'TO PLAN OR NOT TO PLAN': THE SOCIOTECHNICAL SHAPPING OF FUTURE CITIES[1]

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Introduction

The massive diffusion of new information and communication technologies (ICTs) – especially the more recent development of mobile and wireless technologies – has necessitated a re-conceptualising of the relations between space, time and technologies. City-makers and urban scholars currently face an enormous challenge, as new notions of space and time increasingly call into question old paradigms. This process in turn affects the way ICTs are dealt with as part of government, planning and policy agendas.
This 'paradigm challenge' affects the whole range of issues related to the analysis and management of spatial, economic, political, social and cultural aspects of contemporary urban life, and constitutes perhaps the main task in thinking through relations between cities and ICTs.

In their pioneering work *Telecommunications and the City*, Graham and Marvin (1996) introduced an element of order to the chaos of ideas and assumptions about telecommunications. They organised its impacts on crucial sectors such as the economy, social and cultural life, urban environments, infrastructure, urban physical form, and planning and governance. A whole chapter was dedicated to the conflict between old and new paradigms.

Recently in many municipalities around the world, there has been a wave of public initiatives regarded as best-practices of policies for a so-called digital inclusion strategy which, local authorities argue, is to be followed by a broader process of social inclusion. Public participation is one of the main elements in such policies, and is one of the first assets to be cited in local authorities' discourses. As ICTs have become an economic competitive advantage for attracting inward investments, many of these initiatives tend to be supported by the false idea that ICTs alone can serve as social and economic leverages. And so, possible strategic roles of ICTs within the urban agenda would be compromised by a more immediate and superficial application.

This is what a cross-national research with four case studies (two European and two Brazilian cities) on the sociotechnical shaping of urban-technological development policies has shown. This study focused on the way local authorities and planners are looking at ICT issues in terms of visions, physical and digital initiatives, and policy.

Previous results point towards the global tendency of using ICTs as economic competitive advantages, and the immense difficulties of planners in dealing with invisible and rapid-changing elements of the contemporary city.

This paper aims to explain, first and briefly, some of the challenges posed to planning and governance in the way these activities are being fragmented across public administration, while missing the pace of technological developments in the city. Second, we move on to observe some concrete cases in which planners and local authorities of well-developed cities in Brazil, Belgium and the UK have been faced with these challenges, towards the construction of an urban-technological approach for urban planning. A third, and perhaps most important part, will build a comparative analysis between the four case studies, based

on a group of influential factors. Finally, the fourth part draws some conclusions that might help us understand and better plan the future of our cities.

1. Challenging the traditional forms of urban planning

The transformations imposed by ICTs have been threatening all concepts about space, time and cities, and this in turn affects notions about region, nation state, place, boundary, distance, concentration, decentralisation, physicality, virtuality, and territoriality, just to name a few. Different concepts that underpinned urban society and urban studies in the past are called into question by new spatial relations directly influenced by new technological, economic, political, social and cultural paradigms. These paradigms are however dominated by a simultaneous complexity and vagueness.

Since a great deal of work on urban studies traditionally relies on "physicalities" – visible and tangible things like the physical space and traditional infrastructures –, invisibility seems to be a very common embedded challenge to the paradigms that underpin the contemporary organisation of urban space:

> "In contrast to motorization that completely altered the urban scene, IT has quietly merged into the existing urban structure, causing little change in appearance." (Shiode, 2000: 105)

Thus, if it is hard for scholars and researchers to 'see' and 'touch' ICT applications and infrastructure, it is even harder for planners and local authorities to overcome this paradigm of invisibility and intangibility. For those who deal daily with traditional urban problems – like traffic congestion and the maintenance of transportation links, problems with water or electricity supply, or urban violence – it may be too difficult to understand the complexity and virtuality of electronic networks carrying no more than invisible signals from one computer to another, and the flows of information and knowledge that permeate contemporary forms of human interaction. Pragmatically, this sometimes results in local authorities and planners experiencing problems raising the proper resources or support for more proactive initiatives. This is because, when trying to justify high investment on ICTs, they cannot always show improvements statistically.

Therefore, due to this invisibility, networked ICT infrastructures are usually taken for granted. Perhaps as a consequence of this, some commentators have noted a tendency for planners and policy-makers to overlook ICT matters. These challenges directly contribute to city-makers' lack of awareness about virtually every aspect of ICTs. The fact that connections are rarely made between ICTs, land use and transformations of urban form means that city-makers are often unfamiliar with many aspects of urban technological and knowledge-based developments.

Such changes imply new systems of physical infrastructure and, consequently, new ways of delivering services to the population. These powerful new infrastructures are being used to transcend physical spatial constraints, and represent a significant transformation compared to the previous systems of roads, highways, bridges, copper-cables, and water and sewer pipes.

To aggravate this complex situation, despite this new system being added to more traditional forms of infrastructure, there is also an organisational and managerial uncertainty. The neo-liberal economic model under which the technological and regulatory changes happened led to the superimposition of different private-owned systems of the same or similar kinds in a given city or region. This reflects well the chaos that cities and regions have become as new infrastructures have been superimposed on traditional ones, and where control and management are far from the hands of local authorities.

This lack of a more comprehensive notion of ICT infrastructure and applications suggests that commercial and private-driven initiatives are proactively taking advantage of these new tools to draw inventive models in directions quite distinct from the public interest. Meanwhile, ICT initiatives are "slipping through the fingers" of planners and local authorities. This seems to corroborate to Graham and Dominy's (1991: 193) argument that "telecommunications appear to be very much a secondary area of policy for many local authorities, being considered largely in relation to other policy initiatives".

Due to these uncertainties, the theoretical approaches to the field of ICTs and cities could not appear more heterogeneous. Meanwhile, on the ground, unbalanced and polarised urban developments are a much harder and worrying reality.

2. Constructing an urban-technological approach for planning

The comprehension of such contradictory coexistence of complexity and vagueness is a key stage in the process of overcoming the historical neglect of ICTs by the public sector. The concepts embraced by Social Construction of Technologies (SCOT) theory are seen as crucial here. This theory is important because it demystifies the idea of aseptic technologies, of technical elements without more important and intrinsic roles in society. The idea is that of technologies or a set of technologies (or 'artefacts' as they are called by Bijker, 1987; see also Bijker, Hughes and Pinch, 1989) with a range of complex social, economic, political and cultural roles, that is to say, a socially constructed development of a certain technology.

In other words, introducing new technologies to be absorbed by society implies considering all sorts of interactions and manoeuvres by what Bijker (1987) calls 'relevant social groups', so that these technologies would occupy their space in time (in terms of practical use). In socio-technical terms, this process is regarded as the stabilisation of a certain artefact, where society has come to a consensus about the meaning of this artefact and has, thus, incorporated it in a series of social activities.

Another concept borrowed from SCOT which can be very useful here is that of 'interpretative flexibility' (Pinch and Bijker, 1989). This concept offers an explanation for why so many 'languages' are spoken by actors within the events of a socio-technical process, generating complexity and vagueness. Interpretative flexibility deals with the variety of visions and interpretations given to a certain artefact within a given social context. According to Pinch and Bijker (1989), each interpretation of an artefact depends on how a 'problem' and respective 'solutions' are realised by different actors.

The confusion, complexity and vagueness of the concepts related to ICTs and their impacts on the notion of space seem to be directly connected to the enormous amount of interpretations of ICT initiatives by different actors. As long as they do not understand what ICTs are, they will also have a different vision of what ICTs can be used for. Accordingly, Pinch and Bijker (1989: 41) argue that "different social groups have radically different interpretations of one technological artefact". In the specific case of urban-technological strategies, this would mean a number of alternative strategies; one for each social group or one for each conjunct of problems and solutions. Why, then, is the concept of interpretative flexibility relevant to the attempt to explain the dilemmas of urban-technological developments in this context?

A proper answer to this question must come from a cross-national study that has taken into account four case studies, being two in Europe (Newcastle upon Tyne in the UK, and Antwerp in Belgium), and two in Brazil (Catanduva and São Carlos). In general terms, however, interpretative flexibility helped us to map out the variety of major interpretations of the ICT initiatives in these four cities, and to find interesting similarities. Social actors and

technological entrepreneurs (the people who lead the idea of a certain implementation) can be identified in order to identify distinct visions and discourses. This shows how a possible dominant model may or not prevails over other visions to result in a single strategy. So, what would be the outcome of such dispute of different interpretations?

A decisive aspect of the challenge to understand the network society is the recognition of local strategies for the use, implementation and management of ICT developments. We suggest that special attention has to be given to some crucial dilemmas involved with the promotion and social construction of such strategies. Uncovering these dilemmas and barriers can be useful for further policy implementations that may be more integrated (in terms of traditional urban and ICT policies), more efficient and more adapted to the diversities of different localities. In this sense, the way local authorities manage interpretative flexibility and a possible democratic construction of urban-technological strategies has proven to be one of the most influential dilemmas.

2.1 Seeking integration within a fragmented structure: the cases of Newcastle and São Carlos

We can find some similarities regarding the structure of urban-technological approaches in cities surrounded by as different contexts – nationally and internationally – as Latin America and Europe, as Brazil and United Kingdom. Leaving the most structural contrasts aside, it is possible to say that the ways through which Newcastle (UK) and São Carlos (Brazil) find to implement ICT-related projects within their urban agendas, are very similar, considered that both cases have no structured division or directorate dedicated to this strategic task.

Newcastle upon Tyne is a city characterised by the struggle of its local authorities, development agencies and population against the decreasing number of jobs and quality of life that affects the whole North East of the country. In recent times, as with most cities in this region, Newcastle and its economy were dominated by heavy industry, especially coalmining and ship-building. This dependence of the city's economy on heavy industry has had a long-term effect on its image, and on citizens' confidence in the local authorities' ability to reverse the economic crisis in the region that followed industrial decline. Newcastle has entered enthusiastically into the race for competitive advantages to attract people to live in the region, with particular emphasis being placed on incentivising clean, high-tech industries to relocate themselves in the North East of England. The recent history of Newcastle has been driven by this, a fact which is reflected in the development of ICTs, which has tended to rely on regeneration projects, and initiatives to rebuild the image of the city.

The constant attempts to rebuild the city's image are a feature of urban renaissance and urban regeneration discourses that have in turn provided strong motivations for the implementation of ICT initiatives. This sense of renewal stems from the economic development premise that Newcastle has to get rid of its image of a depressed former industrial city with poor quality of life, in order to advance as a new city of the 21st century.

Attempts to image the city according to some economic development paradigms, such as business centres, educational poles, technological centres of excellence, science regions and the like, has been an imperative to cities around the world. While local authorities try to rebuild Newcastle's image over and over (from coalmining to heavy industry, and then to 'party' town, and now as tech-and-culture centre), the young town of São Carlos (which is about to turn 150 years old) has a half-century tradition of being portrayed as Brazil's capital of technology. São Carlos is indeed known for hosting branches of two of the biggest and best universities in Brazil (University of São Paulo and Federal University of São Carlos) as well as other research centres (such as Embrapa). This is reflected in some figures that show the incredible rate of 1 PhD for every 179 people living in the city, in a population of about 200 thousand inhabitants. Authorities claim that the city is to receive two science parks

at once before 2008. The idea of publicising the city as the capital of technology emerged in the 1980s, with the creation of Brazil's first technology-based business incubator in the city. Local authorities have been proactive in promoting the city as such ever since.

The urban regeneration discourses in England emerged with full force, also, during the 1980s and 1990s as an attempt to 'rebuild' cities and re-arrange local economies. The ideas embedded in urban regeneration proposals brought about a strong sense of renovation. With the advance of information and communication technologies, the convergence of media, and the development of other new technologies, this will for renewal seems also to have been renewed. ICTs are a great motivator for regeneration projects as well as for attempts in building a city's image from scratch (as it is the case in São Carlos), and may be used to attempt to trigger shifts in the local economy. The use of ICTs for boosterism is apparent in the local actors' discourses and perceptions as a vision of urban development.

ICTs were and are still the 'product of the moment' for cities, so Newcastle and São Carlos had no option but to adopt a proactive discourse. It was therefore natural that telematics technologies should become a major player in the game of local boosterism following the entrepreneurial imperative in both cases.

In Newcastle, this impetus continues today under the umbrella of the City Council's Going for Growth initiative. Ideas of renewal, renaissance and regeneration are exactly what the 25-year strategy Going for Growth is based on. ICTs are a very small part of the whole project, and ICT projects are scattered through various initiatives and parts of the council. These projects and visions are also, in fact, reflected in the fragmented way in which ICTs are implemented by the City Council through its management structure of six directorates. Projects, apart from bigger cross-division ones such as Going for Growth, are usually defined and carried out internally within the directorates and divisions. ICT projects are no different. They are, therefore, developed almost in isolation across the divisions of the council. This means that projects are developed without attention to mutual interaction. In this way, even costs, benefits and budgets for ICTs are extremely difficult to pinpoint.

To try and generate an overview of this situation, Newcastle's council has implemented what is called the E-Services Panel, which is made up of City Councillors and directors of some divisions. It is aimed at the discussion and approval of ICT projects. However, the analyses and deliberations of this panel tend to follow predominantly economic factors rather than social, cultural or even spatial ones. In the end, the panel becomes dependent on priorities setup by other departments, and tied to the management structure of the city itself.

São Carlos, as most cities in Brazil, has a long list of directorates called secretaries, such as: agriculture, health, education, finance, sports and leisure, sustainable development, planning and management, housing and urban development, and so on. They are sixteen in total, and despite all attempts of central coordination, each secretary has its own projects, which depending on the overall relevance within the administration, are sometimes integrated.

The most visible attempt of coordination is a programme which uses both a computer system locally developed called Management System for Public Actions (SAOP in Portuguese) – which tracks deadlines sending emails to the people in charge of different public actions –, and a routine of meetings with the whole secretariat every month, in order to follow the accomplishment of every project by the municipality. This seems to be something very similar to Newcastle's E-Services Panel, with the difference that in São Carlos meetings are not exclusively targeted at ICT strategies. The city still has an IT division, which technically builds the majority of ICT initiatives in the city, without having the authority to plan broader and more transversal actions.

This is not to say that local authorities in São Carlos are not aware of the importance of ICTs for governance and planning, but that actions are carried out rather in a scattered fashion which, in turn, tends to lessen the comprehensiveness of the initiatives over city-wide problems. One example of this comes from a very important department specifically created to manage information flows and databases called Department of Information, Documentation and Patrimony. Instead of being a central division within the whole administrative structure, it is partially isolated as part of the Secretary for Housing and Urban Development.

In both cases, the management structure of the city follows a 'silo' distribution model, so that the resources and targets are vertically distributed between the many directorates, secretaries and their respective divisions. There is thus no global budget established especially for ICTs. Each one of the directorates and secretaries has its own projects related to the use of ICTs for different purposes, each therefore has its own separate budgets. These are, in turn, part of one departmental budget.

The historical approach to ICTs, and their symbolic meaning as an investment attractor points towards continuity in terms the way telematics technologies are developed as part of entrepreneurial and business-focused strategies. If this general historical perspective prevails, both Newcastle and São Carlos are likely to continue to figure in the crossfire of fierce competition among urban centres.

2.2 Centralised coordination of urban-technological strategies: Antwerp and Catanduva

Antwerp, at the heart of Flanders, is one of the biggest cities in Belgium, with one quarter of the Flemish population, and is strategically positioned at one of the corners of the region so-called Flemish Diamond. Apart from its economic importance for Flanders and Belgium, the city has also become synonymous in Europe with innovation, and with the successful implementation of ICTs, being a founder member of the steering committee of TeleCities. It is undoubtedly the most advanced city in Belgium to make extensive use of ICTs for public administration. Local authorities in Antwerp regard ICTs as a central issue for the future of the city, and have created a specialist agency dedicated to ICTs, Telepolis.[4] This semi-independent agency is responsible for the coordination, use and implementation of ICT initiatives in the city, the modernisation of the city administration, the management of infrastructure and contracts related to ICTs, and for urban-technological policy-making (Firmino, 2004).

Catanduva, in Brazil, is considered a medium-sized city with its 110 thousand inhabitants. Despite not being a prominent case in any economic sector – surrounded by bigger and more important cities in the State of São Paulo –, regarding Brazil's continental size, Catanduva is well situated in the heart of the most prosperous state in the country, being part of a network of more than fifty well developed and well structured medium-sized cities in São Paulo (included São Carlos). Perhaps because of its relative small size, the city has been receiving media attention in the past two or three years as a case of success in applying initiatives related to electronic government (eGov), digital inclusion, administrative integration, public wireless network, and so on. Although in a small proportion and not with the same broader results as Telepolis in Antwerp, local authorities in Catanduva have given power to a certain IT Department within the Secretary of Urban Planning and Informatics, to create and disseminate its own comprehensive ICT initiatives.

In Antwerp, the early development of ICT initiatives – particularly infrastructure – was heavily influenced by the political and administrative restructuring of local authorities in Belgium. The regional devolution process of the early 1980s triggered an intensive introduction of ICTs by the city administration in Antwerp, in order to administrate the merger of nine neighbouring

localities into what now is the municipality of Antwerp. With this urban amalgamation in place, the political strategy immediately adopted by the local authorities was the decentralisation of public services and administration across nine city-districts. There were also concerns over the growth of the extreme right wing party, Vlaams Blok, in recent elections. This situation, apart from justifying the political decentralisation, also forced the democratic parties to form a coalition in the city council and districts to ensure a strong opposition against the Vlaams Blok, which was called the *cordon sanitaire* (Van Assche, 2002). Decentralisation was thus the only way around political and financial problems that had arisen over night, and was envisaged by local authorities as an adjunct to the establishment of the *cordon sanitaire*.

Local authorities' proactiveness in Catanduva come from a much more peculiar situation late 2004, when the, then, just elected mayor decided to form a close and small body of three advisors from different backgrounds in order to both conceive a broad and comprehensive agenda for the next four-year actions and keep tracking the accomplishment of its derived initiatives. The body, informally known as Strategic Management Group, had as one of its leaders, not incidentally, the director of the IT Department, and soon launched an umbrella project called Catanduva Digital City. The project embraced a variety of initiatives related to the use ICTs targeted at different areas such as education, health, public transportation, urban surveillance, administrative modernisation, and so on. Catanduva Digital City has been very celebrated in Brazil as one of the best ICT initiatives in the country; unfortunately not without political appropriations. At the end of the first year in office, local authorities had to deal with the collapse of the coalition that won the elections, representing a weakening on the mayor's political power to manage his projects. Digital City has, then, lost some power and media attention but, most importantly, kept its main characteristic of being the umbrella for a variety of actions related to ICTs, with applications in many areas of urban development. Authorities have just started harvesting the good outcomes of such a proactive attitude towards urban-technology, such as a more integrated and modernised government, a network connecting educational end public health systems, a public wireless network covering the whole city, etc.

ICTs also worked for Antwerp as an integrative instrument because of their capacity to improve communication between different departments of the city and between 'district houses' (the political and administrative headquarters for a given district). Telepolis is the physical and institutional result of the evolution process of Antwerp's urban-technological approach, and it is Telepolis that provides Antwerp's differential in terms of strategy. It is a unique case of a strong and relatively independent public body being created to deal exclusively with ICT issues. The creation of a central agency like Telepolis is not a common phenomenon in the recent history of urban-technological developments in Europe, although it is being emulated here and there on a small scale.

Independently of specific results and the age of these cases, Telepolis in Antwerp, the IT Department and the Digital City project in Catanduva, form the central spine of a coordinated structure to deal with and plan a long term strategy for urban-technological development in these two cities. Therefore, in Antwerp as well as in Catanduva, some social groups have tended to envisage ICTs functions and capacities as a means to enable, respectively, the ongoing political reforms in Belgium, and the opportunity to integrate and strength, locally, the very fragmented political structure in Brazil. Thus tremendous efforts have been and are still being made to establish a solid and integrated urban-technological strategy in both cases, despite their very contrasting regional and national scenarios.

3. The sociotechnical shape of urban-technology: a comparative analysis

We learned that at least three factors are extremely influential in the sociotechnical shape of urban-technological strategies, and need to be taken into account while observing and

analysing the role of urban planning and urban development for the future of cities: the importance of interpretative flexibility; the power of a particular context; and the shape of the general approach towards urban-technology.

3.1 Negotiating visions: the importance of interpretative flexibility

Interpretative flexibility represents one of the most influential dilemmas confronting local authorities as they attempt to develop an urban-technological strategy (Firmino, 2004). While a plurality of visions may be beneficial for a democratic construction of initiatives, it may prove difficult to handle and translate into strategy. Yet, it takes into consideration the fact that the development of ICT initiatives by local authorities is a complex social and political phenomenon involving a number of parties and variables. The wide variety of visions of ICT initiatives by the different sectors involved in the development of public policies is crucial in defining the local approach.

We can see an interesting contradiction between the cases of Newcastle and São Carlos on one side, opposed to Antwerp and Catanduva, on the other. On one hand, both sets of actors' discourses presents virtually the same patterns of dominant aspects related to interpretative flexibility, in a number of divergent visions to ICTs, and with prominent discourses of economic regeneration and administrative modernisation. On the other, looking at the structure in which the initiatives are developed from the early stages of negotiation, these two groups of cases are very different from each other. Fragmentation dominates the scene in Newcastle and São Carlos, while in Antwerp and Catanduva, an integrated and centrally coordinated approach prevails.

In the first two cases, projects are generally conceived, planned, funded, implemented and managed virtually independently in terms of the internal divisions of the municipalities. This means that a division can run an ICT project without interacting with other divisions. Depending on the nature of the project, interaction will eventually take place, only when the original unit needs further relationship with others. In Antwerp and Catanduva, such interaction happens almost compulsorily, as Telepolis and the IT Department lead nearly 100% of ICT-related initiatives, towards a better integration of visions. This means that every ICT initiative will tend to be developed according to the interests of actors in the city administration, the council and the ICT-dedicated units.

While not necessarily meaning that every interpretation and expectation will be taken into account, the integrated approach in Antwerp and Catanduva seems to have greater chances of handling interpretative flexibility than the fragmented structures in Newcastle and São Carlos. This does not necessarily mean that projects and initiatives developed in one city will be more successful than in others: such differences in terms of projects also depend on the way they are further developed and implemented. An alternative implication, or the downside, for cases with strong central coordination, is for the coordinator to suppress the multiplicity of visions with an 'authoritarian' implementation of initiatives.

As regards the approach and strategy for the four cases, two clear patterns stand out. First, within the fragmented fashion of developing public actions, visions for a particular initiative are dealt with on a small scale, in terms of directorates and secretaries. Interpretations representing different units tend not to collide on their way to becoming an action or policy. They are 'canalised' from the early moments inside the responsible unit, through to implementation, usually by the same unit. So, once a project is defined by a certain unit responsible for its implementation, it tends not to be influenced by other units' visions, as there is little interaction between them. Second, following the centrally coordinated model, demand and ideas for initiatives tend to be the sole responsibility of the ICT-dedicated units. The local government and city departments need to report to them in case of a certain

demand or problem related to ICTs. The units will then, through their officers and technicians, study the case and promote further development.

Interpretative flexibility is thus a clear challenge for local governments' urban-technological development of ICTs. According to the cases studied, managing the diversity of visions for ICTs, produces different results in terms of ways that actions are structured and put in place. This is not to say that high levels of interpretative flexibility will prevent local authorities deploying ICT initiatives. However, from the perspective of an integrative strategy, interpretative flexibility is a major dilemma. In order to create integration within local government for an urban-technological development, interpretative flexibility would have to be incorporated into a single strategy.

3.2 The power of a particular context

Another influential factor said by interviewees to be directly involved with the current shape of these structures is the regional and national context of which these four cities are part of. This of course makes a cross-national study more complicated but also very valuable for analysis and comparison.

The British political and managerial system on one side, and the Belgian and Brazilian on the other, represent roughly, two opposite sets of systems in terms of centralisation and decentralisation or, in other words, in terms of autonomy delegated to local authorities.

The British system is highly centralised, with central government deciding targets, general policies and the mainstream funding to be allocated. It was clear that in order to keep a reasonable flow of inward investments from the central government – which represents the major income – local authorities have no option but to follow the strict agenda set by Downing Street. Little flexibility and autonomy is allowed, with the result that local authorities tend to function as no more than representatives of the central government. Local authorities and their strategies are strongly tied to what London judges best for them.

Despite the significant differences between Brazil – a federation of 26 states and one federal district, with power division between federal, state and municipal spheres – and Belgium – also a three-tiered federation with divisions between federal, regional and linguistic governments – they both share the fact the their regions and municipalities exercise more autonomy in deciding about their own major action in terms of urban-technology. In Belgium, for example, the city of Antwerp has been autonomous enough – even in the context of the Flemish region – to decide about its own territorial, administrative and political configuration with little interference from upper levels of the government. The planning system in Belgium and in Flanders allows local authorities to decide about targets and policies as long as these are compatible with the very general plans established for each territorial unit of the country. The Brazilian cases are not much different, giving that cities actions do not go against state and federal constitutions.

In short, the upper governmental levels in Brazil and Belgium do not interfere in the means local authorities use ICTs and pursue their targets, as long as they are in accordance with the strategic plans for the regions and the country. These differences between the three countries, obviously, play an important role in the creation and management of city-wide strategies and have to be taken into account, independently of specific similarities between the cities' actions.

3.3 Similar initiatives, different approaches

As regards the approaches and strategies adopted by Newcastle, São Carlos, Antwerp and Catanduva, what is evident is that they have developed or are still developing very similar

projects when seen in isolation. These include street kiosks, access to the Internet and computers through public places, social inclusion schemes through free or subsidised courses, modernisation of the administrative and managerial structures, a public body to oversee the ICT projects, and so on.

However, looking at the initiatives in isolation is not in itself a sufficient basis for understanding each city's approach, which is better achieved by looking at the way they integrate the projects and manage all these things together, as well as their vision for ICTs. This area reveals remarkable distinctions between the two sets of cases described above (dispersed and integrated), and a contradiction that is present in both.

Now, what is even more striking in terms of the overall structure of urban-technological development, is that the combination of local political context with the lack or presence of integration, and yet, the vision or awareness of particular social groups in each case, have produced basically four different patterns of actions and attitudes towards the use of ICTs in cities. This seems to corroborate our argument that integration, though being a facilitator and important issue for policy-making, does not alone guaranty the success or the final shape of an urban technological strategy. In the end, this will depend on a myriad of factors that combined, form what we are calling the sociotechnical shape of urban-technology.

Thus, first, a strongly centralised structure at the national level in the UK, together with the extremely fragmented and dispersed structure of local actions and budget distribution in Newcastle, results in a vague, indeed barely discernable urban-technological integrative strategy characterised by the reactive and defensive attitude of the local authority.

Secondly, in São Carlos, while enjoying the relative municipal autonomy of Brazilian political structure, and having a dispersed way of developing actions and projects, local authorities have managed to produced extremely interesting cases of ICTs usage in urban development initiatives and to modernise public administration almost from scratch. This is mainly because of a very privileged group of visionaries inside local government, beginning with the mayor, most of them very welcoming to new ideas aimed at longer term urban planning strategies.

Third, in the same political context as São Carlos, and with a more centrally coordinated approach to the use of ICTs as part of the urban agenda – with the IT Department and the broad Digital City project – local government in Catanduva has had many problems on trying to implement specific projects on the ground, due to reasons that range from financial shortages to political disputes. Sooner or later, many initiatives are put in place, though many times not as initially and centrally planned by the IT Department.

Fourth, although, we face a dispersed, decentralised and very complicated general government structure in Belgium, with different and complex levels of territorial and cultural distinctions in a country with three main languages (Flemish, French and German) and three active cultural communities (Flanders, Walloon and Brussels), a highly centralised and integrated structure defines the strategy towards the coordination of ICTs and urban policy-making in Antwerp. The consequence is an integrated strategy with a proactive attitude from local authorities and the public agency.

Finally, it is evident that these four cities represent exemplary cases of two distinct ways of approaching and understanding ICTs as part of the urban agenda (dispersed in Newcastle and São Carlos, and integrated in Antwerp and Catanduva). These cases also represent four different ways in which the social construction of ICTs or the absorption and stabilisation of a set of information and communication technologies takes place at the local level, vis-à-vis the existent social structure, the political and administrative systems, the economic basis, the historical and circumstantial conditions, and key actors' interpretations and aspirations regarding these issues.

4. Conclusions

It is interesting on the basis of this comparison of four cities in three different national scenarios, to note the similarity between them in terms of the individual projects and the dominant aspects of actors' interpretations (such as economic development discourses, portraying ICTs as competitive advantages, etc.). Despite this equivalence, the overall strategies adopted by the respective local authorities were very different. Fragmentation on one side (Newcastle and São Carlos) and integration in the other (Antwerp and Catanduva) were found to be the outcome of complex relations and elements such as, for example, the political and administrative context of each case. Another influence was the historical circumstances in which each strategy was developed. The initial motivations of the actors in each case were also influential here.

The most interesting differential between the way these approaches evolved into initiatives, seems to lie in the way different interpretations, visions and expectations are managed by the local authority or local power. Incorporating them into a single vision (or not), integrating them (or not), seems to be the most relevant factor shaping urban-technological strategies. Interpretative flexibility and urban-technological strategies in these cases, showed to have their connections related to the nature of interpretations and the processes involved with the handling of such interpretations.

After this brief comparative analysis in a cross-national perspective, we cannot conclude this paper without highlighting the importance of two aspects in the sociotechnical construction of future cities: the relations between planning and urban-technological issues, and the handling of interpretative flexibility on the construction of urban-technological strategies.

4.1 Relating planning to urban-technological issues

Recent studies (Graham and Dominy 1991; Spectre 2002a 2002b; Aurigi 2005; Firmino 2005) show that few cities are dealing consciously with the relationship between physical and digital urban spaces aimed at evolving a democratic construction of ICT strategies and a closer interaction with public places. However, the relation between planning and urban-technological issues is not something new or unknown, from the point of view of social construction of technologies. Cities and technologies have already been addressed as a socio-technical phenomenon by Aibar and Bijker (1997) in a very specific and different account.

They address a unique framework of social construction of technologies to explain the rival plans for the extension of the urban area in Barcelona in the nineteenth century. This study, *Constructing a City: The Cerdà Plan for the extension of Barcelona,* is particularly interesting in analysing urban planning through the lens of social constructivism. According to Aibar and Bijker, the issues of cities and technologies started to attract the attention of urban researchers in 1979 with a special issue of the *Journal of Urban History*. The first striking vision of this phenomenon could not be other rather than one dominated by technological determinism or, as the authors put it:

> "Researchers studied the role of technologies like street lighting, sewage, of the telegraph in the processes of geographical expansion of cities and of suburbanization. Technology was analyzed as a force that shaped society and the cities, but its own character and development were regarded as rather unproblematic and even autonomous." (Aibar and Bijker, 1997: 5)

By considering the approach of planners and policy-makers to technologies historically, the authors found evidence of a grotesque dissociation between the social, economic, spatial

and technological spheres. Space was commonly seen (and still, in many cases) as an aseptic container for social activities, while technology was taken to have little influence over the shape of local societies inhabiting these spaces. Space was rarely considered by planners and city-makers to be a social event itself, complexly interrelated with everything else (including history); nor was technology itself seen as socially shaped. This created a methodological and conceptual gap between the development of technologies in cities on one side and planning interests and activities on the other.

Yet, according to Graham and Marvin (1996), the development of information and communication technologies has worsened this complicated relationship between planning and technologies even further because of their invisibility, fast evolution and novelty in terms of application and consequences for social and territorial configurations. By the time Graham and Marvin delivered their theory, traditional technologies (water, sewage, transport etc.) were already part of a more familiar approach within urban studies, as a socio-technical process. Telematics technologies have opened the way to further confusion about their relationship with the urban milieu. As Graham and Marvin state it, "urban studies and policy remain remarkably blind to telecommunications issues" (Graham and Marvin, 1996: 7).

In the cases of Newcastle, São Carlos, Antwerp and Catanduva, these difficulties in comprehending, at least superficially, the complex relations embedded in the development of technologies for cities potentially compromise further actions and policy-making towards a strategic use of these developments as urban issues and part of the urban agenda. In the most prominent case, although particular and historical conditions have generated a strategic vision for technological development in Antwerp, the city is still missing an urban or spatial component of this vision by not involving planning with ICTs. In Catanduva, the IT Department is part of the structure of the Secretary of Urban Planning and Informatics, but both parts are kept apart from one another while traditional planning activities are still following their path with little integration to ICT issues.

This fact might indicate that while actions on the ground may differ enormously amongst cities in Europe, Brazil or elsewhere in the world, the mindset of perceptions about ICTs seems to be extremely homogenous in the way they are affected by a confusing and varied range of visions marked by technological determinism.

4.2 Interpretative flexibility and urban-technological strategies

If the projects implemented and dominant aspects of actors' interpretations are so similar, what makes the difference between the cases? This difference has to do with the way these interpretations are managed up to the final stages of the implementation of an initiative.

Recalling these most significant characteristics, while the structures in Newcastle and São Carlos do not consider integration and incorporation of visions to a broader strategy, in Catanduva, but even more in Antwerp, the ICT-dedicated units are responsible for this role of a mediator and coordinator. Antwerp's agency, Telepolis, is the most evident example, being an organisation indirectly created to translate interpretative flexibility into strategy. Although working with a top-down type of strategy, this mechanism does succeed in giving a voice to the most relevant parts in the public administration, enabling them to consider their own visions and assessments of problem and solution in the area of ICTs.

So, although there seems to be a relation between interpretative flexibility and the performance of ICT initiatives, this particular connection cannot in the end be verified in the four cases above. Instead, we saw that different ways of dealing with interpretative flexibility (even if involuntarily), result in different strategies for urban-technological issues. As a consequence, we must conclude that interpretative flexibility seems not to interfere in the

implementation of ICT projects, but in the way they are developed within the local government structure.

Interpretative flexibility appears to be inherent to ICTs development just as well as any other aspect of urban development. This should not be seen as a negative aspect however: It seems to be crucial that a bottom-up model of decision-making process (involving public participation), involve and incorporate a large number of social groups' expectations. In other words, interpretative flexibility is an important ingredient of a possible democratic shape of public policies.

We can thus conclude that interpretative flexibility in itself plays a very relevant part in building integrative urban-technological strategies. It is nevertheless the way different interpretations are taken into consideration that will ultimately define the shape of such a strategy.

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4 In October 2003 a merger between Telepolis and the IT department of the city of Ghent created Digipolis. The two biggest cities in Flanders joined forces for the constitution of an inter-municipal agency.