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Sección ARTÍCULOS

City, ICT and Policy

Galit Cohen and Peter Nijkamp

ABSTRACT: New technologies tend to exert a profound influence on modern city life. This paper addresses the role of information and communication technologies (ICT) in the city. After a broad overview of the potential of ICT in a geographical setting and its possible impact on urban policy in regard to the ICT sector, the paper focusses attention on urban public policy in regard to the ICT sector. This study offers the proposition hat urban ICT policy is driven by the stakeholders' attitudinal and perceptional factors which govern ultimately decisions of the urban administration. Based on an extensive survey among urban policy-makers, the paper seeks to test the above hypothesis by offering a wide variety of empirical findings.

JEL classification: R58, R50.

Key words: ICT, ICT policy, Urban Policy.

1. An Urban Perspective on ICT

Modern economic and technological dynamics manifests itself in differentiated spatial (urban and regional) ramifications. Cities have always been the fireplaces of a civilized world through their key role and core competence in terms of trade, transport, spatial interaction and logistics. In the past era of physical interaction and mobility, cities acted as economic growth poles with strong attraction and diffusion forces for goods and people. In the cyberspace era cities shift increasingly their potential towards spatial centres of services, information and knowledge and seek to reinforce their position as global, national or regional command centres. Role shifts have influenced the operation of cities, but their functional-economic role has remained largely the same, be it that their action radius has increased. This study addresses the role of information and communication technologies (ICT) in the city.

ICT may be regarded as a collection of technologies and applications, which enable the processing, storing and transfer of information to a wide variety of users or clients. Since these technologies are expected to have a major impact on human life, a

Address for correspondence: Free University. Department of Spatial Economics. De Boelelaan 1105. 1081 HV Amsterdam. The Netherlands. E-mail: *pnijkamp@feweb.vu.nl*

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wide variety of ideas about the role of the city, its features, or even its survival in the future have been published in many visionary books, articles and papers. Such studies address usually the blend of hardware, software and humanware in the ICT field.

It is noteworthy that several authors have even labelled the current or forthcoming ICT-dependent developments as the «Information Revolution» or the «Information Age» (see for reviews inter alia Castells, 1996; Slack and Fejes, 1987; Friendries, 1989). This term refers to the fact that knowledge and information have become rather rapidly the key features and driving forces of a modern city. Negroponte (1995, p. 163) even claims that we are already in the post-information age. ICT has been identified (perhaps prematurely) as the cause for the «Death of Distance» (*The Economist*, 1995). If the costs of distance are nullified, the whole notion of urban entities is likely to change. This view is the basis for many expectations of radical changes anticipated in urban areas, at two different scales. On the one hand, there is the emergence of «global cities», which serve a non-contiguous hinterland scattered around the world (Castells and Hall, 1994). On the other hand, there is the dispersion of the urban area due to the growth in the phenomenon of urbanites living and working in ex-urban settings. ICT may enable a non-urban way of living, although cities tend to remain socio-economic and cultural focal points.

The subsequent spatial transformation has brought about a new pattern of competition between cities for «positive» growth (Malecki, 2002; Lever, 2002; Chorianopoulos, 2002; Alles and Esparaza, 1994; Graham, 1999). Such growth is defined in terms of rising economic performance (i.e. increasing income or wealth per capita). In recent years, cities have also been competing in providing clean environments and high quality amenities, which are part of the welfare expected by their residents and by business life. ICT is increasingly seen as a sine qua non for economic growth.

The economic success of Silicon Valley in California during the 1980s was a source for envy for many local decision makers in the industrialised world. Many actors have designed policies to replicate the success, but only a few have accomplished such objectives (e.g., Route 128 in the Boston area and the M4 motorway in the UK). Analyses of some of the success and failure stories (see, e.g., Saxenian, 1983) have revealed that the outcome is only in part a result of the policy pursued.

Nowadays a growing public interest in ICT is arising which leads to policies and strategies to induce ICT development and mobilise it in order to achieve a variety of desired public goals (i.e. national ICT policies, or intervention and deregulation in the IT sector). Several publications on this subject have painted a picture of a future society in optimistic colours, but have failed to provide clear evidence of how to get from here to there and what will be the consequences of the adoption of these technologies on other constituents of society (Melody, 1996). Alongside the expectation that the private sector will play a major role in the ICT field, the expected benefits from ICT are encouraging policy-makers and planners to formulate public policies, which favour the development of ICT. After the introduction of national (and even international) ICT policies, scholars are paying increasing attention to urban or local ICT policies. They emphasise the potential of local public policies to complement,

induce and substitute for (or even correct) national policies and private forces (Gibbes and Keite, 1997; Graham, 1997; Graham and Dominy, 1991). Thus, there is a case for public policy in the ICT sector.

The growing importance of ICT in everyday life, business activities and governance creates the need to incorporate it in urban policies. However, the wide range of possible interventions tends to lead to different ICT policies for cities. One city may leave the field to the influences of private forces and national or international policies, while other cities themselves initiate comprehensive plans for the introduction and adoption of ICT. Various alternative factors may explain these differences, in particular factors that relate either to the city characteristics (or administration characteristics), or to the personal characteristics of the decision-makers in the city .

It should be noted that urban ICT policies are still in an early stage (Servon and Horrigan, 1997). In most cases, governmental organisations are just beginning to wrestle with the wider economic and societal implications of the information revolution (Evans, 2002). In other cities, there is neither a clear strategy regarding ICT nor plans to address ICT as a policy arena. Indeed, some cities are already active in the ICT field, and many cities exist virtually on the web. However, comprehensive plans about the introduction and utilisation of ICT, if they exist, are still in their initial stages. Thus, ICT may be considered (in many cities) as a hypothetical future activity that cannot be observed as yet. Many more —as yet uncertain— developments are still to come.

The present paper focuses on the perceptional drivers of urban ICT policy. Specifically, we aim at understanding whether and how an urban decision-maker's perception of his/her city and his/her beliefs about ICT can contribute to the explanation of the way he/she assesses the relevance of ICT policy to that city. A basic assumption in this study is that most of the possible urban ICT initiatives are still yet to materialise. The features of such future policy are still under consideration. In some cases, the decision maker is already involved in ICT policy, in others there is still no concrete coherent strategy about ICT policies. Urban ICT initiatives are still new, preliminary, and, in most cases, eclectic. Hence, it is logical to assume that urban ICT policies are still a «new product» and in order to anticipate the future of ICT policy, it is useful to study the beliefs and attitudes of decision makers that surround it. Our study takes a cognitive approach, which focuses on how decision makers acquire and use information and how their beliefs, attitudes and preferences affect their decision. Vickers (1965) made a central contribution to such an approach in his book *The Art of Judgement*. He elaborates a framework to understand the mental process of decision making as an «appreciative system». He stresses the importance of judgement, i.e. the way the decision maker judges the reality, the norms and the action (policy). The appreciative system of a decision maker hypothesised to affect the decision maker's choice spectrum and behaviour and, consequently, the policy he considers and develops (see also Parsous 1995). Vickers then uses the mental process of an individual decision maker as a factor that explains policy. Vickers' model will be deployed as a frame of reference in our paper. More details can be found in Cohen (2003).

2. Contemporary Cities and ICT Governance

Cities are centres of human activity. The modern city induces and absorbs high tech developments. The city is a place which is in a state of constant change. Some of the changes are immediately visible (new building, roads), others need a more careful examination to be noticed (population changes, economic sector domination). The constant movement of goods, people and ideas challenges any attempt at a static description of a city. Bertuglia *et al.* (1998) stress that the city is a dynamic system, not in equilibrium. Even if we aim at just a snapshot of a city, its complexity and multidimensional characteristics force us to settle for specific aspects of the city. According to these authors, the city can be analysed through its many dimensions that co-exist: religious, cultural, political, economic, social, geographical, and many others. However, complexity is not a negative characteristic. As Salingaros (1998) puts it: *«not enough complexity and the city is dead*!*»* (p. 54). Such perspectives are supported by modern evolutionary ways of thinking.

Glaeser (1998) asserts that: «*A city is just a dense agglomeration of people and firms*». Ultimately, the benefits of cities come from reduced transport costs for people, goods and ideas. Historically, the benefits of the city cannot be overestimated. As Ward (1976) wrote, the city is the cradle of civilisation and the home of man which must be protected, supported and recognised as the major carrier of socio-economic and cultural progress. Nowadays, the city is the economic, social, cultural and political heart of a modern society.

In recent years, the model of city as a central place (based on Christaller's ideal city size distribution and functions) is gradually being replaced by the model of network cities (Batten, 1995). In such a system, cities form the centres, nodes and junctions and rely on this network. The various nodes of a network city can be seen as a heterogeneous flexible system. They may be distinguished from central place cities in both spatial and functional terms. While the central city depends on its size and has homogeneous goods and services, a network city does not depend on size and offers heterogeneous goods and services. Moreover, accessibility in the central city is vertical, and relies mainly on transport costs, whereas accessibility in the network city is horizontal, and depends on information flows.

Nevertheless, the dense agglomeration also has negative aspects like pollution, congestion, crime, health problems and other social problems. At some point, the benefits of agglomeration may be overwhelmed by the costs of the congestion that it causes. Indeed, there is positive correlation between crime rates and urban size (Glaeser, 1998). The concentration of poverty is higher in cities, mainly as a result of poor immigrants to cities that are attracted there because of transportation costs, the public goods bundle and social networks (see Glaeser, Kahn and Rapaport, 1997). Modern cities are suffering severely from environmental costs (e.g. Los Angeles, Rome, Athens), and it is precisely these externalities which are decisive for the course the city is going to take in the future (see also Verhoef and Nijkamp, 2002).

The stress on the urban territory as a whole has at the same time caused urban sprawl. Both the land price and the environmental externalities in central areas of the cities have become an impediment for new household and firm locations, so that an

outward shift has taken place. Industries moved to the urban fringe or to special industry parks in the neighbourhood of cities. More and more urban areas have multiple centres (Kloosterman and Musterd, 2001). People moved to suburban –and even more distant– locations, but this massive movement meant essentially only an expansion of the functional urban territory. Thus, despite a broadening of the spatial range, the urban system has still kept its original function and has even reinforced it in the past decades. Thus, a decline in urban environmental quality tends to create geographical relocation with a wider spatial coverage (the «ecological footprint» of the city; see Rees and Wackernagel, 1994; Nijkamp and Finco, 2001). In conclusion, both negative and positive aspects of the city challenge the city administration. Indeed, side by side with the increasing complexity of the city and its associated policy challenges, the role and effectiveness of urban government decrease. Still, as many scholars (e.g., Glaeser, 1998; Malecki, 2002; Evans, 2002; Graham, 2002) claim, the role of local governments is important and critical to mitigate the above-mentioned negative aspects and exploit the positive aspects of urban areas.

It is noteworthy that in many countries public policies have in the recent past shown a marked shift from direct interference to indirect (or conditional) policies (e.g. incubation policies, innovation policies, etc.). Short and Kim (1999) termed this shift transformation in urban governance from the welfare-state model to the economic development model. Kearns and Paddison (2000) claim that city government has to become more entrepreneurial, which may contradict the model of welfare governance.

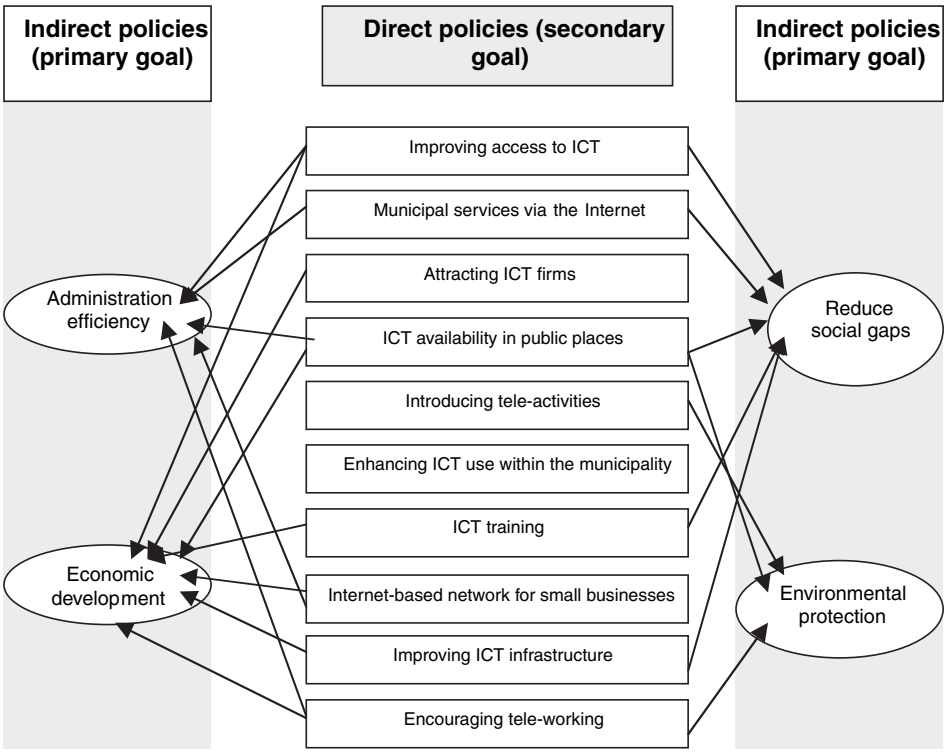
It is noteworthy that public decision-makers are not the only actors affecting city development. In addition, many «city-makers» (Grosveld, 2002) are, in fact, making the city what it is and what it will be. Grosveld identified 11 sectors of city-makers: performing arts, hospitality (tourism and congresses), real estate and architecture, corporate services (accountants, lawyers), academia, museums, media, international organisations, multinational companies, the finance sector, and the public sector.

Obviously, households and individuals themselves should not be absent from the list of city-makers. Their preferences (for jobs, housing and leisure) have a major impact on the city development. This complex system calls, on the one hand, for an enabling government that can accommodate these various social interactions, and, on the other hand, a government that takes into account the aggregate effects of these uncoordinated social interactions (Indovina, 1998). Altogether, the constant urban changes, the changing role of urban governance and the massive effects of different city-makers are all leading modern cities to undergo drastic evolutionary changes, in which the human resource potential, composed of creativity, competence and communication, exerts a dominant influence. Entrepreneurial and creative city governance is needed to meet these challenges and be prepared for the ICT future, despite all uncertainty.

As Salomon (1998) stresses, technology, in general —and ICT in particular— is not merely a collection of hardware. Technology is a social construct. Moreover, ICT is not neutral and may, depending on specific contextual factors, accommodate either dispersion or concentration trends (Nijkamp and Salomon, 1989). Moreover, the use of the technology is regulated, on the one hand, by the value it provides to the poten-

tial user and, on the other hand, by various rules and norms, and these uses and regulations determine the impacts of ICT on society and their spatial structure. This policy may have two forms. The ICT sector is either viewed as a final goal in itself, which has to be achieved through the implementation of proper policy incentives (e.g. fiscal policy, land use policy or educational policy as instruments to achieve ICT goals). Or it views ICT as a vehicle to achieve higher-order goals for the city (such as a strong international profile). Clearly, in a way, we have here a system of goals and instruments at different hierarchical levels of policy formulation (see also Figure 1).

Figure 1. Direct and indirect ICT policies.



3. Evolving ICT Policy in a Complex Urban Force Field

The relationship between the city and ICT is a complex one. Graham and Marvin (1996) claim that much of the ICT discourse is deterministic and simplistic, taking (mostly) a utopian view. The deterministic view sees ICT developments as radically reshaping society, and by extension, cities. However, we can identify an evolution in the discourse itself. In the 1970s and 1980s, the dominant voice was the prediction concerning the decline of city importance and the death of distance (Pascal, 1987; Gold-

mark, 1972; Toffler, 1981; Martin, 1978). Nevertheless, as these technologies were already adopted, most of the researchers were convinced that the city was not going to disappear. Not only has the attractiveness of large cities not reduced, but some developments suggest that ICT reinforces the position of large cities (Moss, 1991). Kollko (1999) suggests that ICT has led to the «death of distance» but not to the «death of cities». Also Glaeser (1998), after analysing processes that weaken and strengthen the city, concludes that the city is not going to «die». However, Graham (2002) claims that both distance and cities are far from being dead, and geography still matters.

Moreover, Graham and Marvin (2000) indicate that most ICT applications are largely metropolitan phenomena. Graham (2002) stresses that ICT and large metropolitan areas are mutually supporting. In contrast to the naïve belief that ICT will contribute to a decrease of spatial differences (since distance is less important), Goddard claims that these technologies support a more uneven pattern of regional development (Goddard, 1991).

From another perspective, Beyers (2000) stresses that, while perhaps technology does enable people to live far from city centres, nevertheless: «*…Not only are many businesses in the information society strongly tied to localized markets, but it is also in cities that most people working in these sectors* ***want*** *to live, for reasons related to consumption and tastes, and dictated by spousal relationships and other social relationships.»* In the same vein, Gaspar and Glaeser (1998) stress that although ICT may eventually cause a decline in the need for urban concentration, it is less clear than the futurists would have us believe. Also Hall (1999) assesses that ICT may decentralise activities, but stresses that its precise impacts are far from clear.

From another perspective, there are scholars who identify changes in the city's status, as well as changes in it organism. Snickars (1999) argues that urban areas traditionally used to be seen as top-hierarchy members of a national settlements system. With the introduction of ICT, it is more appropriate to regard them as members of a network-based global system of central places. Some others argue that ICT will reduce the hierarchy of cities, where the position of cities is not merely determined by population size (Graham and Marvin, 1996).

In this context, Atkinson (1998) gives a list of possible, mutually contrasting, trends. On the one hand, the urbanisation economics of diverse jobs, labour, and cultural opportunities supports the location of industry in large metropolitan areas. On the other hand, for industries that prefer to locate in lower cost areas, the ability to telecommute (tele-work) and other tele-activities may lead to the expansion of the city and reduce the attraction of the central city.

Since ICT is expected to have significant influences on the city, its shape and its metabolism, one would expect that urban planners and urban decision makers are likely to be major players in the ICT field. Some scholars are urging and hurrying urban decision makers to act in that field (e.g. Caves and Walshok, 1999). However, as Graham and Marvin (2000) argue, despite the central importance of the 'urban' in cyberspace debates, issues of urban policy and planning have been virtually absent within both the popular and academic sides of the discussion. There are several types of urban ICT policies that can be found in cities (Graham and Marvin, 2000; Gibbs and Tanner, 1997):

- Integrated transport and ICT policies (teleworking programmes, communication corridors);
- City-level new media and IT strategies (city networks, local services, infrastructure);
- Information districts and urban «televillages» (enabling advanced IT infrastructure to attract firms);
- Integration of marginal groups through ICT initiatives.

Various scholars have identified spatial differences in access to, and provision of, ICT. Their recommendation that public policy should address this imbalance has led to some local level initiatives (Gibbs, 1993). However, Gibbs and Tanner doubt whether such policies, which do not examine the processes of change, are effectual. They stress that: «*Establishing an ICT infrastructure may be a precondition to regional development, but it does not automatically result in the provision of effective or relevant services to local businesses or other sectors of the community*» (Gibbs and Tanner, 1997, p. 35).

A specific area that has attracted a great deal of attention is the provision of municipal information and services through ICT applications (mainly via the Internet). The first goal is the improvement of services to the citizens, and the supply of more efficient services. A second goal is supplying information about the city to potential investors, inhabitants or tourists (unfortunately many municipal web-sites in Europe are available just to native-language speakers). A third goal is to increase public participation in local processes by better information and possibilities to react, on-line, to proposals in the city agenda (E-governance). Rouillard (1999) explores the possibilities of ICT as a tool for public participation and concludes that E-governance can make the policy-making process both transparent and vague, so it is not a guarantee for an informed public.

Pratchett (1999) stresses that ICT have the potential to fulfil three complementary roles of local authorities: local democracy; public policy making; and direct services delivery. However, as Pratchett claims, there is a systematic bias which favours service delivery applications and overlooks applications regarding the other two roles. The reason for the bias, according to Pratchett, is that the decision-makers who initiate the ICT policy are not active in the other policy areas.

A second policy initiative in a large number between cities concerns ICT infrastructure. In many cases, municipal agencies are now developing strategies to address these market failures and provide telecommunications infrastructure for less profitable areas. Graham (2002) reviewed examples for cities that have become involved in telecommunications infrastructure initiatives. Some of the municipalities extended their own internal broadband network to a wider population (i.e. Glasgow, Kentucky; Amsterdam, the Netherlands; Bochum Germany), while others worked in partnership with private telecom firms to extend their optic-fibre networks (i.e. Alameda, California), and, in other cases, municipalities have built the networks and then opened them up to telecom providers.

Another important initiative is to increase access to the Internet in public places as part of the overall strategy to increase access to the Internet. Other cities have built community tele-centres, which are supposed to deliver public access to marginalised

populations. In these centres (which also can be schools), in addition to access to Internet and other ICT services, there are often also training and support services. Clearly, without the appropriate skills, the availability of equipment and infrastructure is worthless.

Again another type of ICT centre is a neighbourhood telecommuting centre to encourage teleworking (Mokhtarian and Varma, 1998). These centres offer an alternative work arrangement that provide office facilities shared by remotely supervised staff of multiple employers. Other cities have various telecommuting programmes for their employees (e.g., San Diego, California) as part of their efforts to decrease commuting (Mokhtarian and Salomon, 1997).

Other tele-activities that are stimulated by the municipality aim to serve the disabled or other disadvantaged groups in order to help them overcome physical barriers. In some cities (e.g., Berlin), there are tele-video services to pensioners, to enable them to get help and guidance through the videophones.

In order to stimulate business activity in the city, some municipalities are actively involved in a project that supports the introduction of ICT application in small and medium sized businesses. Berranger and Meldrum (2000) describe such an initiative in Manchester, focused on the creative industries.

4. An Analytical Framework for ICT Perceptions

The previous section has demonstrated the varied ways in which a municipality can initiate ICT activities. In spite of these examples, in many the European cities such initiatives are rarely implemented or even considered. However, in the light of the literature that was reviewed above, a number of observations can be made.

First, the rapid changes of cities have visible and invisible aspects, captured differently by different observers. As a result, different urban decision makers have different images of their city and different ideas of how to improve and develop the city.

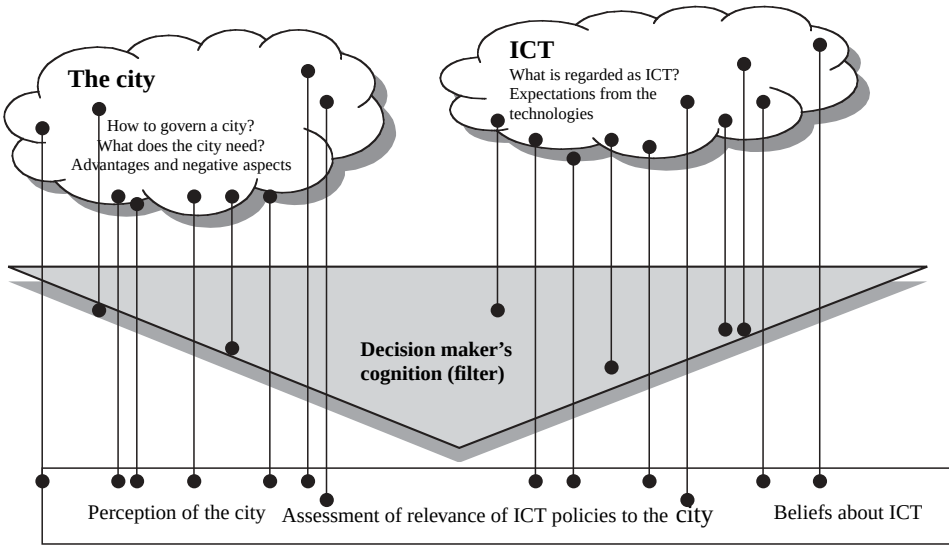
Second, the style of urban governing is also changing, encouraging entrepreneurial and creative urban decision makers. This suggests that urban decision makers should consider, new measures to meet urban challenges.

Third, ICT comprises technologies that are associated with fast, efficient ways to process, store and transfer information. Many professional and academic disciplines use and investigate ICT from different angles. Different decision makers are aware of, and assess differently, these effects. The judgement of an urban decision maker as to whether various ICT policies are suitable for a city is, therefore, related to two major aspects. The first is the way the decision maker perceives his city and the proper way to govern it. The second is the way the decision maker assesses the effects of ICT. Therefore, there are several possible ways to evaluate the expected effects of ICT and the future society.

Figure 2 summarises the relationships between the city, ICT, the cognition of the decision maker and ICT policies. Both the city and ICT are broad concepts, which include many aspects, angles and implications. Clearly, just a fraction of the information of the city and ICT-related aspects is processed by the decision maker: for exam-

ple, the information about the city translates the complex city into more simple phenomena, represented by facts and figures. Likewise, images, metaphors and data transmit the multifaceted implications of ICT. The cognition of the decision maker processes the information, or ignores some of it (i.e. some lines in the diagram do not go through the cognition, while others go through it).

Figure 2. Complexity of the city and ICT-related aspects and the assessment of relevant ICT policies.



5. Empirical Findings on Urban Decision Makers' Perceptions of ICT

5.1. Prefatory remarks

This section aims at discussing and testing the relationships between a few selected characteristics and the assessment of the relevance of ICT policies. Three variables were selected to represent the «real world». The first one, «city size», represents one characteristic of the city. The other two, «age» and «field of professional activity of the respondent» represent the decision maker's characteristics. All 3 variables will be tested against the various aspects of policy variables[1]. The null hypothesis in all cases is that there are no relationships between the above characteristic variables and the

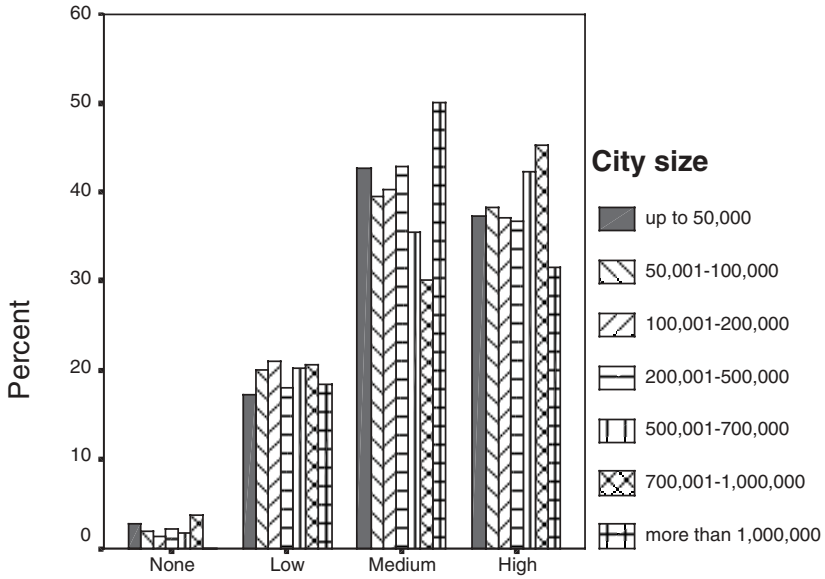
[1] We will use the Pearson Chi-square test here, even though it may have some weaknesses in case of larger samples.

policy variables (hence, the expected matrix assumes no relationships). In the present study we will only address a series of correlational questions on city size, perceptions of urban decision-makers and their individual attributes. A more comprehensive approach would require the use of a complex multidimensional path model. Results on the latter approach are found in Cohen (2003).

5.2. City size and perceptions of ICT policy

Our sample contains information on views and perceptions of respondents (urban policy makers, planners, frontliners, etc.) from a large number (approx. 200) of European cities of various sizes (see for details Cohen, 2003). It is interesting to test whether the size of the city affects the perception of the relevance of various ICT policies. The cities were categorised into 7 relevant size categories, as indicated in the subsequent figures.

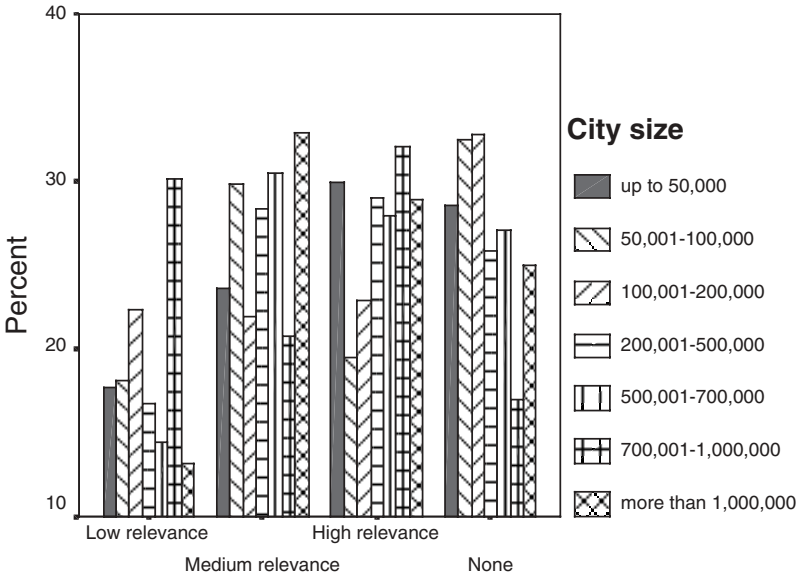
Figure 3. Influence of the municipality on ICT in the city, according to city size.



First, the city size association to policy is tested with the perceived influence of the municipality on ICT in the city. The Pearson Chi-square statistic equals 12.65 with a significance of .811. Therefore, we cannot reject the null hypothesis that there is no association between the two variables. Figure 3 gives a graphic presentation of the association between the two variables. As we can see, there is a roughly similar representation of each city size in the four categories of the policy variable.

In the second place, city size is tested against the extent to which respondents think that various ICT goals and tools are relevant to their city. Here, the Pearson Chi-square test equals 32.76 with a .018 significance level. Therefore, we can reject the null hypothesis, with probability level 0.05, and claim that there is an association between the size of the city and the extent to which various ICT goals and tools seem very relevant to the decision makers. However, as Figure 4 shows, although in each category there is a different representation of city sizes, we cannot identify any systematic pattern of differences.

Figure 4. The extent to which respondents think that various ICT goals and tools are relevant to their city, according to city size.

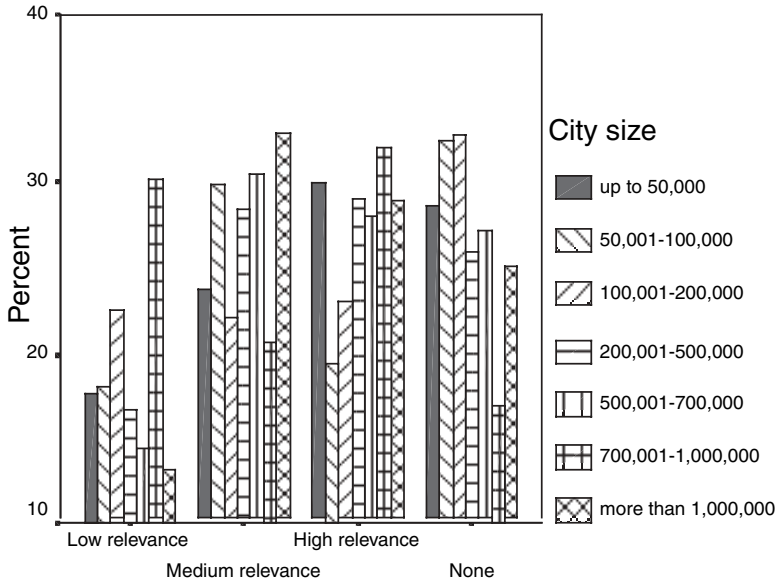


For example, we can see that respondents from a city with size of 50,001-100,000 inhabitants (the second category) are concentrated both in the category of medium relevance and no relevance. Therefore, we cannot recognise the tendency of respondents from that city size, since it is not linear. Moreover, the next category of city sizes (100,001-200,00 inhabitants) has a completely different pattern, so we cannot predict the extent to which respondents think that various ICT goals and tools are relevant to their city according to city sizes. In other words, for each category of relevance there is different distribution of city sizes, but we cannot draw the conclusion that the tendency to think that various ICT goals and tools are relevant to their city either decreases or increases with city size.

Finally, city size is tested against the decision makers' awareness of various ICT tools. The Pearson Chi-square statistic for those two variables is 40.4 with a signifi-

cance of .002. According to the Pearson statistic, we can reject the null hypothesis and conclude that there is an association between the awareness of ICT tools and city size. As Figure 5 shows, there is a tendency to have high awareness for respondents from both very small and very large cities. The intermediate size categories are less represented in the category of high awareness. Moreover, respondents from big cities are less represented in the category of no awareness at all.

Figure 5. Awareness of ICT tools according to city size.



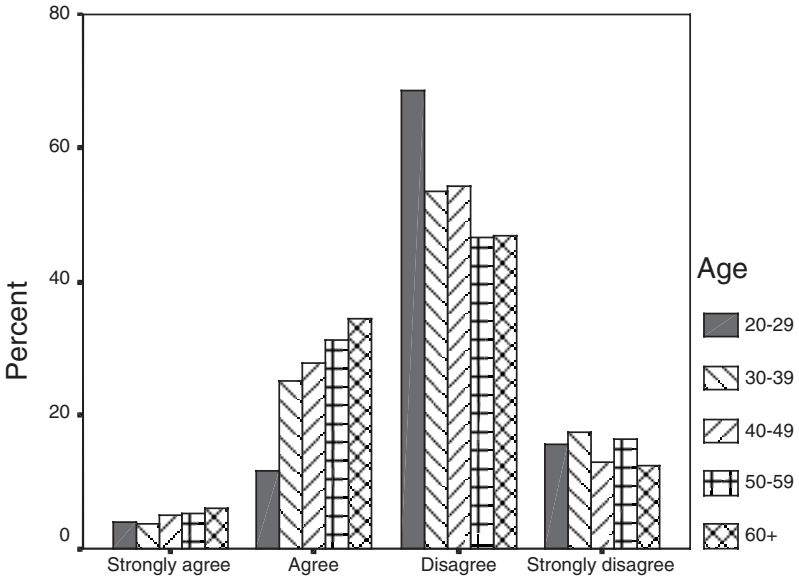
5.3. Age of the respondents and perceptions of ICT policy

The age of the respondents in our sample ranges from 22 to 80. Although most of the respondents are aged between 40 to 60, one may still claim that age may affect the awareness, usage and attitudes towards ICT and, therefore, it also affects their perceptions of ICT policies. As in the previous section, we will test the association of age with the four policy variables that were developed in previous chapters.

First, let us consider the association between age the perceived influence of the municipality on ICT in the city. The Pearson Chi-square statistic equals 11.29 with a significance of .504. Therefore, we cannot reject the null hypothesis that there is no association between the two variables. According to the Pearson statistic the extent to which the respondents agree with the statement that private sector decisions and activities are not affected by municipality ICT activities, is also not associated with age categories (Pearson Chi-square = 18.25 with a significance of .108.). However, as Figure 6 shows, we can see that the tendency to strongly agree or agree with the state-

ment increases with age. Therefore, we can detect a pattern that the older the respondent is, the more he thinks that private sector decisions and activities are not affected by municipality ICT activities. Next, we tested the extent to which respondents think that various ICT goals and tools are relevant to their city. Here, the Pearson Chi-square statistic equals 12.8 with a .379 significance level. Therefore, here too, we cannot reject the null hypothesis that there is no association between the age of the respondents and the extent to which they think that various ICT goals and tools are relevant to their city.

Figure 6. The extent of agreement with the statement that private sector decisions and activities are not affected by a municipality's ICT activities, according to age of respondents.



The fourth test on the awareness of the respondents to various ICT tools is neither associated with the age of the respondents. The Pearson Chi-square statistic equals 7.9 with a .789 significant level. Therefore, we cannot reject the null hypothesis that these two variables have no association.

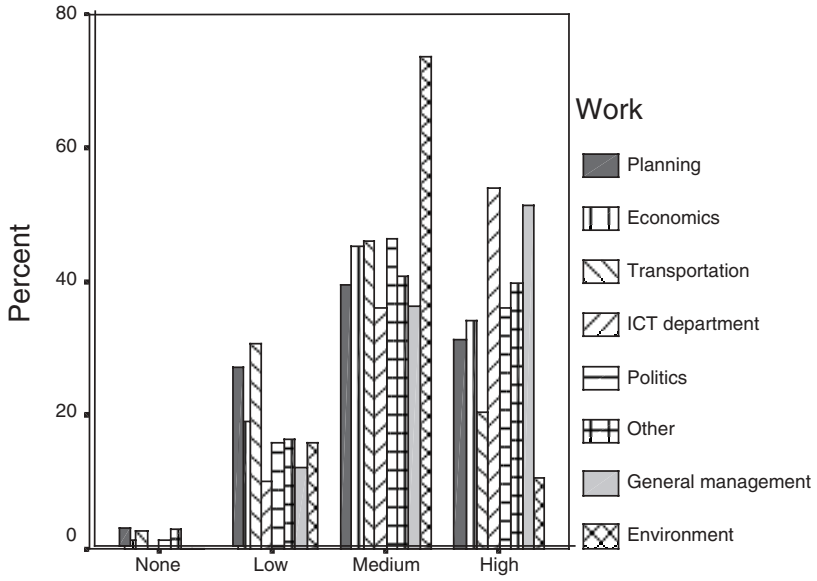
5.4. The respondents' field of professional activity and perceptions of ICT policy

We consider both elected politicians and municipality administration staff as policy makers and decision makers. Therefore, it is interesting to examine whether politicians perceive policy differently from municipal administrative staff. Moreover, there might be systematic differences within municipal administrative staff, according to

their field of activity. Here, as in the previous section, we test the relationships between the decision makers' field of activity and the four variables that represent perceptions of ICT policy.

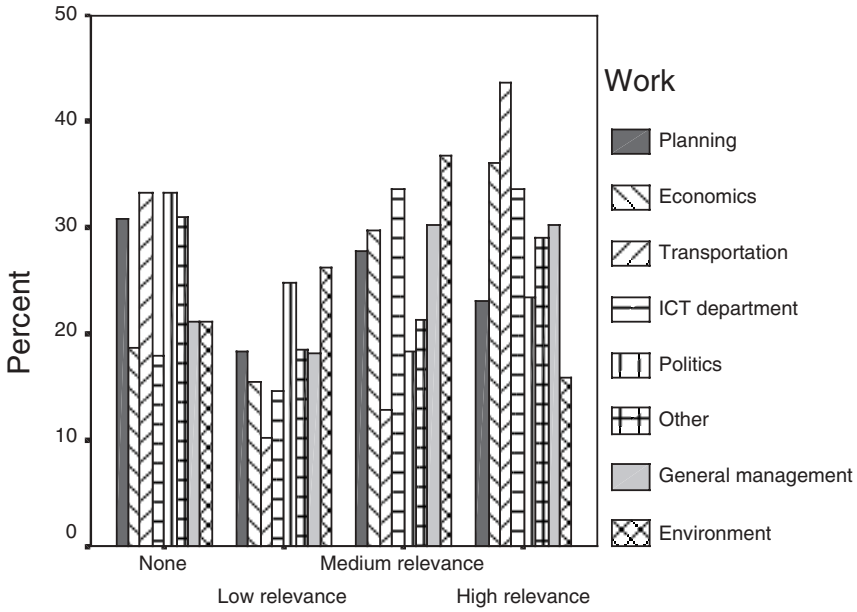
The Pearson Chi-square statistic for field of activity and the perceived influence of the municipality on ICT in the city equals 52.75 with a .000 significance level. Therefore, we can reject the null hypothesis and conclude that there is association between the two variables. Figure 7 shows the representation of the different fields of activity in the four categories of the policy variable. Clearly, respondents from ICT departments believe that the municipality's ICT activity does affect ICT in the city. Also respondents from economic development departments tend to attach high influence to the municipality. On the other hand, urban planners are more sceptical and do not think that municipality activity influences ICT in the city. As the figure shows, politicians have no clear tendency, compared with administrative staff.

Figure 7. Perceived influence of the municipality on ICT in the city, according to respondents' field of activity.



The second policy variable, the extent to which the respondents agree with the statement that private sector decisions and activities are not affected by municipality ICT activities, is, according the Pearson statistic (26.65 with a .182 significance level), not associated with the respondents' field of activity.

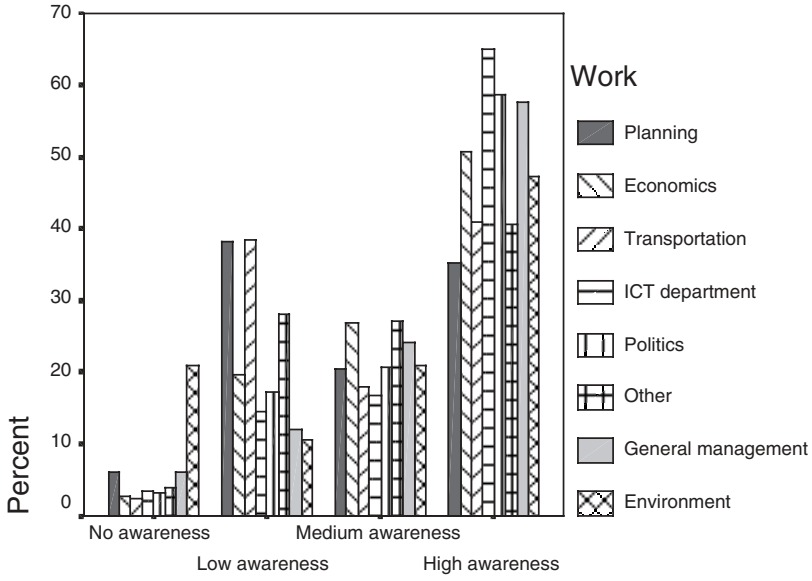
Figure 8. The extent to which respondents think that various ICT goals and tools are relevant to their city, according to respondents' field of activity.



The extent to which the respondents perceive different ICT goals and tools as very relevant to their city is associated with the field of activity (Pearson Chi-square equals 53.06 with a .000 significance level). As Figure 8 demonstrates, urban planners tend to attach no or little relevance to the suggested ICT goals and tools. Also politicians are represented more heavily in the categories of no or little relevance, compared with the other categories. Respondents from transportation departments are highly represented in both the no relevance category and high relevance categories, so there are no conclusive tendencies that can be detected. On the other hand, respondents from economic development and ICT departments are highly represented in the categories that attach medium and high relevance to the various ICT tools and goals.

The fourth and last policy variable: the awareness of various ICT tools, is also associated with the respondents' field of activity, where the Pearson Chi-square statistics equals 95.72 with a .000 significance level. As Figure 9 shows, both urban and transport planners tend to have low awareness of the various ICT tools. In contrast, respondents from ICT departments as well as economists have a higher awareness. Politicians are more likely to have medium and high awareness than no or little awareness.

Figure 9. Awareness of ICT tools according to respondents' field of activity.



5.5. Concluding remarks

In our statistical experiment, three variables were selected to represent the «real world». The first one, «city size», represents one characteristic of the city. The other two, «age» and «fields of professional activity» of the respondents represent the decision makers' characteristics. All 3 variables were tested against the 4 aspects of policy variables, as constructed in the previous chapters. The relationships between the 3 variables and the 4 policy variables were tested by means of the Pearson Chi-square test.

The most significant association is between the fields of activity of the respondents and their perceptions of ICT policy. We found that respondents from economic development and ICT departments have a higher awareness of various ICT measures, and they are more likely to think that ICT policies are very relevant to their city. Moreover, they tend to think that the municipality does affect ICT in the city. In contrast, urban planners (and to lesser extent transport planners) have less awareness: they tend to think that ICT tools and goals are less relevant to their city, and that the municipality's ability to affect ICT is rather low.

The size of the city has a clear association with just one of the ICT policy variables: awareness of ICT tools. There is a tendency to have high awareness for respondents from both very small and very large cities. The intermediate size categories are less represented in the category of high awareness. Moreover, respondents from big cities are less represented in the category of no awareness at all.

The age of the respondents appears to have very little to do with the perceptions of ICT policies. The only association that we could find is that the tendency to «strongly agree» or «agree» with the statement increases with age, i.e. the older the respondent is, the more he thinks that private sector decisions and activities are not affected by municipality ICT activities.

6. Retrospect and Prospect

Public decision making is a complicated issue to study. On the one hand, it involves various actors and interactions. On the other hand, various factors and considerations may affect the decisions. Some researchers take a macro-approach to study public policy making, by identifying structural relationships between actors and institutions. Other researchers investigate the bureaucratic process of policy making as a factor that explains policies. Yet, another group focusses on the individual decision maker, and studies the way individual characteristics determine policy making. Each level of research can shed light on different angles of public policy making and identify relevant factors that can contribute to the discourse. This study took the last approach: namely, exploring the process from the individual perspective.

In most of the cases, the research takes a case-study approach based on documents and publications. Our study takes a different approach, and made efforts to adopt different statistical methods to investigate the individual decision makers. Instead of focusing on particular decision makers, we have tried to identify decision makers by the way they perceive their city and their beliefs about ICT. Our study found that there are relationships between these two aspects and the way the decision makers perceive ICT policy. Understanding these perceptions may help us to evaluate the chances that a decision maker will be involved in ICT-related policies in his/her city and, to some extent, the type of policy that is expected to be adopted. The statistical models that were based on the large database allowed us to get a general picture of the hypothesised relationships between the 3 aspects that belong to the decision maker's cognition.

Therefore, we can conclude that knowledge of the perceptions of a city and beliefs about ICT contribute to the explanation of the assessments and perceptions of urban ICT policy. Perceptions of policy have a few dimensions (as expressed by the 4 policy variables) and not all of them have the same pattern of relationships with the 7 latent variables that represent the perceived city and beliefs about ICT. However, in most of the cases, we did find systematic and stable relationships between the variables.

Although public policy research is usually done with qualitative research methods, we decided to conduct research that involves more quantitative methods and, more specifically, multivariate analysis. The systematic and stable statistical estimates that were established in this study suggest that it is possible (with the appropriate data) to establish statistically generalised conclusions in such a complicated research arena. Therefore, alongside qualitative research that can provide a thorough insight into a complicated phenomenon, our research offers a quantitative approach that enables such insights to be tested statistically.

Another important observation from this study is the substantial differences among decision makers with respect to the ways they see their city. As we stressed earlier, the city that the decision maker perceives is the city that he/she is making decisions for. Therefore, the fact that different actors have different perceptions of their city can shed some light on the policy-making process and the way actors interact with each other, each bringing different perspectives of the city.

Finally, the research demonstrates the various beliefs about ICT in general, and ICT policies specifically. Indeed, most of the urban decision makers sampled in this study do not have simplistic, deterministic assumptions about the influences of ICT. As the new technologies are in mass use already, the extreme utopian or dystopian expectations from these technologies decrease, and more realistic and cautious expectations are expressed. However, the positive aspects of ICT are still not being translated into comprehensive urban policies. This, we believe, is still to come about.

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Annex. Technical Description of the Data Base

To study the urban dimensions of ICT a broad European survey was organized, as part of the EU project TeleCityVision. The target group concerned urban decision-makers (both politicians and responsible administrative staff) in more than 200 cities in 7 European countries (Austria, France, Germany, Ireland, Norway, The Netherlands, and Spain). The questionnaires were sent to various municipal departments that were supposed to have a direct or indirect influence on ICT-related activities in the city, as well as to elected officials of the city (politicians). The effort to include various municipality department members in our sample was due to the fact that ICT policies and strategies are not made by one single recognised responsible body. In contrast to fields like transportation or education, where there is a clear address that is responsible for policies in the field, ICT tends to be a fragmented activity and there is no single clear address that is responsible for policies in the field.

As one might expect, the willingness to answer these questionnaires varied across the countries; there is an overrepresentation for German and Norwegian respondents (who were the most responsive respondents for the questionnaire). However, since this study focuses on the individual level and not on comparing cities, this bias was not considered problematic. Approximately 1500 responses were returned (the response rate varied, between 20 and 40% across the countries).

The questionnaire was relatively long and the respondents were asked to evaluate extensively a variety of attributes and aspects related to their city, the urban policies and their opinions about ICT, as well as their personal use and satisfaction concer-

ning ICT applications. Finally, a few personal questions were added to get a general profile of the respondents. Most of the answers to these questions were given on an ordinal scale, measuring the relative degree of agreement or disagreement with different statements, or the relevance of different issues for the city.

Table A.1. Respondents according to their field of activity

Activity field	*Percentage*
Urban planning, urban development	32.5
Economic development	15.8
Transportation department	2.8
ICT department	6.4
Politicians	15.3
General management, accounting, city services, public relations	2.3
Environmental department	1.4
Others	7.4
No answer*	16.1
Total	100

* Since the Spanish group did not include most of the personal questions in the questionnaire, for these items there is high percentage of «no answer».

As Table A.2 demonstrates, almost all the respondents use PCs and wordprocessing on a regular basis. Usage of e-mail is also very frequent for most of the respondents. Just 13.4% of the respondents have no access to e-mail. Usage of the Internet is also relatively frequent, although less than e-mail. Usage of more professional applications like GIS and CAD is clearly less frequent, since they serve mainly respondents with a spatial orientation. Another interesting aspect of ICT applications usage is the extent to which the respondents find them helpful.

Table A.2. Usage of different ICT applications

Applications	*Daily (%)*	*Weekly (%)*	*Less than weekly (%)*	*Not available (%)*	*No answer (%)*
PC	84.3	4.6	2.1	5.2	3.3
Word processing	80.9	8.3	4.4	2.7	3.7
Databases	33.9	19.9	28.8	9.1	8.2
E-mail	61.7	11.7	9.1	12.7	4.7
Internet	40.3	19.1	12.6	22.2	5.9
GIS	9.5	9.1	20.9	46.9	13.5
CAD	8.1	3.6	17.1	57.7	13.3

As Table A.3 shows, most of the respondents think that ICT will have positive effects on the urban administration. However, fewer respondents strongly agree with the statements that indicate that ICT will affect policy-making political processes than with those statements that suggest more efficient communication and implementation. Therefore, ICT are likely to affect administration more strongly than the poli-

tical process. Moreover, there are sceptical, albeit minority, views about the ability of ICT to increase public participation and to influence public decisions and policies.

Table A.3. Agreement with statements regarding ICT

	Strongly agree (%)	*Agree (%)*	*Disagree (%)*	*Strongly disagree (%)*
ICT will change the policy-making process in our municipality	22.9	50.0	22.8	4.4
ICT make the political decision-making process more efficient	21.7	54.3	25.9	7.1
The implementation of policies is more efficient with ICT	21.1	52.8	21.2	4.8
ICT improve communication within our city administration	53.8	40.8	4.5	.8
ICT improve the ability of our city administration to serve the citizens	54.9	41.0	3.7	.4
ICT improve citizen access to useful information	61.7	35.5	2.4	.4
ICT give the administration better access to public opinion	31.0	48.7	18.0	2.3
ICT will lead the administration to take greater account of public opinion in forming policy	15.0	44.5	34.1	6.3
ICT will increase citizen participation in the policy process	15.6	52.5	26.9	5.0
ICT provide all segments of the population with equal access to education, employment and social services	7.0	32.6	44.8	15.6
ICT increase, even more, the gaps between the rich and the poor	16.6	45.7	29.2	8.6
ICT enable people to get better access to professional services without living in a city	36.8	58.0	4.0	1.2
ICT enable people to get better access to urban cultural life without living in a city	26.2	51.6	18.3	3.8
ICT improve the quality of social relationships	2.6	17.3	55.1	25.0
ICT will increase working at home in our city	17.2	59.5	20.8	2.5