World Digital Cities: Beyond Heterogeneity

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Abstract. This paper reviews worldwide activities on regional information spaces. In the US and Canada, a large number of community networks appeared in the early 1990s. As a platform for community networks, information spaces using the city metaphor are being developed worldwide. In Europe, more than one hundred digital cities have been tried. Asian countries are actively adopting the latest information technologies for city informatization. All of the above are independent activities, and thus their goals, services, and organizations differ. In parallel, local commercial portals provided by global companies are becoming very common in major cities. Unlike regional community networks and digital cities, to increase the efficiency of gathering and maintaining local information in a large number of cities, the companies often provide uniform platforms to develop local sites. As a result, local portals look homogeneous though the information is always particular to each city. Regional community networks and digital cities must accept that they are in competition with global companies. However, it does not mean that the homogeneous platforms will govern the heterogeneous activities. We observe that heterogeneity of the regional information spaces is also increasing just as local commercial portals.

1 Introduction

Since the early 1990s, and particularly with the popularization of the Internet and the World Wide Web, a wave of experiments and initiatives has emerged, aimed at using Information and Communication Technologies to – broadly speaking – regenerate and enhance communities and local economies. This paper reviews worldwide activities focused on the creation of regional information spaces. In the US and Canada, a large number of community networks appeared in the early 1990s. Since then, as a platform for community networks, information spaces using the city metaphor have been developed worldwide. In Europe, well more than one hundred similar initiatives have been tried out. Asian countries are rapidly adopting the latest information and communication technologies for actively presenting city information and creating civic communication channels.

All of the above are related but independent activities, and thus their goals, services, and organizations differ. Many denominations and buzzwords have been employed for labeling localized information and communication networks, depending on the fashion of the moment and the popularity of certain paradigmatic examples: ‘cybercities,’ ‘virtual cities’ and ‘civic networks’ are examples of names that have

been attached to all sorts of projects. However vague – and therefore disputed – such a definition could be, we will then refer to these regional information spaces as 'digital cities' throughout this paper, following up the 'digital city' conferences and research activities that we have been involved in, during the past few years.

The digital city, as a regional information space, has been initiated by two distinct phenomena: the development by private companies of local portals, which are very common in major cities, and the birth of non-profit, 'grassroots' community-generated electronic forums, such as the 'freenet' movement in the US. If the cities are large enough, commercial sites are a cost-effective way of providing fresh and accurate information including events, transportation, and weather forecasts. Unlike non-profit digital cities, however, these local portals are cost sensitive. One trend has been to increase the efficiency of gathering and maintaining the information by adopting uniform platforms. As a result, the structures and interfaces of local portals tend to be homogeneous even through the information is customized for each city. At the opposite end of the spectrum, other regional Web sites are being constructed by small communities. Individual volunteers are also creating an enormous number of personal local sites. Their sites are completely heterogeneous reflecting the cultural backgrounds of the corresponding cities.

Digital cities commonly provide both profit and non-profit services and face a dilemma in trying to balance these two different ways of relating with their users. As their physical counterparts, they need to find ways to articulate both profit and non-profit dimensions. Cities do not exist without commerce, and without commercial services, digital cities can lose attractiveness and fail to relate successfully with the real city. Without non-profit services, the digital city becomes too commercialized as a result of pursuing economic benefit, and it utilization is bound to get highly socially polarized, and scarcely beneficial for the wider community. Technology is also shifting the border between profit and non-profit services. For example, free e-mail and free desk space services have often been provided to guarantee an equal opportunity to anyone who wants to access the Internet. However, since free e-mail services are now also provided commercially, it is no longer clear whether the provision of this service should still be seen as a challenge or a mission for the non-profit sector.

This paper overviews American, European and Asian perspectives towards digital cities. It observes the heterogeneity of models and experiments in the field, and tries to reflect on the wider, cross-continental issues of the articulation of agency, governance and economic sustainability within the electronic city. It concludes stressing on the need for wider, cross-disciplinary research and development efforts for constructing the digital city of tomorrow.

2 American Community Networks

2.1 Brief History of American Community Networks

In the early days of the Internet, somewhat avant-garde attempts were made in many places to explore concepts for developing the future of the network. It seems,

however, that at that time no clear vision had been formed on the structure of the information space for regional communities. President Clinton's administration announced the National Information Infrastructure Initiative (NII) in March 1993, and the NII agenda was proposed in September. Both efforts contributed to establish the foundations of information networks in the United States. NII was proposed as one of the key scientific and technical policies directed towards satisfying the High Performance Computing Act. It specified concrete target values for six items like universal access and scientific and technological research. Research areas included the impacts on the economy, medicine, life-long education, and administrative services. As a consequence, it promoted and catalyzed a wide range of network studies.

However, the United States is so vast that it is impractical to depend on the state-sponsored information superhighway to construct an information network that can cover all regions. This, coupled with a political tradition of community-centered, privately inspired grassroots engagement and the ever strong emphasis on freedom of speech and expression, made possible from the beginning that leading community activists recognized the necessity for local, independent networks structured to support the everyday life of citizens. Such activities gained quickly a high profile in the United Stated, and a great deal of worldwide visibility because of their innovative potential.

The Cleveland Free-Net, born in 1986, was the world's first citizen-led community network. It started from a free electronic help line that connected doctors and patients, and provided a communication channel for everyone with a modem and computer. It promoted the exchange of ideas and opinions of inhabitants in Cleveland region, and their encounters within the region. At the same time, the WELL (Whole Earth 'Lectronic Link), a pioneer 'virtual community' that would become famous worldwide, was born in 1985 [17]. Stemming from a series of various electronic "conferences," it formed a great virtual community where people of all generations and occupations could gather from all over the world. They ruled out anonymity and emphasized 'exchange with a human face.' The WELL was a network-based virtual community but it was not bound to locality. Though some of its 'conferences' extended from the virtual into the physical world and promoted face-to-face meetings and offline exchanges, the WELL was not designed to support regional communities. The early years of networked communities were characterized by a strong emphasis – to the point of being an almost blind faith – towards the myth of the inevitability of the global village and what had been hailed as the 'death of distance' [5]. However, a distinction between globally-oriented displaced 'non-grounded' projects and 'grounded' virtual cities with a clear relationship with geographical communities had to be drawn as place-based digital spaces were rapidly emerging [1].

More typical examples of region-oriented community networks started being constructed at the beginning of the 1990s [8]. The Blacksburg Electronic Village [6] was born in 1991, and the Seattle Community Network [18,19] appeared in 1992. They differ in that the former was started by a consortium consisting of regional companies and universities, while the latter emerged from civil activities. In the case of Blacksburg, Virginia Polytechnic Institute and State University worked with Bell Atlantic and local authorities. They built a consortium to create a virtual information space close to the region. The first two years were spent in preparing computers and

communication equipment, and dial up services started in 1993. Blacksburg Electronic Village gradually grew large enough to attract regional inhabitants. In Blacksburg's case, the leading role was taken not by the citizens who used the network, but by the university, companies and administration. The network was constructed from the technological viewpoint of companies and universities: a sort of research into telecommunication. In the same way, many of the early community networks were promoted by 'technical' leaders. The citizens lacked technology and experience and could not take the lead. Most community networks require the guidance provided by technical leaders in constructing network infrastructure. However, once the technical infrastructure is in place, users rapidly acquire skills to manage the equipment. In 1995, the activity of Blacksburg Electronic Village decreased. This was the result of a fundamental disagreement that was discovered between technology providers and users in terms of goals and expectations of community networks.

The Seattle Community Network (SCN) emerged from civil activities. In 1990, SCN was started as a part of the CPSR initiative (Computer Professional for Social Responsibility) with the goal of creating a cyber space accessible to the public. In 1992, the project was launched in Seattle and started to work on its ideals, vision, and strategy. Services started in 1994. Though SCN was faced with financial problems and competition with commercial portals, it grew in size by cooperating with regional libraries, seen as a key entry platform, and offering a network accessible by everyone. The noteworthy characteristic of SCN was that the project was led not by universities or city administration, but by citizens, and its purpose was to provide a sustainable information space for the region's inhabitants. Its services included e-mail provision, homepage creation, and support for regional activities rooted in everyday life. SCN lead the way for grassroots locally relevant networking, and just after it started operation, similar attempts were raised in many places in the US. In 1993, the Greater Detroit Free Net started services, and in 1995, Genesee Free Net commenced operation. In 1998, the number of community networks exceeded 300 but most were found to be plagued by many problems. For example, volunteer-based activities often suffered chronic fund shortages, highlighting the problem of the economic viability of community-driven electronic networking.

After the birth of pioneering community networks like Blacksburg and Seattle, commercial sites like AOL Digital City, and Microsoft Sidewalk came into being. A detailed explanation of these projects will be provided in Section 5 "Commercial Local Portals." These are profit-oriented portals that provide local information. Their outstanding usability and rapid growth has raised the warning that "the pursuit of profit will destroy grass-roots community networks." On the other hand, small ventures have also started to construct local portals. Though these sites are not run by the citizens, unlike the commercial portals offered by global companies, they are offering community sites dedicated to specific regions [18]. Their future is noteworthy as a medium intermediate between community networks and commercial portals.

2.2 Issues in American Community Networks

American society traditionally has a strong attachment to the values of local community, and said it has been noted that "the township comes first followed by the county, and lastly the state" [20]. The basic idea is that "Activities related to everybody should be executed by everybody. Moreover, everybody should use it by his or her own volition" [15]. American community networks tend to be independent from administration and companies. The participation and the self-motivating efforts of the citizens have been seen as essential for the success of the electronic community. Maintenance and operation tasks have been performed by volunteers who tended also to be the main users of the system. The activity is based on the American interpretation of philanthropy. Rather than a private charity-like virtue, the concept is emphasized as the offer of services to enrich the community. Philanthropy has been recently shifting to social enterprise: relatively strong institutions are supporting the various NPO activities undertaken by the citizens, and this is providing a significant boost to their success. Though the activities are voluntary-based, they conceptualize ideals, set targets, and explicitly give direction to the community.

The proactive ness of both grassroots community, the state, and commercial institutions, coupled with the fact that these tend to operate independently from each other, makes finding the right balance between local and public interests and economic viability a source of concern. Fragmentation of agency means that it is likely that different, competing projects will operate in the same arena, stemming from different actors and institutions. If an initiative is administration/technology oriented, the challenge is to how to bring in social activities. If the activity is socially oriented, shortfalls can appear in technical/financial support, and the competition with commercial portals can become a problem. Citizens can end up participating in both sets of activities. They may work for companies during the day, and work within the community as volunteers in their off hours. This life model, which is common in the US, can be seen as a result of the functional differentiation of society. The polarization of commercial portals and community networks, and the dual involvement in office and home activities can be an unusual and unlikely perspective to people whose societies are less functionally differentiated, as the section on Asian digital cities will show.

A more recent trend is the gradual demise of the technology-oriented, non grounded community networks which were popular in the early days whilst community sites rooted in regions are increasing in popularity. At the same time, commercial portals acquire a large number of users and are establishing themselves as useful tools for everyday life. It will be interesting to see how the relationship between commercial sites and local community networks develops. The commercial sites by global companies may subsume the small community networks and wipe them out. Smaller-scale commercial local portals may boost their connections to regional communities. The main concern of American community networks is finding how to coexist and create synergies with their commercial counterparts.

3 European Digital Cities

3.1 Brief History of European Digital Cities

The European conceptualization of the 'digital city' started with the experience of Amsterdam's *De Digitale Stad* [2,3] in 1994. The Amsterdam case was the first to use the word 'digital city,' but this project quickly got so well known and admired for the scope of its aims and its openness, to literally become a paradigm, and start a sort of 'digital city' movement within Europe. The Dutch digital city started its activities as a grass-roots and non-profit organization, but the crucial difference respect to earlier American experiment was that government was directly involved, and supportive of the project. DDS' functionality ranged from the support of community activities to the encouragement of political discourse and engagement, like linking the citizens to the administration. Digital City Amsterdam was initially funded by the regional administration, but later it had to become financially independent. To stand on its own feet, the digital city acquired a company-like character. To cope with the radical technological changes, top-down decisions are often required.

The beginning of Digital City Amsterdam was slanted towards the aspects of democracy, administration, politics and economy. Its 'urban' character was also strongly metaphorically emphasized by its interface, graphically presenting and structuring the system like a city with thematic squares, cafes and 'residential' sections hosting individuals' websites, hence the 'digital city' idea. But several accounts on DDS indicate that its character tended to become more like that of a non-grounded, virtual community, able to offer web space, email, and social virtual places to users not necessarily interested in Amsterdam as a city. Commercial pressure eventually made DDS change into something rather different from its initial 'vision.' It lost its urban metaphorical character and had to compete with a much more varied and articulated offer of free internet services and connectivity becoming available from many other companies. This has eventually made it lose much of its attractiveness and its 'cutting edge' status as a digital city [13].

At the end of 1995, Finland decided to commemorate the 450th anniversary of Helsinki, and as one part of its celebrations initiated construction of a high-speed metropolitan network. The consortium was established by Elisa Communications (former Helsinki Telecom) and Helsinki city. The members included companies like IBM and Nokia, and universities in Helsinki. They jointly developed virtual tours as well as public/civic services. For example, Helsinki City Museum provided a cultural service for the citizens and visitors interested in the history of Helsinki [11,12]. A three-dimensional virtual space was set up where the visitors could wander around the Helsinki city hall of 1805. Even though the actual hall did not exist anymore, they built it on the Web and re-created the atmosphere of that age. The three-dimensional virtual city model of Helsinki was meant to allow visitors to make a call just by clicking the screen.

The notable point here is that Europe has many digital city initiatives born through the cooperation of public administrations, companies, and social activists. Frameworks similar to Helsinki have been introduced in other European cities. In Ireland, for instance, the Eircom telecommunications company constructed the 'Ennis

Information Age Town' with the assistance of the administration and with public and voluntary partnerships [7].

Trying to integrate and coordinate the efforts of the private, public and voluntary sectors towards better regional and local information systems has been an important theme in Europe. We need to mention TeleCities, an alliance of EU cities that started the European Digital City Project in 1993 [16]. This was originally characterized as a program to support telematics applications and services for urban areas. The TeleCities consortium characterizes itself as "an open network of local authorities dedicated to the development of urban areas through the use of information and telecommunications technologies." Its target is to share the ideas and technologies born from various city projects, and to strengthen the partnerships between EU cities through this sharing. In this model, each city sets the targets of (1) to utilize information and communication technologies to resolve social/economic/regional development issues, and (2) to improve the quality of social services through the use of information.

The TeleCities support program allows each city to take its own course of actions while facilitating the formation of partnerships and the successful bidding for European Community funds. However, while this approach seemed to have a good potential in bringing together local authorities and the industrial/commercial sector, grassroots community and voluntary projects tended to be left out, and many initiatives appeared to be 'pushed' to their potential users in a top-down fashion. Especially in the early stages of projects' conception and construction, the top down management failed to stimulate the citizens' participation, even though it ensured good levels of support. However, in some cases management became aware of this operational gap, and started to emphasize the need to "base the informatization on society" or the importance of informatization in resolving "social issues."

Along with this direction, Vienna city, one of the longest-standing members of TeleCities, created the informatization plan called "The Strategy Plan for Vienna 2000." In Vienna, both the city and the citizens shared the responsibilities for informatization: the city was responsible for the civil services and the citizens were responsible for the projects executed by individual communities. The digital city was run by this cooperative structure. For example, if the city wanted to resolve the issue of digital signatures, the citizens would willing participate in a trial project and enable its speedy introduction. Such collaboration was realized based on this cooperative structure. Moreover, their plans, processes, results and lessons learned are reported to the EU for use by the other cities, so that effective information sharing is being realized. Similarly, in the Italian city of Bologna the 'Iperbole' – Internet for Bologna and the Emilia Romagna region – initiative was started and run by the local municipality with the intention of being fairly open to grassroots contributions. The city council would provide information and civic services, but would leave an open door to voluntary organizations and citizens group, allowed to become information providers and publishers, as well as engage in debate, within the official digital city.

About 100 cities from 20 countries have been taking part in TeleCities. EU support of city informatization is strengthening, and each city is developing its own digital counterpart taking advantage of the sharing of best practices, project plans, and success stories. While increasing its members base and facilitating the projects, however, TeleCities found that their activities still largely lacked the commercial

viewpoint and so tried to steer to accommodate this need. In 2001, three of the main urban informatization organizations, eris@, ELANET and TeleCities, moved towards cooperation; they also support Global Cities Dialogue which aims to construct a worldwide urban network.

3.2 Issues in European Digital Cities

Since Europe consists of various nations with different cultures, histories, economies and socio-political traditions, it is an obvious consequence that digital city approaches are heterogeneous and diverse. Within this perspective it is easy to see why European coordination has proved important. The 'digitization' of European cities has at some notable characteristics. One is that networks are generally generated within, and restricted to regions. The other is the increased sensitivity towards inclusionary themes and the governance of the digital city. Attempts have been made at collaborating from different social groups like citizens, companies, universities and administration. The top-down activities by administrations and public-private partnerships have in some cases tried to meet the bottom-up activities by small-to-medium businesses and universities, and so have been more rooted in the region and its inhabitants. There tends to be less dualism and confrontation between grassroots community activities and commercialism than in the US. We analyze these two characteristics in detail below.

The region-centered networking might well be an obvious consequence of the traditional fragmentation, regionalism and municipalism that have characterized the spatial and institutional organization of most countries in Europe throughout the centuries. In some cases this goes to down to the neighborhood scale. Instead of one overarching network that covers the whole city, many small networks that were constructed to serve micro-regions could be combined. For example, the networks in Barcelona were created to serve the barrios, the inhabitants' life units; they were connected to create a communication network for the whole city. This method yields networking at the daily life unit level, thus seems more suitable to facilitate the participation of citizens. In Europe, cities and towns of all sizes, including rather small ones, have been active trying to develop some electronic information system, possibly because this is coherent with their micro-region networking traditions.

The second characteristic is the relative openness towards trying to form partnerships of different social groups and institutions. In Europe, citizens, universities, city administration and companies often cooperate to form complex communities. In the U.K., for example, nation-wide regional network development was started in London by a public-private partnership supported by IBM in 1999. In Milan, the community network, started by a university, has involved for a certain period direct participation of profit-making companies and the local public administration. This collaboration style is common in Europe: companies contribute to civic networks not necessarily on a purely commercial basis. The coordination and potential for exchange between administration and citizens seems stronger in Europe than other areas.

The above characteristics are reflected in the activities of groups like TeleCities, and the European community itself. The EU's vision of the information society has been linked to the movement of European digital cities, and digital cities have greatly

benefited from the flow of funds from the EU towards a variety of projects and clusters, usually awarded within the EU's Framework Programmes for research and development The assumption is that various models of the information society (where information can be stored and transferred at low cost and in real time) will emerge and lead to the knowledge society followed by the wise society. However, it doesn't mean that the EU is planning to integrate all cities into a one huge pan-European city. While being supported by the EU, each city is constructing its own community that reflects its cultural background. Cultural differences might trigger problems when connecting independent communities, but such problems can be eased by information sharing and communication among cities such as the ones fostered by TeleCities. This two-tier situation of independent networks and voluntary adherence to some wider alliance within consortia, encouraged by an easier access to funding opportunities, can produce innovation stemmed from international cooperation, and encourage its dissemination. It remains to be seen how strong is many initiatives' dependence on EU or national funding, and how able these can or cannot be to become self-sustained, viable services in the longer term.

In the future, how will digital communities develop in Europe? As explained above, Europe seems keen at balancing administrative and civil activities. Even if companies have been providing significant contributions from the point of view of technology and development, most European digital cities have been keeping commercialization at arm's length. But the imperative of economic sustainability implies that most projects, especially large ones, will have to deal with profit issues, and possible commercialization of services and information. Will the rise of commercialism stimulate community activities or create new conflicts? Will European digital cities find ways to retain their original traditions even if they strengthen their coordination with the private sector?

4 Asian City Informatization

4.1 Brief History of Asian City Informatization

The most significant trend in Asia was the emergence of city informatization as a governmental national project. Though the momentum generated by American grass-roots activities had a great influence, digital cities in Asia were created as a part of governmental initiatives. The first country in Asia to implement an informatization project was Singapore. The administration started the Singapore IT2000 Master Plan in 1992. In 1996, it launched the plan called "Singapore One: One Network for Everyone" to develop a broadband communication infrastructure and multimedia application services. Korea proposed the KII (Korea Information Infrastructure) in 1995 in response to the American NII. In 1996, the Malaysia administration announced the plan called the Multimedia Super Corridor. Their new high-tech cities, Putrajaya and Cyberjaya, are part of the Malaysian e-Government; the surrounding regions are designated as multimedia zones. One organization similar to the Western community network is the research project called MINOS (Malaysian Institute of Microelectronic Systems). MINOS, which also acts as an Internet provider, broke

away from the Malaysian government in 1996. Three different sectors: public administration, business and citizens, cooperate with each other to improve everyday life and promote social interaction. They realize technical innovations with the aim of contributing to the development of the country.

In Japan, the regional network Koala was born with the assistance of a prefecture government. In 1985, it set up an information center, in 1994 it connected to the Web, and in 2000 it was reorganized as a business corporation that promoted community networks. After that, many regional community networks have been developed in Japan with assistance of administration and telephone companies.

The originator of informatization in Asia is the administration. It is rare to see leadership exerted by civil activities or grassroots organizations. The reaction from commercial sites has also been slow. As for Koala, though it appears to be a community activity, it started as a part of the informatization policies set by the administration. The policy of introducing IT proactively and implementing coast-to-coast informatization was originally proposed by the government. What tended to happen were the emergence of a precise and relatively rigid government-oriented information strategy, rather than the clarification of rules and purposes for community networks in order to prepare the ground for bottom-up initiatives. As a result, the promoters often aimed at large-scale investment such as laying optical fiber lines or equipping all schools with PCs. The activities of Asian digital cities can be seen as mainly governmental initiatives often named city informatization.

An interesting example of rural networking can be seen in Yamada village, Japan. This project started in 1996 with the aim of reversing the depopulation trend in rural areas, and can be defined as a regional informatization project to stimulate village life. The community site, which is mainly for village inhabitants, was developed with the support of the administration. In 1998, the ratio of connected villagers reached 60%, and the interaction within the village and with the outside increased. The Yamada project greatly contributed to our understanding of the potential of civil participation in rural areas. However it is worth noting that the Yamada village project was mainly driven by the administration, and despite its success it cannot be described as a citizen-led activity.

More recently, however, due to a better understanding of the limitations of the top-down approach, many countries have started, since the late 90's, to preach the importance of civil initiative. This movement seems to have been fostered by the influence of American community networks. People who have experienced the grass-roots activities in the US have played important roles in introducing the concept to Asia. In Japan, organizations like the Community Area Network (CAN) Forum have emerged. CAN was inspired by American community networks and its goal is to promote human communication in actual communities by utilizing the Internet and to create a rich information space. CAN itself is not a digital city but a promotion organization to build regional networks in Japan.

4.2 Issues in Asian City Informatization

As described above, Asian regional informatization is mainly based on administrative activity. The grassroots activities and university driven projects such as Digital City

Kyoto [9,10] have strengthened, but they have not entered the mainstream, remaining standalone exercises.

The challenge is to predict the future of the Asian digital cities. In Japan, Internet access from the wireless phone system called i-mode has sprang into wide use in the past several years. Individuals are quite active on the Web, and their homepages are often richer than those created by the administrations. In Korea, broadband access via ADSL is rapidly spreading and various utilization trends like IP telephony have emerged. China has organized large scale digital city symposiums several times concentrated on the emerging information industry. In Asia, the functional differentiation of society is less pronounced than in the US. Regional informatization has started to take a more complicated aspect with mixed initiatives. Participants of digital cities can be representatives of some companies and at the very same time act as volunteers, as work and private life is less separated. The multilateral motivation of individuals might lead activities complex. However, this fuzziness could also be exploited in a beneficial way to facilitate the creation of consensus and the convergence between administration, business and civil activities. The forthcoming of Asian digital cities can be shaped differently from what we have seen in Western countries.

5 Advances in Commercial Local Portals

Urban commercial portals have become most noticeable in the US. There are many local commercial portals run by telephone companies, Web companies, airline companies, and so on. As companies are trying to create portals for the same city, the competition between them is getting strong. The companies hammer out their own ideas and go head-to-head to gain the upper hand over their competitors. The best-of-breed commercial portals place all key information on one page, which enables an overview of the digital city features to be instantly grasped. The general orientation of these initiatives tends to be towards providing easy to find and search information, with good maintenance of the system and frequent updates. Many of these commercial portal sites consistently set the benchmark in terms of update frequency and information volume etc.

Commercial portals might soon cover cities all over the world. Even if no regional company is available to run a commercial portal in a country, some global company will find a way to cross the border and gain access. For example, AOL's ‘digital city’ family of portals has the highest user number among the regional information sites of major US cities. AOL's digital city provides entertainment, shopping, people and more. It also provides regional information based on the concept of “the nation's largest locally-focused online network.” Another regional portal is Citysearch. In May 1996, the site started to provide latest information from the viewpoint of local inhabitants to major American cities. The information provided includes not only hotel vacancies, events, and sightseeing information for tourists, but also museums, movies, and restaurant information for the benefit of the local inhabitants. Sites like this aim at eliminating the need to reference the yellow pages, maps, and guidebooks, and provide some value-added information, but all of this comes at the price of a top-

down, heavily controlled, selected and edited set of contents, and very little – if any – two-way interaction and communication.

It has been noted that the development of a field in technology consists of three phases: the *technology driven phase*, the *productivity driven phase*, and the *appeal driven phase* [21]. Considering this transition pattern, the current status might be regarded as the second phase, a phase however wherein the commercial viewpoint is emphasized. The emergence of commercial sites run by large companies tends to be regarded as threatening to regional information communities. Both in North America and Europe, community-based sites tend to repel commercial activities for the understandable fear of the 'commodification' of the concept of community networking. They warn that commercialism will prove detrimental to the future growth of community networks. The prime purpose of commercial sites is advertising, and their approach to community information and activity has to be coherent with their commercial strategy. Someone said that the bud of community activity will be nipped before it is noticed and so will be lost forever: the competition with commercial sites might bury community activity before it starts.

However, commercial portals often effectively provide access to up to date public event information, a function that might not be easy to be provided by community voluntary sites. Especially in Asia, which does not have a long history of community activity, the provision of public event information is highly appreciated, even if it comes from a for-profit organization. There might well be a role for commercial portals serving community purposes, and this might spell synergies as well as a degree of competition between commercial sector and voluntary projects. Therefore, the dualism between the two types of initiatives seen in North America may not appear in Asia.

6 Advances in Information and Communication Technologies

In the previous sections we have mainly concentrated on contextual issues for urban digital initiatives in North America, Europe and Asia. Obviously we need to keep in mind that we cannot overlook technological innovation as another important factor influencing the construction of the digital city. How do we look, however, at this relationship between technology and urban societies? Traditionally there has been a split between social scientists' approaches and how computer scientists would look at the problem. We would like to argue that filling the interdisciplinary gap is becoming vital for the future design of digital cities. Traditional social sciences tend to downplay technological issues and put weight on issues related to the socio-economic context or impacts of cybercities, and on participation of the citizens. Computer scientists on the other hand concentrate on technical development and declare that technology is ultimately what creates the online community.

The words of Alan Key well represent the mood of computer scientists: "the best way to predict the future is to invent it." Moore's Law "chip densities double every eighteen months" was expounded in 1965, and still holds valid today. In the last 15 years, computer speed has increased by a factor of 1000 while railway speed has increased only 1.5 times. Computer scientists, who believe they can create the future,

can fail to acknowledge the social complexity their designs have to face. This inadequacy is often justified by the belief that time is what is needed, and the new systems will gradually become more accepted and used by the population. This can be true only to an extent. The recent history of digital city projects is constellated of failures and allegedly brilliant ideas that have not withstood the test of time. Acceptance, above all, can imply a future level of usage, but does not imply at all that a certain system was indeed what was needed, or the best possible solution to certain urban problems.

On the other hand, it is not easy for social scientists to analyze and give direction to a continuously evolving technology. This is coupled with the fact that social sciences have been used too often in isolation from the technology they were supposed to deal with. Technological objects and systems have been often been treated by social scientists as mysterious 'black boxes,' penetrable only by those technically-gifted people who had designed them. By doing so, social scientists might tend to remove or ignore vital technological and design-based issues that themselves embed social constraints and opportunities, those possible 'futures' that computer scientists try and embed into their projects.

It is therefore clear that the digital city lies at the border between computer and social sciences. On the one hand it is true that technology creates a number of possibilities as well as constraints. It is also true that technology does not happen – and is not deployed – in a void, and that socio-political influences and policy-making have a direct bearing over the final 'shape' of the technological 'solution.' Finally, it is the citizen, the participant of the digital city, who actively interacts with these embedded possibilities, selects from among them and creates a future that can sometimes be very different from the one initially envisaged by the scientists who had designed the new technological system.

We also need to acknowledge that the speed of technical innovation is such that what is crucial for scientific studies in computing is often not suitable for encouraging social activity. A reasonable approach for digital cities is to adopt legacy technology so that the citizens can easily participate in parallel with exploring the technological frontier to outline bold futures. The digital city should be designed as a space for everyday life and at the same time, embed the experiments that will allow it to be a space for the future.

Information technology, which impacts the future of digital cities, has two strands. One is the continuous improvement of computing speed and storage capacity represented by Moore's rule, coupled with the sharp increase in communication bandwidth, that allow us to move from text to images or video. Another strand is the importance of the social value of networking. Computer science is familiar with the first strand of computing and transmission capacities, and knows how to deal with it in quantitative terms. The 'bit' unit of information has been defined and used to measure the improvement of computing speed and storage capacity. The history of computer science is the process of optimizing technologies to deal with bits, reducing redundancies, optimizing their usage, increasing capacity to handle them. On the other hand, the second strand cannot be reduced to 'bits.'

Some approaches that are eminently social but that try and bring into the equation the technological components and their design, exist. The perspective of the so-called Social Construction of Technology (SCOT), or Social Shaping of Technology [4,14]

for instance, can provide a good basis for starting considering the relations between social actors and technical artifacts, and understanding better the intertwined potentials of design, policy-making, and use-adoption of technological systems like digital cities can be. There also seems to be a very strong need for envisaging methods to measure the impacts, and possibly the benefits of digital cities over urban societies. It is urgent and essential to establish methodologies that can be used to forecast/validate the social value of networking.

7 Conclusions

The purpose of this paper has been to elucidate the activity on digital cities after 1990, providing some reflections on some overarching issues that seem crucial at this stage in the development of 'digital cities' around the world. We have mentioned how digital cities have been developed by various organizations and thus have different characteristics problems. Those started from a grass-roots activity depend on volunteers and often face financial and management problems. The non-profit associations yield regional information spaces at relatively low cost, but there is difficulty in maintaining adequate leadership and social responsibility. On the other hand, digital cities assisted by public administrations can utilize their funds and facilities, but a strong bias toward regional economic development or bureaucratic improvement, can hinder more active social participation. In the case of Private Finance Initiative, the initial investment can be effectively reduced. In the case of Public-Private Partnership, fund raising is rather easy in the initial stages, but difficulty exists in establishing a sustainable budget structure. In any case, it is not easy to design and maintain digital cities that benefit all participants.

For-profit and non-profit community sites compete and coexist in North America. Characteristic of European initiatives is the attempt at coordinating administrations, companies and citizens, while that of Asia is government-directed growth. Obviously the digital city is a mirror of society, and there is no assurance that the model that succeeds in America will succeed in Asia. We need to create models that suit each region.

However, some basic issues, common to most initiatives, have been identified and merit further scrutiny and improvement efforts. First, the arena of actors involved in shaping the digital city. Synergies help making the projects effective, sustainable, and holistic, and therefore efforts to find ways to coordinate actors and create pluralist, complex projects should be welcome. Cities – the 'physical' ones – are complex entities. They have been successful for centuries, and keep their prominence despite all sorts of past predictions about their dissolution, just because of their ability to concentrate and somehow articulate the co-existence of community, voluntary movements, politics, commerce, tourism, culture etc. Digital cities need to deal with the same complex mix of things in order to attract and retain usage, and function as entities that 'augment' their physical counterparts. A city famous for its tourist attractions will not develop its digital city without an eye on tourism, because the commercial aspect is a part of the basic structure of everyday life. Physical squares

would not be used as much as they are without the presence of shops. The same, we expect, should apply to virtual squares and places.

Complexity calls for pluralism and participation. Combined, multi-disciplinary research has been identified in this paper as the way forward to think the present and the future of digital cities. Participatory design and development is similarly needed to sum up the activities in the three elements of cities, namely administration, companies and citizens.

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