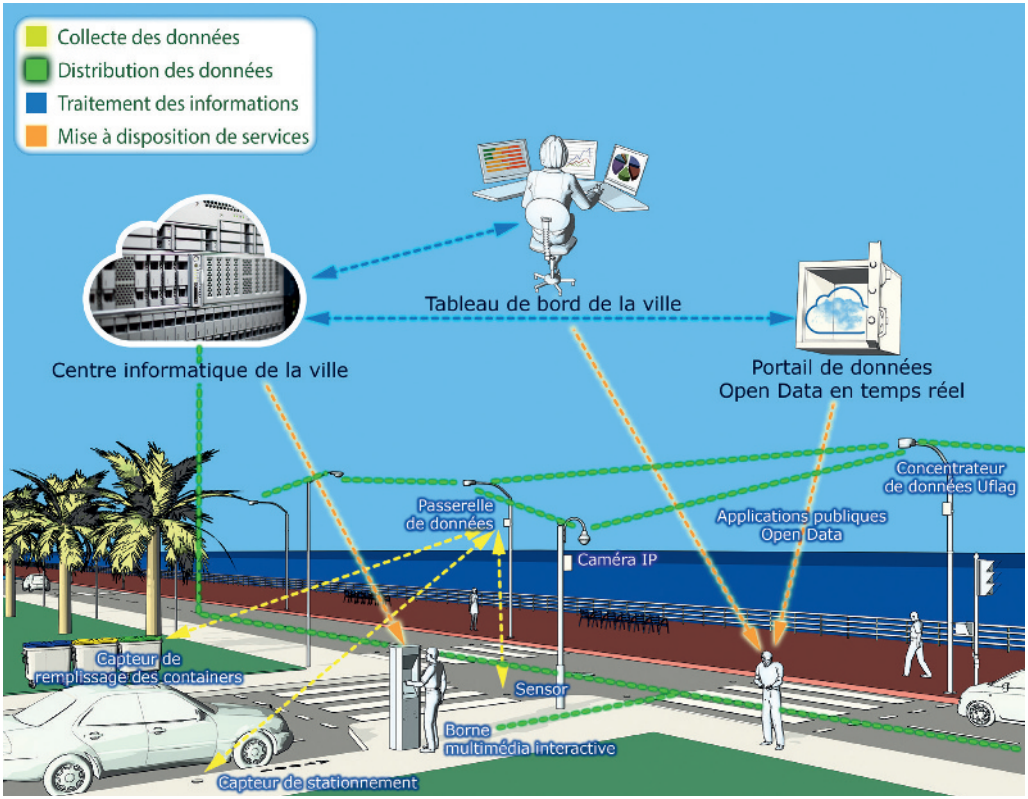


Smart parking sensor platform devised by Libelium, 2011
Sensors buried in parking spaces detect the arrival and departure of vehicles. The information is conveyed to system integrators to offer comprehensive parking management solutions.

on massive investment from individuals. From energy management to waste treatment, city dwellers are more and more frequently finding themselves called to action and faced with strategic choices that affect the overall balance of technical systems. A new model of consumer is emerging which is blurring the traditional line between operators and users.

The consequence of this set of developments resides in the fact that an increasing number of individuals have access to real-time information on their city, a city in which they can control certain functions. This information and control can be brought about through various means. On this subject, the growing role of smartphones – the mobile screens that are assisting us ever more frequently and with ever more diverse tasks, espousing some of our desires especially closely – should be noted. In 2014, around 60 per cent of mobile phone owners in the United States possessed a

Installation of a smart electricity meter in France, 2011
Linky, the meter promoted by EDF, France's foremost electricity supply company, is intended as a first step towards a better management of the electricity grid.



Connected boulevard project in Nice, France, developed with Cisco Systems, 2013
The data collected on the boulevard are sent to the city computing centre (the cloud on the left), before being displayed on the city dashboard (figure in the centre). They also feed an open data portal (on the right).

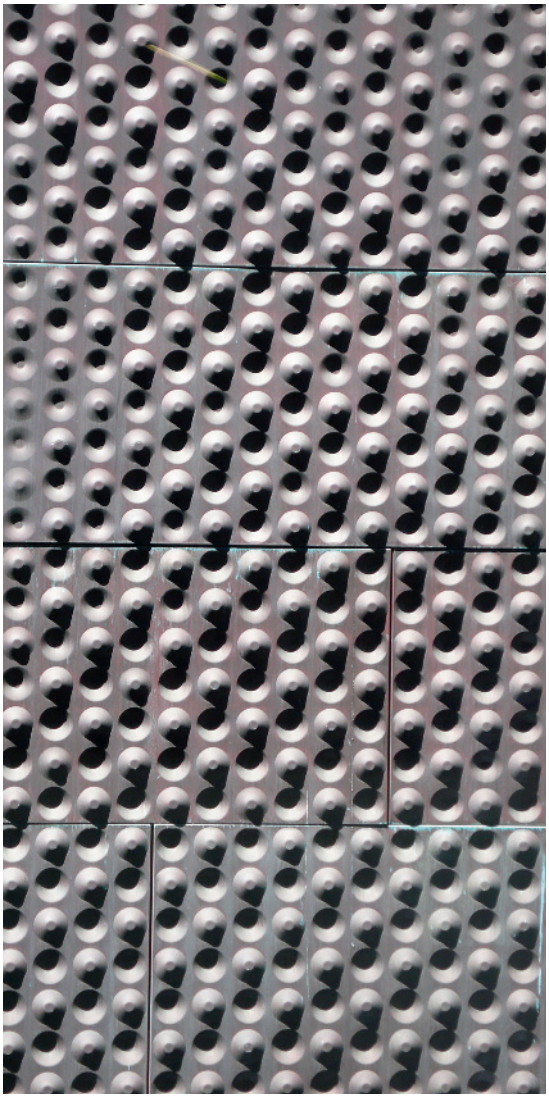
smartphone.[35] The 50-per-cent level had already been reached in the EU5 countries (UK, Germany, France, Spain and Italy) by the end of the year 2012.[36] This market penetration is not restricted to developed countries. During 2013, the proportion of smartphones rose from 10 per cent to more than 22 per cent of the total number of mobile phones in India, and this growth is forecast to continue at a sustained pace in 2014–15.[37] Even more than the 'fifth screen' – the electronic bulletin board that many towns are still counting on to improve their communication – it is the smartphone screen that is currently making the most difference to our relationship with the city.[38] All kinds of information relating to the environment, transport and cultural life are displayed on it in real time. It can also be used to decipher the two-dimensional barcodes that are proliferating all over the place on urban walls.

Through the various terminals which city residents can access to inform themselves and make decisions – mobile phones being foremost among them – something like a dawning of city consciousness is being brought about, in which the city discovers the state it is in as well as the directions it may take. Revealingly, the municipality of the highly connected city of Santander runs a website called 'Santander City Brain' to collect ideas and suggestions about its present state and future.[39] The impression of a dawning consciousness is at the origin of the notion of the sentient city, which has aroused the interest of numerous researchers, designers and artists.[40] It is as though the urban realm were suddenly equipped with a sensitivity capable of resulting in some form of consciousness, or even self-awareness.

Although there is not strictly a relationship of cause and effect between these two sequences of phenomena, but rather a shared source – the individual in the digital era (which will be discussed in chapter 2) – the intuition of a city that has developed the equivalent of sensations is reinforced by the prominence of the senses: sight, but also hearing, smell, taste and even touch, as much in the way we represent the city as in the judgements we make about it. Tactility in particular constitutes a rapidly rising dimension in contemporary culture. This is witnessed by the new place accorded to it by architecture through what tends to be described as the 'return' of ornament.[41] Before the sentient city, or rather as a complement to the capacity of feeling that we attribute to it, stands an individual who, far from being cut off from sensation by the digital revolution, reveals him- or herself to be hyper-receptive to all types of sensory stimuli. There have been many publications by researchers and critics examining the consequences of this hyper-receptivity in fields from contemporary art to gastronomy.[42] As for the city of senses, the sensory city or indeed the sensual city, in 2005–6 the Canadian Centre for Architecture dedicated an exhibition to the theme which revealed the new urban issues that are attached to it.[43] The subject went on to become the main theme of the French contribution to the 2010 Shanghai Expo coordinated by the architect Jacques Ferrier.[44]

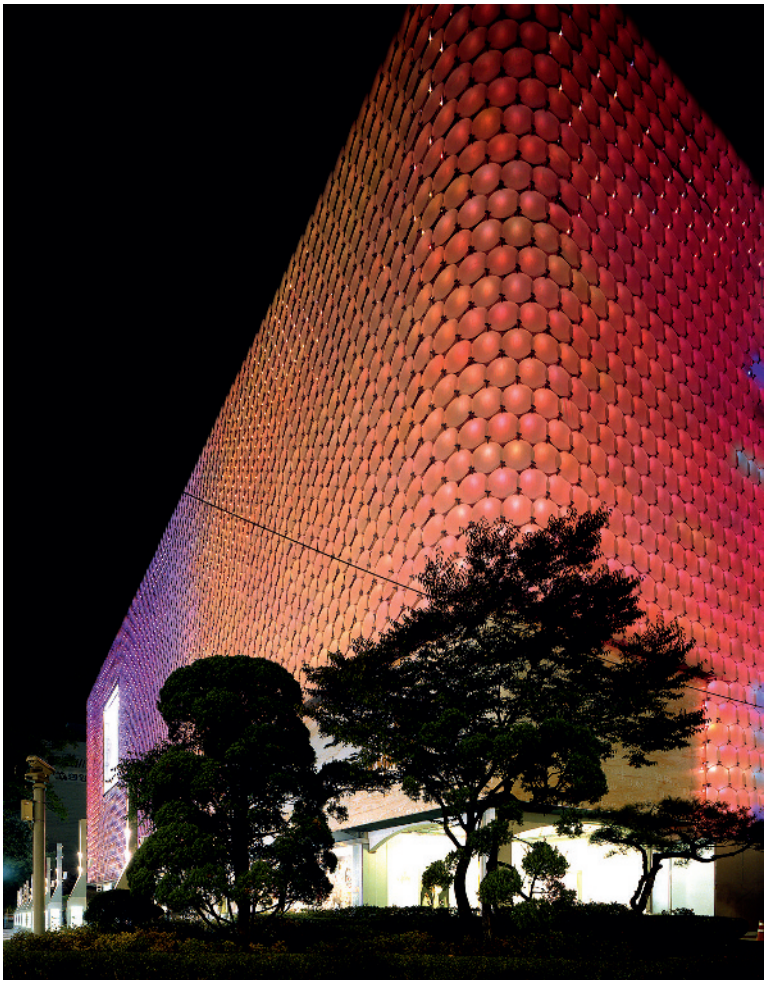
Herzog & de Meuron, de Young Museum, San Francisco, 2003
Typical of the 'return of ornament' in architecture, the envelope of the museum seems to blur the boundary between sight and touch with its dots that evoke the Braille alphabet.

Sentient city and sensory or even sensual city: the two perspectives are interrelated. The notion of the senseable city, to which the laboratory founded by Carlo Ratti at MIT refers, purposely plays on the confusion between these two possible interpretations of the urban realm in order to propose a city that would be at once equipped with some form of sensibility and detectable through the senses, with or without the assistance of information and communications tools (sensors).[45] Furthermore, both



refer to development issues that are related to the digital. This is obvious in the case of the sentient city, as already discussed. For its part, the sensory or sensual city reveals itself as inseparable from the aspirations of the 'creative class', to adopt an expression of the American urban studies theorist Richard Florida, which is at the origin of this new knowledge economy founded on the digital that is presented as an alternative to traditional development scenarios.[46] The stakeholders who embody this new mode of development, be they scientists, businesspeople or designers, are striving for a rich and varied urban environment that engages all five senses. Art galleries, performance venues, gastronomic restaurants and fashion boutiques all pertain to the ecology that the knowledge economy requires, just as much as sensors, fibre optics and ubiquitous computing do. Their absence around Kendall Square, in the business district developed by MIT at the gates of its campus, is seen by the institution as a problem that needs to be resolved as quickly as possible.[47] There can be no lasting intelligent growth without a stimulating urban environment.

Despite this type of relationship, the hypothesis of the sentient city, an urban organism capable of feeling and of accessing some form of consciousness, or even self-awareness, remains far harder to comprehend than that of the sensory or sensual city. It essentially leads back to the question of the smart city that is at the foundation of this book. Intelligent, yes; but in which sense? Before at last addressing this question directly, let us continue to gather clues, paying particular attention to two other dimensions of the sentient city: first of all the accumulation of data relating to it, and then the importance of the occurrences and events that punctuate its life.



UNStudio, Galleria Department Store facade, Seoul, South Korea, 2004
Another instance of the return of ornament in architecture. The changing colours of the glass discs of this facade respond to the dynamics of atmospheric conditions. They are intended to induce pleasurable sensations in the passers-by and shoppers.

Massive Quantities of Data

One of the direct consequences of the proliferation of chips and sensors is a massive accumulation of data relating to the city and how it functions. Mobile phones alone supply large quantities of information about, for example, their owners' locations and the calls they make. With smartphones, which allow access to the Internet, even greater quantities of data can be collected. More generally, cities are progressively entering

Office dA, BanQ restaurant, Boston, Massachusetts, 2008
Gastronomy represents an essential dimension of the smart city. High-end restaurants have become strategic assets in the competition to attract members of the 'creative class' in order to promote a knowledge-based urban economy.

a new phase in their development that is marked by exponential growth in the production and storage of information. At the same time, the strategic character of the urban realm is intensifying for a whole range of big businesses, since information seems more and more to be the strategic resource that drives the engine of capitalism. Being present in such a market cannot be justified solely by the direct profit generated by the sale of products and services. It also allows access to a precious data set that can be either directly exploited or sold on.

In such a perspective, the question of the control of information produced by cities arises immediately. On this point, the diversity of existing attitudes is obvious. While some municipal authorities seek to maintain control of the data generated by urban services, others seem strangely indifferent to this issue. The fact that the question has only recently emerged may explain the latters' indifference at least in part. It would be fair to wager that this will have been banished in a few years' time, when the question of information ownership will be unavoidable and will represent a major political challenge.

Also related to this is the difficulty cities have in acquiring coherent strategies in a field where everything moves too quickly – so much so that it is perhaps impossible to build a stable outlook.

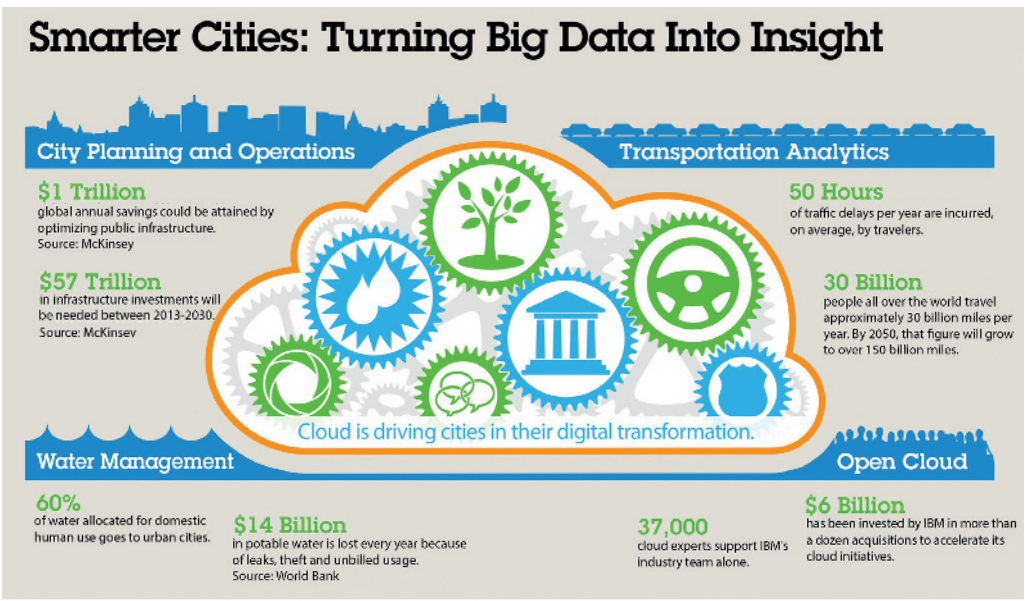
Besides ownership, accessibility represents another sizeable issue. Who has the right to consult and use the data? It should be noted here that rights are not the only aspect of accessibility; it also brings up technical questions of formatting and readability. It is possible to have the theoretical right to consult information but to be unable to read it for the lack of technical training or appropriate software. Only a tiny minority of users are capable of exploiting the raw data that are produced by the smart city's various sensors and servers. The rest need them to be formatted so that they can read and interpret them. The increasingly strategic character of urban mapping, which is intended to render the information produced by cities visible, should be considered in this perspective. The map constitutes one of the ways to make the ideal of open data – which is demanded by a whole range of stakeholders, municipal authorities, Townsend-type civic hackers and community activists – effective. Making data produced by cities available to all would seem to be a new citizens' objective.[48] But, upstream from the statistics and maps that are delivered to the public, do not the formatting of

Elkus Manfredi Architects, image of an 'active street', 2013
The image was used by MIT during a zoning petition. It is not intended to represent actual building designs but to convey the overall ambience of the new Kendall Square district. Numerous shops, cafés and restaurants contribute to the animation of the street.

data and the writing of interfaces that allow them to be read and interpreted, a genuine predigestion of information, confer excessive power on those who are responsible for them? As with data ownership, the way we choose to make data accessible gives rise to questions of a political nature that are only partly answered by the current discourse on the public character of data.

In literature relating to big data, these issues are often relegated to the background by the prospect of achieving a new science of cities based on correlations that would not previously have been noticed between apparently unconnected phenomena, as well as on a more thorough and, above all, more realistic modelling of urban functioning, which is often described, with reference to living organisms, as metabolism. Some enthusiasts' writings can give the impression that the data will spontaneously generate new knowledge, in the manner of an archive that no longer needs historians to produce information about the objects contained within it. While it is of course possible to imagine that algorithms might one day take over from humans to exploit the massive quantities of information that cities are creating, it seems more feasible to envisage a cooperation between machines and humans, even if only to interpret the revealed correlations.

IBM, infographic on 'turning big data into insight', 2013
The document is part of a promotional campaign for IBM's SmartCloud and Smarter Cities Intelligent Operations software. One of the objectives of the latter is to provide a dashboard that enables better decisions to be made for cities by tapping into big data. Such an ambition carries with it a distinct neocybernetic connotation.



Joan Serras and James Cheshire, 'Mapped: Every-day Bus Trips in London', 2012
This map shows the 114,000 daily bus trips in London. The wider and redder the lines, the more buses running along them. Timetable data from over 22,000 London bus stops were used to create a representation emblematic of the new type of urban visualisation made possible by using a very large data set.

In the meantime, it is an illusion to believe that pertinent questions emerge of their own accord, like fungus on the compost of big data. Modelling optimism meanwhile reflects what is perhaps another illusion: that of the city as a system which, while not closed in on itself, is driven only by a finite number of parameters. Such an illusion already typified the systemically and cybernetics-inspired attempts at urban modelling of the 1950s and 1960s, such as the 'urban dynamics' developed by the American computer engineer and systems scientist Jay Forrester in the late 1960s.[49] In this respect it is revealing to see Forrester included among the pioneers frequently mentioned today in literature on smart cities. He features for example among the sources consulted by IBM researchers who were seeking to establish a general theory of the smart city, as well as among those used in a 2013 book on urban modelling that is revealingly entitled *The New Science of Cities*, published by the British urbanist and educator Michael Batty.[50]

This return of the temptation to consider the city as a system founded on a feedback loop between parameters that are finite in number touches on one of the foundational elements of this neocybernetic approach to

Jay Forrester, 'Life cycle of an urban area – 250 years of internal development, maturity, and stagnation', 1969

Jay Forrester's *Urban Dynamics* (MIT Press (Cambridge, MA), 1969) was among the first ambitious attempts to model urban evolution over the long term. Some of the conclusions reached by Forrester, such as the damaging effect of building low-cost housing, proved highly controversial. Equally unappealing for many was the prospect of long-term urban stagnation. For its author, these somewhat counterintuitive results proved the fecundity of urban modelling, a belief shared by many proponents of big data mining.

intelligence, which will be discussed further in the following chapter. Such an approach also refers to an even more fundamental shift, in the final stage of which events and occurrences tend to occupy an ever more determining position in the urban experience as well as in the management of cities. While the networked city that progressively emerged with the industrial era accorded absolute priority to flow management, the latter often tends to fade into the background behind the perception of the dense web of events that take place in cities and the plan to control their evolution in order to construct ideal development scenarios.[51] Flows themselves are more and more systematically perceived from the viewpoint of the events that give them rhythm or disrupt that rhythm. To convince ourselves of this, we need only think of the increasingly determining role that is played by traffic jams and accidents in the perception of vehicular circulation. Like the smart city, the networked city appeared as both an ideal and a concrete process of transformation. This ideal and process are now being replaced. The advent of a new urban intelligence is leading to the transition from the networked city to the event-city.

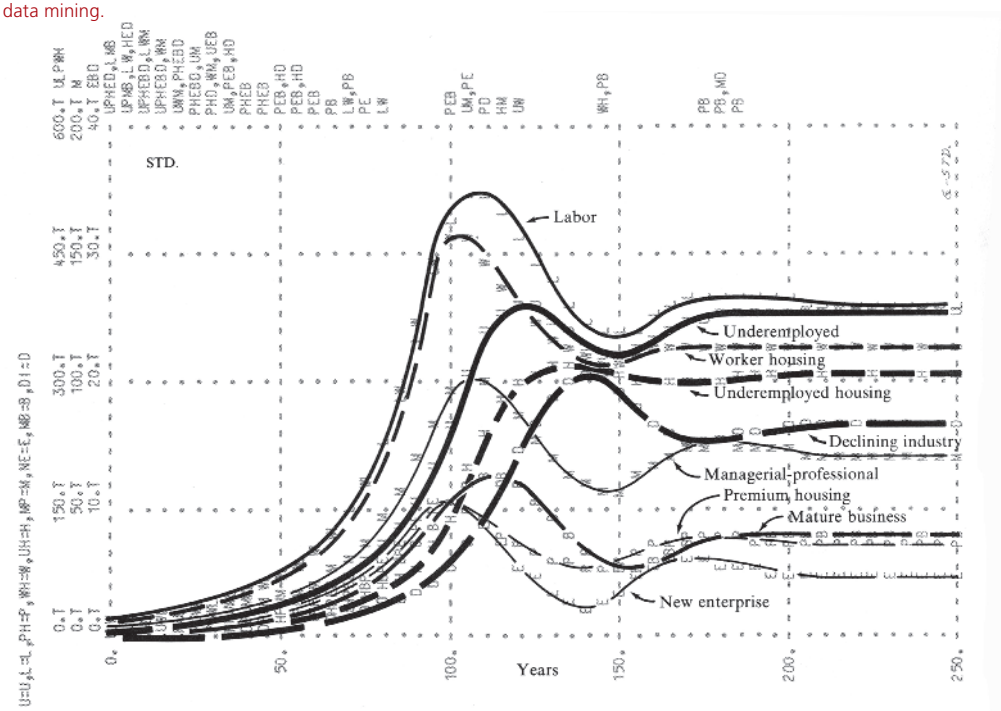


Figure 1-1 Life cycle of an urban area—250 years of internal development, maturity, and stagnation.

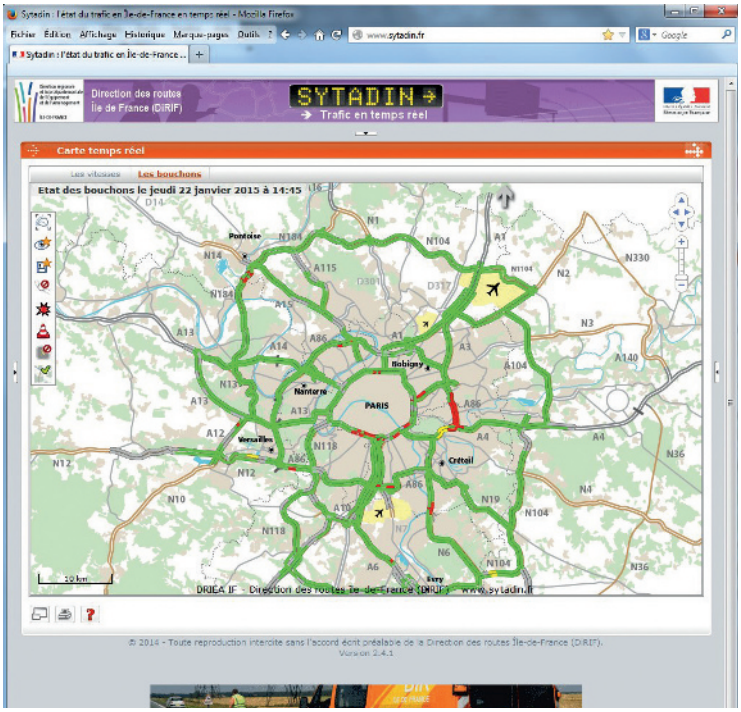
What Happens

On the screens to which they connect themselves, city dwellers have access to occurrences, events and situations, rather than to physical 'things', objects and organisations. Certainly, street layouts are displayed on smartphone screens, but above all what are presented to view are the place where the phone's owner is located and the possibilities at his or her disposal. Occurrences and events: such are also the state of traffic and the existence of jams, the detection of a breakdown or online purchases by consumers who identify themselves through the use of passwords. More widely, every day the sensors and meters of the smart city record millions of elementary occurrences, the temperature at such and such a place, the presence or lack of vehicles, and water and electricity consumption. These

Jean-Charles Alphand, map of the sewers of Paris on 1 January 1889, *Les travaux de Paris 1789–1889*, Paris, 1889
More than any other 19th-century metropolis, the new Paris planned and built by Haussmann and his engineers appears as a networked city where flow management played an essential role.

micro-occurrences agglomerate to reveal more general situations. Traffic maps such as the ones offered by the Sytadin system for the Île-de-France region around Paris are typical of the results that are obtained at the culmination of this agglomeration process. In the minds of its connected citizens, the city begins to merge with everything that is going on within it.

The French philosopher and urbanist Paul Virilio has suspected this event-based character for some time. It formed the theme of an exhibition and book supported by the Fondation Cartier in 2002–3, entitled *Ce Qui Arrive*, meaning 'what happens', in its original French version (though its official English title was *Unknown Quantity*).[52] In Virilio's eyes, the theme necessarily took on a catastrophic tone, from ecological accidents to terrorist attacks such as those of 11 September 2001. Behind these apocalyptic scenarios, cities tend to appear more and more as systems of occurrences and events that sometimes agglomerate and sometimes fit one inside the other. In the first case, the result is overall situations, as has just been explained; in the second, it is the events that now punctuate the lives



Screenshot of the Sytadin website at 2:45 pm on 22 January 2015
Sytadin offers real-time traffic information on Paris and its region. It signals ongoing roadworks and accidents.

of medium-sized towns as well as metropolises – calendars of sporting, festive and political occasions – and whose importance in the definition of the city is only on the increase. Related to this evolution, the iconic monuments of cultural capitals equally tend to be assimilated into events. The Eiffel Tower no longer constitutes so much a 300-metre-high metal structure erected in the 19th century as a constantly renewed celebration of Parisian identity in which tourists are invited to participate. Its visitor numbers – 6.7 million in 2013 – likewise represent a situation constructed from micro-occurrences which are meticulously tracked by the organisation in charge of managing the Tower.[53]

Piled up, agglomerated, fitted one inside the other or – more often than not – all in a tangled muddle, occurrences, events and situations form the threads from which the fabric of today's great urban narratives are woven. Even more than urbanists' plans, it is the narratives and scenarios that are inspired by them which allow cities to set objectives for themselves. The often-denounced crisis of urban planning is revealed to be contemporary with the rise in power of an event-based city in which reality and fiction are often difficult to distinguish from each other. For example, it is possible to pass almost imperceptibly from the visitor numbers for the Eiffel Tower and events such as 'Paris Plages', for which temporary artificial beaches are created along the river Seine in summer, to the narrative of Paris as tourist capital of Europe, or even of the world,

Cover of Paul Virilio's *Ce qui arrive*, Actes Sud (Arles), 2002
In the exhibition and catalogue entitled *Ce qui arrive* (literally 'what happens'), Virilio developed an interpretation of the contemporary city based on the importance attached to devastating events such as accidents, ecological catastrophes and terrorist attacks. The public paid particular attention to this interpretation, in the immediate aftermath of the 11 September attacks of 2001.

Cargo plane crash in Amsterdam, Netherlands, 4 October 1992
The crash of a cargo plane belonging to the Israeli airline El Al on the Bijlmermeer neighbourhood of Amsterdam killed 43 people. Because of its spectacular character, the accident was among those referred to by Virilio in *Ce qui arrive*.

which constitutes one of the clearly declared strategies of Paris's municipal authority. Despite the publication from time to time of regional-scale masterplans, the French state's 'Grand Paris' initiative, launched in 2007 to adapt the metropolis and fit it for the 21st century, also stems more from narrative than from traditional planning. It revels in successful substories, such as that of the Saclay plateau south of the city, which has been dubbed the European Silicon Valley or France's Cambridge, Massachusetts. The plan for the regional metro system's development up to 2050 also seems to come straight out of fiction – a fiction to which it is tempting to attribute a self-fulfilling character, on the model of what happened in the field of information and communications technology.[54]

Paris is not the only metropolis to feed off self-fulfilling narratives. The event-city par excellence, with its half-million surveillance cameras, royal news updates and Olympic Games, London dreams of bristling with crystal towers like those of Shanghai. It aspires to reconcile Asian-style economic dynamism with European-style sustainable development.

However, beyond the ticket offices of Parisian monuments and the surveillance cameras of London, the role played by digital technology in the rise of the

The Metropolitan Police Special Operations Room in London, 2007
A bank of television monitors displays images captured by CCTV cameras. In London, video surveillance does not only represent a means to monitor what happens. It is also part of more wide-ranging scenarios regarding the future of the city as a place where globalisation goes hand in hand with security to ensure a better quality of life.

'Paris Plages', a view of the banks of the Seine near the city hall in Paris, 2002
'Paris Plages' is typical of the importance accorded to all kinds of celebrations and festivals in the elaboration of long-term urban scenarios.

event-city stems from something more fundamental than the omnipresence of instruments for capturing what is happening. Information possesses, by its very definition, an event-based character, since it corresponds to the selection of a given state within a range of possible states. This begins with the basic bit of information which, as is well known, can take a value of 0 or 1 – the value finally taken appearing as a micro-occurrence. The French philosopher Pierre Lévy put it well when he wrote that: 'a bit is neither a particle of matter, nor an element of an idea, it is an atom of circumstance'.[55]

Ever since the very beginning, the world that information and communications technology has been helping to bring about has possessed a strongly event-based character. It is no accident that one of the first major computer networks, and the first where something could be revealed on screens thanks to a computer, is related to the paroxysmic events that are thermonuclear strikes. This is the Semi-Automatic Ground Environment system, better known as SAGE: a set of tools for aircraft detection and anti-aircraft defence to protect North America against possible attacks from the Soviet Union, which was coordinated through the largest computers of the period, built by IBM specially for the purpose.[56] At the height of the Cold War, what could be seen on the screens in the SAGE system's control rooms were events and situations – and these could be virtual or real, because the reign

of computer simulation began at the same time as the response plans for possible thermonuclear attacks were being developed.

It is interesting to note that the inventor of the SAGE system is the same Jay Forrester who is today recognised as one of the pioneers of urban simulation with his 'urban dynamics'. What is more, the city development scenarios that Forrester elaborated rely on the same type of program as the one that powered SAGE. From the outset, computer simulation has covered a vast area extending from defence problems to urban and even environmental issues, since Forrester's program was also to serve as a basis for the Club of Rome think-tank's scenarios in the early 1970s concerning the exhaustion of natural resources and the increase in pollution.[57]

With the rise of simulation, the boundary between what is really happening and what is simply likely to occur is becoming less clear than before. In envisioning a supercomputer, a distant descendant of those in the SAGE system, which can no longer quite tell the difference between simulated and real attacks (even though it controls the launch of the United States' intercontinental missiles), the film *WarGames*, directed by John Badham in 1983, reveals the risks of such a shift from the real to the virtual event. Although reality has always fed on fiction, the influence of the latter has been considerably reinforced with the advent of the digital.

Factory Fifteen, a possible future skyline of London, 2011
Other key elements of many London scenarios for the future include the strong presence of high-rise buildings that conjure up a European version of the Shanghai district of Pudong, as well as various elements of green infrastructure.

View of a control room of the SAGE system, 1959
On the screens of the SAGE system, one of the very first large-scale computer networks, operators could monitor events and situations related to the defence of North American airspace.

Revealingly, it is an adolescent video gamer who sparks off the crisis portrayed in *WarGames*, by hacking the website of the North American Aerospace Defense Command (NORAD) and setting about playing with the computer. Video games plunge their devotees into a universe dominated by occurrences, events and scenarios. While the settings contribute to the immersive character of each round, it is the events, quests and battles that matter most. The world of video games, where players pursue objectives and frequently take aim at other players, still today displays aggressive or even militaristic characteristics. It appears as the heir of some of the logics developed in the Cold War period – such as the importance of the human–machine pairing, which was to generate the theme of the cyborg, and the impossibility of completely distinguishing between reality and fiction. It was this impossibility that turned the Cold War into a 'game' where hypotheses were rife, and where scenarios managed to achieve as much importance as facts. Even more than the conflicts that preceded it, the Cold War went back

to a series of grand narratives, or rather a metanarrative which justifies taking arms when faced by a potential worldwide conflict that must be avoided at any cost. Pending this inconceivable event, the metanarrative of a clash between blocs gives meaning to regional and local clashes and to the partial narratives that they generate, such as the countless stories relating to the Vietnam War. Here again, the video game takes on board this importance of the metanarrative, which serves as a background for the rounds in which the gamers engage.

Occurrences, events, situations and scenarios circulate from the city to the video game. The narrative dimension is another unifying factor between these realities that are otherwise so different. A strong social component might also be added to the list of possible analogies. Because – contrary to the vision of their detractors, who are quick to reduce them to a solitary exercise of reaction and adaptation skills – many online games, beginning with the famous *World of Warcraft* which brought together some 12 million gamers at its peak in 2010, are also platforms for socialising.

The command centre of NORAD, still from John Badham's *WarGames*, 1983
On the screens of the command centre, a nuclear war simulation game played between the NORAD mainframe and the main protagonist of the film, a high-school student who has hacked the NORAD computer network. Only the computer does not know the difference between simulation and reality.

Screenshot from the Ubisoft video game *Watch Dogs*, 2014
Aiden Pearce, the hero of the game, checking his smartphone. The smartphone is an essential component of the game. It enables Pearce to hack into various devices linked to the city's central operating system.

This set of analogies forms the stage onto which various games that use the space of the city as a setting invite themselves. Armed with their smartphones, participants carry out missions at the interface of the physical and digital worlds, immersed in this augmented reality that increasingly constitutes the framework of an urban experience in which atoms and bits would seem to be joining forces. The game *Watch Dogs*, launched in 2014 by Ubisoft, summons up this enriched urban experience by presenting a character who has to use his smartphone to survive in a futuristic Chicago. Does this mean that cities, as well as schools and businesses, are becoming 'gamified'? There is much talk of gamification in relation to the application of video-game logic to all sorts of areas, from education to services. Our perception of the city likewise carries the mark of this proliferation of gaming culture.

Like many of the fundamental aspects of human culture, the notion of the game has always been ambiguous. For example, how far is it appropriate to extend a notion that encompasses everything from children's games, chess and relaxation at no cost, to sporting competitions, World Cups and Olympic Games which may have considerable financial and political interests attached to them? Digital culture has amplified some of these ambiguities. 'Serious

games', which go hand in hand with the rise of simulation, thus deliberately mingle the tone of entertainment with that of competition, allowing schools and businesses to refine their pupils' and employees' reflexes and to test new strategies. Above all, in many video games the true identity of those playing them is problematic. Surely the real protagonists are those who have conceived virtual worlds such as *World of Warcraft* and *Final Fantasy*, rather than those who come into conflict within them by following pre-established scenarios? As will be shown in chapter 2, this issue is not unrelated to some of the questions raised by the development of intelligent cities. Who should govern them: a caste of decision-makers who are likely to program the urban realm in the manner of a life-size game, or all those whose actions come together to make them into living environments? The transition from the city of flows to the city of events, situations and scenarios is accompanied by major political uncertainties.

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