



**E-city: digital network
and cities of the future**

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Key to the reading

In writing this book, my aim is to reflect upon the perspectives related to the development of Information and Communication Technologies (ICTs) Particularly, I will try to understand whether the innovations deriving from these new technologies can bring about significant changes in urban planning and in future urban models.

The underlying hypothesis is that the field of urban and territorial planning is undergoing a transitional period where new technologies merge with old methodologies of project elaboration. In the academic world, as well as in the public administration, not everyone seems to have fully understood the scope of the "digital revolution", and this translates into a sort of resistance to change.

Nevertheless, new information and communication technologies nowadays permeate all aspects of our social life and are bringing about substantial changes in the way people relate to each other as well as in individual behaviours. The so-called Digital Life is a phenomenon that concerns the younger generations in advanced societies: in addition to classroom education, young people learn to develop new codes of human interaction thanks to computers, mobile phones, SMS, the i-pod

and all the other digital multimedia tools currently available on the market.

The proliferation of digital applications has already induced radical changes in several sectors. By way of example, we can mention the automation of production processes, photography, financial transactions, home banking and on-line shopping. In addition to that, we can expect new and more user-friendly applications to be developed in the future and to become ordinary tools in our daily lives, thus affecting our habits and determining new life styles.

In the wake of such considerations, the book tries to look at the future. It does so by focusing not really on the technological, sociological or economical aspects of the phenomenon, but rather on the new urban models that will be developed in an information society that is increasingly geared towards globalisation, and on the urban planning tools that will regulate future land transformation processes.

The book is divided in three parts: 1) e-Network, which emphasises the development of digital networks and the ensuing land transformation processes; 2) e-Planning, which focuses particularly on planning tools and the innovations brought about by the development of ICTs; 3) e-City, which looks at the cities and territories of the future. Each part stems from one initial question which underlies and directs the whole reasoning.

PART 1. e-Network

«Can digital networks determine territorial settlement patterns, thus playing the role which was previously exerted by other network infra-

structures, such as the rail or the motorway system?»

In tackling this issue, we have to bear the following in mind: digital networks have to be viewed as a new category of public works in its own right; thus, we must think of their strategic use in synergy with other public works.

As a matter of fact, contrary to common thinking, digital networks are not "immaterial", but they are conveyed by a physical infrastructure made of pylons, cables, aerials, satellites, hardware and software platforms. Communications systems, which are the physical pillar required to set up a digital network, can be either via cable (twisted pair, optic fibre) or wireless (WiFi, WiMax, UMTS, satellite) and they differ in cost, set-up time and performance, which is not a secondary issue at all. The very rapid evolution of information applications determines an early obsolescence of equipment and services, thus requiring greater processing power (computer) and higher performance telecommunication systems (broadband). It is precisely the availability of broadband networks which is becoming an insufficient though necessary condition for the development and competitiveness of territories. Many on-line services can be used as indicators to determine the level of attractiveness of a specific territory: telemedicine, e-government, ASP services, but also home banking, e-learning, e-commerce, etc.

As an example, let us focus on the services offered to enterprises. Particularly at small and medium enterprise level, we see a consolidation of "outsourced services", i.e. phases of the production process (which are peripheral to the core objective of the company) that are

entrusted to external companies in order to reduce costs and ensure adequate qualitative standards. Many of these services can be carried out on-line, provided that a performing telecommunication system is available. This shows that the competitiveness of a territory can be measured according to the availability of digital networks suited to the new needs of companies and citizens. And this may sometimes conflict with the policies of broadband development adopted in various countries. In this early phase, the creation of infrastructures for telecommunication systems was completely left in the hands of private operators who, quite rightly from their point of view, followed a market-oriented approach. The result was a reasonable acceleration in the distribution of ADSL technology (the first step into the world of broadband communication), but a limited achievement, for instance, of optic fibre networks in a few big cities, where the service area ensured an economic return on the wiring costs incurred by the private operator.

This should make us reflect upon the Digital Divide phenomenon which, to the mind of many people, boiled down to southern countries being opposed to more developed ones. As a matter of fact, within some European countries it is also possible to measure a considerable gap in the competitiveness between those territories which are reached by robust digital networks and those which are cut-off from them, such as rural and mountainous areas. It is likely that this divide will become even greater as the increase in traffic and the development of ICT applications provided through digital networks will require even "broader" bands and the twisted pair will no longer be sufficient for the provision of the service. ADSL 4Mb/sec (the most commonly

used in our households) was the fastest connection speed a few years ago, but is already inadequate for several types of services. We see it, when we want to watch a movie in streaming⁽¹⁾ or when we want to start a video-conference.

This train of thought leads us to a conclusion: it is most likely high time to start a second phase of digital network development, characterised by a closer public-private relationship to ensure the management and rationalisation of network infrastructures and on-line services. Public authorities can no longer "gaze out the window" letting commercial factors be the only ones to determine the development of digital networks. They must, on the contrary, perform their duty and set out an overall strategy which combines the legitimate economic objectives of private operators with the development policies of various territorial contexts. To this end, the digital network must be considered as a truly strategic objective, just like the other network infrastructures. This is what determines the great value of digital networks in their interpretation as a new category of public works.

In the first part of the book, we try to piece together the role of infrastructure networks in the development of western civilization (chap. 1), from Roman ancient networks to modern Trans-European Networks. What emerges is a direct link between the development of network infrastructures and the development of the economy. It may be difficult to determine which one comes first, but there is certainly a symbiotic relationship. The future will bring us global networks, further investments and, above all, new relationships between the public and the private sectors (chap. 2). The traditional sources

of financing for infrastructural networks (state budgets) will inevitably disappear because of the physiological ageing of the population, the resulting curtailed tax revenue and the greater attention paid to other aspects, such as welfare, social security, tax pressure, environmental protection, etc. All this suggests that, in the near future, public financial resources might not be sufficient to accomplish and maintain the infrastructural networks required by more industrialised countries, and that resorting to public-private partnerships might therefore be appropriate. Any consideration on the future of infrastructural networks cannot disregard climate change and global warming. This is why we have used four different scenarios (chap.3) to simulate how some events in conjunction with some scientific discoveries and social changes can determine the future of our planet. We then tried to understand the environmental, social and economic implications of each simulated scenario. The resulting considerations underline the importance of scientific research applied to infrastructural networks and, more generally, to production processes, in order to optimise performance and reduce consumption. From a physical point of view, future "intelligent" infrastructural systems will not differ considerably from the current ones. The differences will lie in the way they will be able to react to external input and in the services they will be able to provide to end-users. As a conclusion to the first part of the book (chap.4), we will dwell upon a particular category of infrastructural networks, the digital networks, and we will describe their evolution from their dawn to the new economy, focusing on the effects on modern society.

PART 2. e-Planning

«Can the widespread use of ICT technologies contribute to the innovation of projects for territorial and urban transformation? »

The second part of the book deals with the innovation of urban tools (chap.5). There has been a lot of debate in the past about the possibility that the techniques that lead to the elaboration of tools could actually induce substantial changes in terms of their contents. No doubt, the recent ICT innovations have found interesting applications in the urban sector, such as the GIS (Geographical Information System) or e-Government. However, the overall impression is that these substantial changes in urban planning tools induced by new technologies are limited to the representation of cities and territories (CAD and 3D modelling) and to knowledge acquisition processes (relational databases and GIS). Very little, in fact, have they contributed to the processes involved in the communication of choices and, even less, to the decision-making processes involved in the elaboration and management of solutions.

When talking about Digital Urban Planning⁽²⁾, even those who are most sensitive to the issue refer to the rationalisation and development of network infrastructures and to the on-line services that can be provided on the territory by those networks. Needless to say, they intend to demonstrate that networking is essential for the social organisation of the city of the future⁽³⁾. However, translating their thoughts into urban planning tools that are truly capable of regulating territorial transformations by making the most out of ICT yet requires a lot of daring. A group of Chinese scholars have been busy

carrying out some undoubtedly interesting research on the concept of Digital Urban Planning⁽⁴⁾. The expression "Digital Planning" is also starting to arouse a certain degree of interest among the national scientific community⁽⁵⁾ and some local authorities have embarked on some initial experiments in this regard⁽⁶⁾. We should try to understand the state of the art and the new perspectives for Digital Urban Planning (chap. 6), meaning the innovations that recent technologies in conjunction with the use of internet can induce on urban techniques, on tool production methodologies and on territorial governance procedures.

An additional remark is required for the question introducing the second part of the book (the equation ICT = tools innovation). Three different phases can be identified in a territorial transformation project: knowledge acquisition, decision-making, implementation and effect monitoring. Applied to an urban plan, the first phase corresponds to urban analyses and their representation; the second phase to the elaboration of Plan Tables and of implementation technical norms; the third phase to the approval and management of the plan.

The knowledge acquisition phase is perhaps the most impacted by technological innovations in the planning process. It embraces new representation methodologies (bi-dimensional and tri-dimensional) as well as new digital technologies that support territorial analyses: satellite pictures using Google earth, bird's eye representations using Live search, data on traffic and pollution collected by detection stations, etc. Technological platforms used to achieve additional levels of knowledge on the territory, such as the GIS, can also be assimilated to this

phase. From a telematic perspective, e-government services are also innovative tools that can be used to carry out administrative activities and, at the same time, increase the level of knowledge on the territory.

The decision-making phase is more empirical and the borderline with political mediation is more blurred. This is also why, up to now, new technologies have had a more feeble impact. Yet, we can observe some evident improvements, for instance, in the possibility to contribute to the choices being made. NIMBY⁽⁷⁾ phenomena, which often retard or even hinder the achievement of important projects of public works, can be kept within physiological limits by applying suitable information sharing methodologies and by promoting participation to decision-making processes thanks to the internet. The internet can be an amazing tool for the support of democratic participation to the political debate. Its added-value lies in the fact that, while providing institutions and political associations with an extraordinary tool to disseminate information among citizens, it also activates the opposite process, by enabling citizens to participate to the political debate and to the shaping of tendencies and orientations, at both institutional and party levels. Furthermore, internet is perceived by users as a more credible and trustworthy tool than other communication means, since it does not pass through any filters.

The implementation and monitoring phase has always been the Achilles' heel of urban planning. Innovative projects with a clear scientific value can be nullified during the approval process and remain entangled in the warp of management procedures which do not allow for any changes

unless through the painstaking "Institute of Variation". In this field, suggestions for a more productive use of new technologies are less frequent: it is clearly yet an experimental phase. We can only point to general objectives for increased flexibility. For instance, we could make the Technical Norms for the Implementation of Plans more suited to the achievement of established public service provision objectives. We could elaborate performance-based fabricability indexes according to the energy-efficiency level of buildings. Or we could resort to equalisation models that are based on permutation processes managed by a GIS which is capable of indicating the availability of suitable parcels and the interests of building plots' owners in these permutational operations.

PART 3. e-City

«Can the widespread use of digital networks, in the long term, give rise to new urban models or even new land management schemes? »

The third part of the book focuses on the future of our cities and our territories with respect to the development of digital networks and to the increasingly common use of ICT applications. The concept of digital cities is becoming increasingly integrated into the common language, conjuring up science fiction scenarios of cities that are more and more projected towards the future. However, if we look for a more accurate definition using, for example, an internet search engine, we find out that this expression can have different meanings. The concept of Digital Cities is often associated with an arena where people from a local community can interact with each other and exchange

knowledge, experiences, services or simply share interests using the internet⁽⁸⁾.

This is, for example, the nature of the American On Line (AOL) Digital Cities. These are on-line guides of the major American cities where, besides comprehensive information on entertainment and tourist activities (restaurants, attractions, cinemas, etc.), the user has the possibility to purchase services and products on-line. More complex are experiences like the Amsterdam Digital City, which appears like a hardware/software platform allowing citizens to interact with the public administration in order to obtain services or information, using the PC at home, or from other locations in public areas (libraries, bus stops, etc.⁽⁹⁾). The Helsinki Arena Project is even more diverse. It creates a virtual city using a 3D model and allows for the interaction of citizens through live video⁽¹⁰⁾.

The Kyoto Digital City is a complex architecture on three layers which is capable of creating synergies and providing citizens and tourists with a lot of information and services obtained from the GIS such as, for example, real time data collected by detection centres scattered throughout the city (traffic, parking capacity, weather, pollution, etc.)⁽¹¹⁾.

All these experiences (and many others which have not been mentioned but are just as meaningful) have a common denominator: the Digital City is conceived as a more or less complex user-friendly hardware/software architecture, which is more or less rich in terms of interaction possibilities and provides information and services to the citizen-user with regard to different areas, such as tourism, trade, transport, welfare, health, civil protection, politics, etc.

Although innovative, the different meanings of the Digital City that we have so far analysed and the pilot projects on which they are based are solely limited to the technical aspects of the hardware/software platforms that convey them: Digital City = Virtual City. In other words, the city, its functions and, where possible, its interactions are simply represented in a virtual arena created through ICTs. Quite interesting, but certainly well below our objectives! We are more interested in expanding the concept of Digital City and associate it with a city of the future where the intensive use of ICTs can produce considerable changes in the way in which the city is used, and perhaps even change its spatial organisation.

In this branch of research, some key authors are William J. Mitchell⁽¹²⁾ and Manuel Castells⁽¹³⁾, who have made, over the past few years, important considerations on the sociological effects of a future dominated by ICTs. Following the reasoning of these two authors, let us try to foresee the consequences of the "digital revolution" on the future of our cities (chap. 7). We realise that we are faced with a complex phenomenon of fragmentation and reassembling of existing urban models. A bit like in a chemical reaction, where some links are broken up, others are preserved, and new chemical components of unknown properties are created *ex novo*⁽¹⁴⁾. It is unlikely that these transformations will happen in a sudden and catastrophic manner. On the contrary, they will take place in a slow and incremental way. Particularly interesting for us in this process are the new relations that can be established between new urban models and the perspectives of environmental, social and economic sustainability. We have started to ponder on a

new concept, that of "digital ecology", which can actually represent a new frontier for sustainable development. Whereas during the economic boom of the industrial era, important aesthetic, environmental and cultural values were often sacrificed in the name of development, the new information society, characterised by a new sensitivity towards these issues, imposes different choices. The digital era can mark the reapproaching of man and the environment, through a sustainable use of its resources thanks to scientific innovations, among other things. In a society which is increasingly service-oriented, the use of information and communication technologies can no longer be viewed as an optional. On the contrary, it is an indispensable prerequisite for sustainable development and for the competitiveness of territories, especially the ones which have remained on the fringes of global development (chap. 8).

of territorial transformations brought about by new communication technologies: the Digital Plan)

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- (1) The term streaming refers to a flow of audio/video data transmitted by a source to one or more destinations through a telematic network. The data are decompressed and reproduced a few seconds after their reception has begun, without the need to download the entire original file in order to be able to use it.
 - (2) see Wu S. et al., "Digital Urban Planning, Concept and support technology", in Lai M. and Wang M., *Theory and Practice of Digital City*, World Book Press, Guangzhou 2001.
 - (3) see. Castells M., "La città delle reti", Marsilio, Venice 2004. (The city of networks)
 - (4) see. Anrong Dang, Huizhen S., Haoying H., Lei W., "Study on system of technical methods for digital urban planning", ISPRS Workshop on Service and Application of Data Infrastructure, XXXVI (4/W6), October 14-16, Hangzhou, China 2005
 - (5) see. Fistola R., "Nuovi strumenti urbanistici per il governo delle trasformazioni territoriali indotte dalle nuove tecnologie della comunicazione: il Piano Digitale", XXII Italian Conference on regional Science, AISRE, Venice October 2001. (New urban planning tools for the management

- (6) see Fistola R., "Digital urban planning e pianificazione digitale del territorio", XXVII Italian Conference on Regional Science, AISRE, Pisa October 2006. In this paper, the author presents the Digital Plan for the city of Benevento, Campania.
- (7) The acronym NIMBY (Not In My Back Yard) indicates an attitude of protest against works of public interest which are deemed necessary, but are not wanted in one's own territory. Typical examples are the construction of important communication axes, waste-to-energy plants, landfills, roma camps, power plants, etc.
- (8) see Ishida T., "Understanding Digital Cities: Cross-Cultural Perspectives", MIT Press, Cambridge, MA, 2002.
- (9) see Van den Besselaar P. and Beckers D., "Demographics and Sociographics of the Digital City", Springer-Verlag, New York, 1998.
- (10) see Linturi R., Koivunen M. and Sulkanen J., "Helsinki Arena 2000: augmenting a real city to a virtual one", in *Digital Cities: Experiences, Technologies and Future Perspectives*, Springer Verlag, New York, 2000
- (11) see Ishida T., "Digital City Kyoto", in *Communications of the ACM*, n. 7 vol.45, July 2002.
- (12) see Mitchell, William J., "City of Bits: Space, Place and the Infobahn" (MIT Press, 1995); "E-topia: Urban Life, Jim - But Not As We Know It" (MIT Press, 1999); "Me ++: The Cyborg Self and the Networked City" (MIT Press, 2003)
- (13) see Castells M., "The Information Society and the Welfare State: The Finnish Model", Oxford UP, Oxford 2002; "The Network Society: A Cross-Cultural Perspective", Cheltenham, UK; Northampton, MA, Edward Edgar 2004; "The Network Society: From Knowledge to Policy", Center for Transatlantic Relations 2006.
- (14) see Mitchell, William J., "Designing the Digital City", in: AAVV, *Digital City*, Springer Berlin, Berlin 2000.