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Planners' Attitudes toward the Spatial Impacts of Information and Communication Technologies

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ABSTRACT

Information and communication technologies have evidenced a swift development recently, and the effects of these technologies on space have been discussed since the 1980s. Even though there is no consensus about what spatial effects are, all authorities and academics are of the opinion that information technologies play an important role in changing spatial structures. These developments will affect both spatial development and spatial planning. This article aims to offer an insight into the impacts of information technologies on urban spatial structure and development. Within this context, in order to discuss the spatial effects of information technologies, the basic factor on which spatial change is based should be defined. Studies of the changing meanings of space, distance and time have shown that these factors will not be a negative factor in relation to information networks and communication. Information and the need for qualified people are important elements in production, and become determinants in the location decisions for activities. The expected spatial changes are various. In general, future studies will be needed to focus on the spatial effects of information technologies. The article discusses the effects of ICTs on spatial and urban change and to examine the needs that arise and opportunities to be met in terms of the city and regional planning discipline. With that purpose in mind, the aim is to make suggestions in the light of opinions discussed in the relevant literature and to realize a field study in order to evaluate the opinions of urban and regional planners who are deciding the future of cities. The results of the field survey indicate that urban and regional planners are of the similar opinion as experts and academics in the field in supporting that ICTs are an important element that should be considered in spatial planning.

Keywords: information and communication technologies, urban development, spatial change, planning, urban and regional planners

1. INTRODUCTION-CONCEPTUAL FRAMEWORK

Rapid urbanization and information and communication technologies (ICTs) are effective in every field of our lives; these are the two important developments that define the age we are living in. These two tendencies are actually related with each other. According to the studies on this issue, it is shown that the view that supports the idea of the "death of cities" due to electronic communication in the 1970s and 1980s has not proven to be true [1, 2]. On the contrary, these two developments mutually affect each other. Technological developments have effects on cities such as enabling services with higher added value; they also have accelerated industrialization and economic dynamics. E-commerce applications can be made online in all sectors. Big cities have become a center for the investment in and production of new technologies. In addition, via ICTs, many cities are able to develop and even some cities called 'cyber cities' have emerged as a result of these technological developments [3]. Together with swift changes in ICTs came concepts such as those of the e-city, e-region, e-country and e-Europe. Within this context, the effects of technological developments on cities and urban change have become an important element that should be included in the planning discipline and process.

In the information age, cities become a center for the production and the distribution of information. Cities with strategic importance which lead in the production and the distribution of information are more successful in producing well-being and at attracting firms with higher added value when compared to their rivals. However, in terms of information and its management, there are two

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points to be dealt with concerning cities. These are; which information type should be discussed for cities, and while information management is a concept dealt with at firm level, whether this concept can be used for cities, regions and countries [4].

The discussions about the effects of ICTs on spatial development cannot be separated from the concept of the information society. The information society represents an economic wave in human history [5, 6, 7]. Comprehending the main elements of the information society will enlighten us as to how and why ICTs should be regarded in planning practices. The information society is a concept discussed by many scientists and futurologists such as Bell, Masuda, Toffler, Naisbitt, Weiner & Brown and Castells over the past thirty five years [5, 6, 7, 8, 9, 10]. If the issue is dealt from a planning perspective, it can be concluded that these developments may have spatial affects and also affect the discipline of city and regional planning [11].

The word 'information' has been severely used for the concepts of information technology, information age, and information systems. Although data and information are often used synonymously, there seems to be some consensus on a hierarchy of types of information, from data to information to knowledge. Knowledge relates to understanding based on information, experience and study. In this context, data refers to raw facts, both quantitative and qualitative while information pertains to data manipulated and organized in a meaningful form. Data is recognized upon its acquisition from one of many different sources in one of many different ways through events in the real world and the world of the mind [12, 13 cited in 14].

The terms of information technology (IT), new information and communication technologies (NICTs) and information and communications technologies (ICTs) are used correspondingly to indicate a critical step in the long history of technology. Information age is a standard term describing the era in which we live. The use of 'information technology' is increasing and the value of 'information systems' is rising. This trend is parallel with the great importance of information highlight important trends that are shaping information age. The common use of information technology or information and communications technologies shows fundamental differences in what the various scholars actually mean by these terms [14]. "As digital revolution, IT refers to a wave of socio-technical change, comparable to the earlier waves associated with electrification, industrial mass production, the telephone, and the automotive complex. This socio-technical economic system has transformed, and is likely to further transform, the economies and societies of nations. This definition has associated with futurist and utopian thinking of technology. As communication systems, IT refers to digital communications networks, which are seen as vehicles for dialogue between residents and public officials, or strengthening social bonds in communities of place" [14].

Because information and communication technologies are changing very rapidly, they are become more mobile, ubiquitous and augmented. In this sense, mobile technologies are playing an important role in the information era. People have got the possibility to use computers for handling huge amounts of data, text, voice and picture information which are also integrated into a multimedia product in information era. The capacity of computers is growing while their prices are going down. The internet and mobile phones are growing all the time and fast. Information and communication technologies have given and will give a growing number of people access to a great variety of information sources at low cost and great speed. Wireless technology provides opportunities for networking and sending different types of information to anybody who is connected at any time and any place. However, Molitor expresses that ICTs will face more technological change in last years than in the past. According to him, the most important changes will originate from the development of optical transmission, satellite communications, wireless and mobile communications devices, broadband digital technologies and internet resources [15]. The reliable functioning and use of ICTs is no doubt in the interest of the ICTs industry. Thus, the technological development is going to include also tools and means which could help in overcoming current and future problems in the ICTs services. Because of the rapid development of ICTs the examination of spatial effects of ICTs applications can now only be an interim exercise [16].

Urban researchers developed alternative city movements in order to solve problems in urban areas. In this context, learning city, technological city, eco-tech city and smart city concepts should be considered by urban and regional planners. According to Sachs-Jeantet science and technology are an essential component of the future of cities. Competitiveness will depend largely on the capacity to generate and utilize knowledge, scientific and technological capabilities. The pattern of urban development and amenities, and cities' sustainable management will strongly influenced by them [17].

A Learning City (a city, town or community - regardless of its location or size) addresses the learning needs of its locality through partnership. It uses the strengths of social and institutional relationships to bring about cultural shifts in perceptions of the value of learning. Learning cities explicitly use learning as a way of promoting social cohesion, regeneration and economic development which involves all parts of the community. Learning cities have two principal purposes; to support lifelong learning and to learn how to promote social and economic regeneration [18].

Smart cities can be considered as a pilot test areas of e-government applications. Smart city concept is closely related to the knowledge-based economy. The research and the use of new technologies are intensive in the smart cities in order to open up new horizons into the science, industry and trade. The effects of ICTs can be seen in the smart city. E-governance concept establishes

a link between the management of these technologies. E-governance is provided by the usage of information technologies into the management, trade and communication with multi-participation [19]. Financial services, information technology and communication industry are the most significant components of economic growth in the smart city. Thus, smart city is integrated with smart physical spaces and infrastructures [20 cited in 19].

Eco-tech cities brings together ecology and technology concepts in cities. Ecology and technology are seen as opposite concept. Ecology refers to the natural environment while technology refers to the artificial environment. Eco-villages and eco-cities are planned in ecological planning. Techno parks, smart cities and smart houses are designed in technological planning. However, both of them are introverted and separate systems. Electricity, energy, automobile usage and the technology used in daily life are ignored into the eco-village projects. Information technologies, smart devices, information processing, generating and transmission are significant in smart cities. Ecological dimension is ignored in this process with high energy consumption. Ecology and technology seen as opposed two concepts come together in harmony with the eco-tech concept used for the benefit of sustainable cities [21]. "Eco-tech city changes the current planning understanding by sustaining environmental values and natural resources with the use of nature friendly technologies. It is self-sufficient that it produces its own energy and food. A settlement planned with eco-tech approach, will be developed economically as well. It promotes sustainable transport and reduces emissions for urban health using environmental technologies. Eco-tech city is planned in natural habitat for human comfort by selecting better spaces for urban functions with the help of geographic information technologies" [22].

Cities and their economies are become more innovative and competitive. Thus, knowledge production and knowledge-based urban development (KBUD) have become crucial aspects of success in the tough global competition of attracting and retaining knowledge workers and knowledge-intensive industries. New urban quarters are developed in cities in order to form creative urban regions with a particular focus on knowledge production, i.e. knowledge community precincts (KCPs). Knowledge generation, learning, commercialization, and lifestyle are created through a cooperative partnership of all tiers of government, research and education community, private sector operators, highly talented professionals, and the public. KPCs are integrated these centres. Traditional business, technology parks and industry clusters emphasis on the advantages of business co-location. KPCs are different from these areas [23].

2. SPATIAL RESTRUCTURING AND INFORMATION AND COMMUNICATION TECHNOLOGIES

The socio-economic structures of cities, financial markets, and the re-structuring of their foundations have been affected by the existence of an infrastructure, enlightenment in capital flow, the formation of organizations having a role in the decision-making process and the mobility of capital. As Castells points out, the global city has emerged as a concept defining the re-structured cities as a result of this formation. The information and communication age has become the messenger of a new city formation called 'the information city' [24]. Also, the new society is based on information, organized around networks and due to the nature of partial flows; the informational city is not a city form but rather a process [25].

The most common question in discussions of spatial development is whether the development is towards the center or has an expansive characteristic. Basically, the question has a simple answer. The development may exhibit both tendencies; because ICTs offer more independency for the spatial choices for different activities and in fact, this result depends on how this independency is used [11]. Those who support the centralization theory believe that central cities will continue to be active, and their role will even strengthen with technological developments. According to Gaspar and Glaeser, together with the developments in ICTs, every demand necessary for human interaction will increase and the role of cities will strengthen as the centers for various activities and interactions [26]. Supporting this idea, Panayides and Kern state that the developments in ICTs caused an increase in face-to-face communication and an enlargement in city sizes with the assumption that city residents were in a more electronic interaction than the ones lining on the periphery [27 cited in 28]. The discussion of centralization, decentralization and expansion has lead to further discussions concerning the roles of urban and rural areas. Hall agrees with those who support the idea that the roles of cities will remain the same. According to Hall, cities will continue to be the only center for a wide range of activities, and the face-to-face communication necessary for production and consumption [29, 30]. Hall and Kotkin claim that centralization will occur despite the decrease in the importance of physical proximity in urban spaces, and that the vitality of cities will continue [30, 31]. In their study on the developments in American cities, Kotkin and DeVol state that urban revival was a process that began in the 1990s and continued to the present, and that American cities like New York, Boston, Los Angeles and Chicago had come to benefit from that transformative process [32].

Due to different activities demanding special requirements of settlements, different cities offer different opportunities. However, despite these differences, there are some basic factors which are of critical importance in every situation. These factors are the preferred life styles of its citizens causing them to choose the environment they live in and the accessibility of the workforce. A good living environment acts like a magnet that pulls on the qualified work force and workplaces. In their book, 'Splintering Urbanism', Graham and Marvin indicate that the presence of a tendency towards disintegration and an internal dissolution in urban structures in the

development of big metropolises causes the development of socio-economic regions, net spaces and less developed fields [3]. Many scientists (Castells, Hall, Kotkin) warn against the 'dual city' concept, that is, the city separated into different social and spatial fields. The dual city is however, commonly the separated living spaces of the poor and the wealthy. This danger can be prevented only through accurate and proper planning perception.

Garreau defines edge city as any place that "has more jobs than bedrooms, is locally perceived by the population as one place, and was nothing like city as recently as thirty years ago". According to Garreau, edge cities have emerged as new centers with white-collar jobs, shopping, and corporate headquarters [33]. A further concept is explained from Kotkin and DeVol that of edgeless cities, as a new, dispersed and edgeless cities are spread over the nation, although the general shape is difficult to define because of their lack of definite boundaries. With prosperity of suburbs and exurbs, traditional cities have declined as industrial and corporate centers. However, since the late 1990s, cities have begun to fortify their traditional role as centers [32 cited in 28].

According to Sassen services tend to be condensed in global cities. Therefore, the global city emerges through a combination of economic globalization, information and communication technologies via a three-dimensional urban space connected to networks [34]. Cohen indicates that investing in already dominant fields carries minimum risk [35]. In his book, 'The Internet Galaxy', Castells clearly states that discussion of the 'death of cities', with no strong basis, is imaginary and wrong-headed. Instead, he envisages that due to the intensifying of activities and services, and with professions bringing incomes, cities and metropolitan areas will continue to grow and develop. In conclusion, the population will continue to grow and gather in metropolitan areas, and the internet will provide an internal network in these regions. Castells also reminds us that metropolitan areas consist of many different communities, these communities do not have their own administrative statuses, but they do have their own internal administrations, bodies which have very complex structures [2].

Contrary to the perceptions supporting centralization, those supporting decentralization have observed a centrifugal tendency in urban forms together with technological developments. The decentralization thesis was raised in the 1960s, the centralization thesis came more to the fore in discussions dating from the 1990s. The reason for the earliness of the decentralization thesis may be due to the fact that in the years when ICTs were just being developed, the initial responses to and attraction for ICTs came from academics, and they focused on decentralization. Webber was perhaps the first academic to offer the suggestion that the developments in transportation and technology would produce more scattered and various urban settlements needing more space than they did in the past. While communication technologies have developed more rapidly than envisaged by Webber, the developments in transportation types and methods have occurred more slowly. In this sense, the rapidness of the developments in communication has caused dramatic changes in transportation reasons and types [36]. Webber stresses that communication type should be evaluated as a basic factor in re-shaping city form. According to this thought, communication leads to the scattering of physical fields and an increase in the movements of individuals. The traditional urban pattern decreases the importance of working and housing areas. Webber describes urban areas as groups of people communicating with each other in spaces rather than as urban settlements or regions [37]. The idea of Webber is based on 'urban areas without spaces'. Many studies conducted since 1963 agree on the view that the developments in computer and communication technologies accelerate urban expansion and the capital flow in central cities. Pascal supports the view of Webber that technological changes separate societies into parts, change their economies, and therefore the interaction in the space expands. According to the view of Pascal, the relationship between urban form and ICTs depend on the entropy paradigm: the tendency in technological developments will primarily penetrate into urban and then to rural areas. Therefore, new technologies will decrease the attraction of cities which are the centers of human interaction and working [38 cited in 28].

Supporting the view of decentralization, Atkinson claims that ICTs would cause 'the death of distance'. Gillispie believes that there would be a competition between centralization and expansion, however there should be research examining the balance between the powers behind the change. According to Moss, one of the reasons for expansion is the deficiency of space in big cities [39, 40, 41 cited in 11]. Gordon and Richardson stresses that the developments in ICTs will intensify the expansion of urban spaces, as was the case with the automobile, concluding that both make physical proximity unnecessary [42]. In one of their studies, Tayyaran and Khan state that work places and houses were becoming a 'multicore' urban form located outside of space and along transportation routes that consisted of urban satellite hubs [43].

In the relevant literature, a complex combination of centralization and decentralization is seen as a possibility concerning this simple dichotomy. According to Gottman and Harper, communication technology works in two directions, the accumulation and the expansion of social and economic activities [44]. Similarly, Hawley supports the view that both central and centrifugal powers can occur at the same time. The central tendency gathers the units of an organization (house settlements, etc.). The centrifugal tendency causes units to expand towards outwards in the direction of the needs and competition of the spaces [45]. Graham and Marvin suggest that ICTs may be regarded as an increasing explanatory despite the dichotomy of centralization and decentralization [46]. According to Atkinson, the development tendency is present in America. While the development in metropolitan areas causes decentralization, on the other hand, some activities are moved to smaller areas from metropolitan areas. In conclusion, despite the decrease

in physical factors and spatial hierarchy, the basic geographical advantages in the core of cities will continue to attract population and activities without any lessening of their importance [47 cited in 28].

In addition to the centralization and decentralization dichotomy and the possible results of both developments, we encounter new urban forms as another common theme within the frame of spatial structuring with ICTs, some of which includes the electronic cottage, telecity, the city of bits, 'e-topia' (the city with electronic service systems globally connected with each other), digital places and the 'aerotropolis'. The views about the emergence of new urban forms were developed by the supporters of determinism and futurism. Toffler explains the concept of the electronic cottage as a new production system based on the opportunities offered by ICTs. These electronic cottages have become the place for mixed activities, production and entertainment [8]. Fathy describes the electronic cottage of Toffler as a telecity emerging functionally and structurally through the use of ICTs in urban activities. In telecity, virtual networks and information based activities are articulated on the present physical forms of cities. Telecity accommodates teleworkers and provides information services for both its residents and other customers. In conclusion, telecity is a composition of individuals, households, firms and public offices connected with each other through remote services [48]. Similarly, Mitchell deals with the digital network city as a 'city of bits'. He examined the relationship between the global digital network and physical and virtual spaces. In addition, Mitchell believes that 'e-topias' (globally interconnected cities with electronic service systems) could be plainer, greener and more rational, and he hopes that the digital revolution and the new economy may provide an alternative for the uncontrollably growing cities of the industrial revolution [49]. In his study, an attempt to understand information based cities, Horan states that 'digital spaces' can share the same space with physical and virtual worlds [50]. According to Kasarda, basic airport corridors have become the places for the gathering of advanced technology professions, and have therefore formed an 'aerotropolis', which is located in airport corridors and based on low density, wide lanes and fast movements [51] (Figure 1).

SPATIAL RESTRUCTURING		EXAMPLES
Dichotomy	**Urban Centralization**	Revitalization of urban center [30, 31, 32]. Increase in face-to-face interactions and city size [26, 27]. Global city [34].
	Urban Decentralization	Non-place urban realm [37]. Entropy Paradigm [38].
Combination		Beyond dichotomy, mix of centralization and decentralization [44, 46]. 'Megalopolitan' concentration [52].
New Urban Forms		Electronic cottage (A new production system of a household with mixed activities (production, consumption, and leisure) [8]. Telecity (A concentration of individuals, households, firms, and public agencies interactively interconnected to one another via remote services) [48]. City of bits (A digital network city) [53]. E-topia (Lean, green cities with "dematerialization, demobilization, mass customization, intelligent operation, and soft transformation") [49]. Digital places (A city sharing space in both physical and virtual worlds) [50]. Aerotropolis (as advances in ICTs stimulate more air travel due to more long-distance businesses and the emergence of ecommerce) [51].

Figure 1. Perspectives on Spatial Restructuring; adapted from [28].

Briefly, the discussions about the relationship between ICTs and spatial structuring can be summarized from three basic viewpoints; counter-views supporting centralization and those supporting decentralization, and the views supporting the conceivability of both structures and new urban forms. The decentralization thesis held many attractions in the early years of the emergence of technological developments; however, currently this view has been, in part, abandoned. Instead, current literature agrees on the view that central and centrifugal tendencies have an effect on the urban environment. Discussions of new urban forms are mainly based on a futuristic perspective and widely accepted by urban academicians and professionals [28]. Trying to define the important elements behind the spatial change may be a good starting point for the discussions aimed at spatial developments of ICTs (Figure 2). Also, the relations between urban places and ICTs are classified by Graham and Marvin in figure 3 [46].

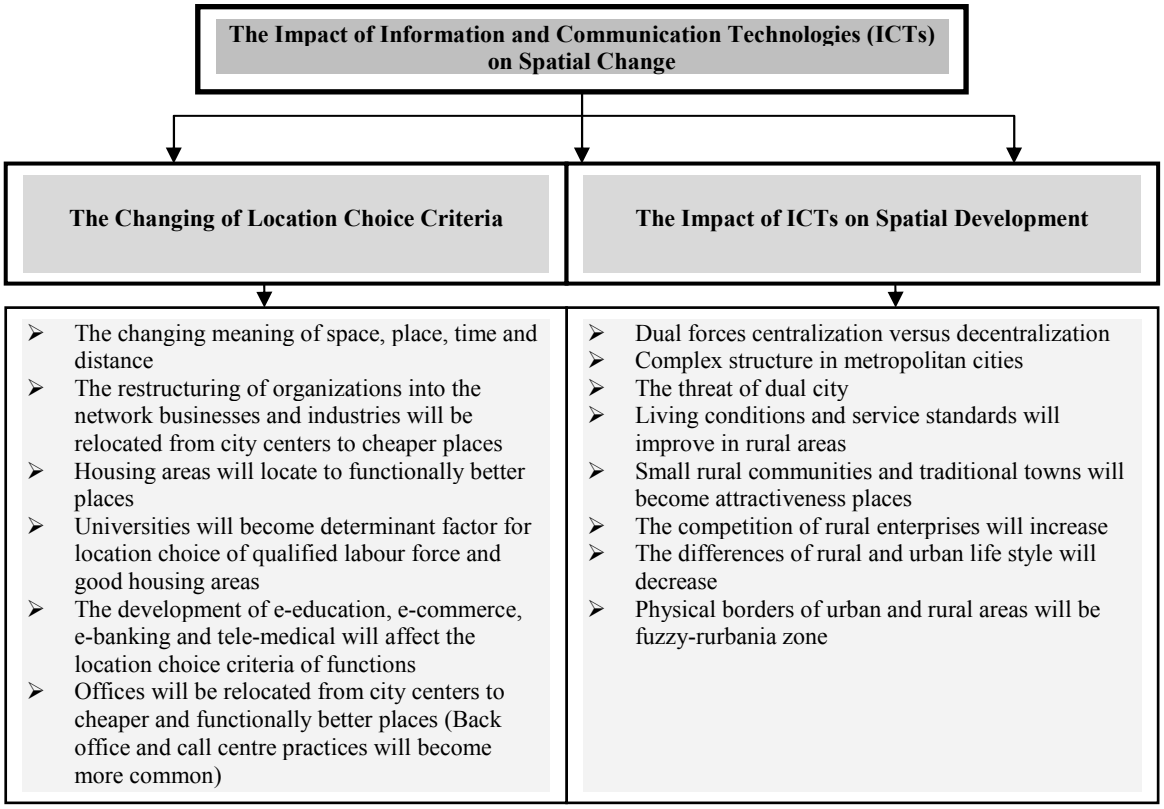

Figure 2. The Impact of Information and Communication Technologies on Spatial Change

According to Graham and Marvin there are a range of different relationships exist between the physical form of urban places and the development of electronic spaces [46]. They highlight four key aspects of city and ICTs relations (Figure 3). ICTs and physical changes in cities push in similar directions. They point out, the development of technology transport networks and suburbs support the development of multicentred, fragmented cities or home-centred social life. New York, London and Tokyo are the hubs which dominate global telecommunications investments and global airline networks, national rail and road systems. Also, they are the centers the largest transport demands are concentrated within cities. Physical synergies are also demonstrated by the fact that the world financial centers of these cities.

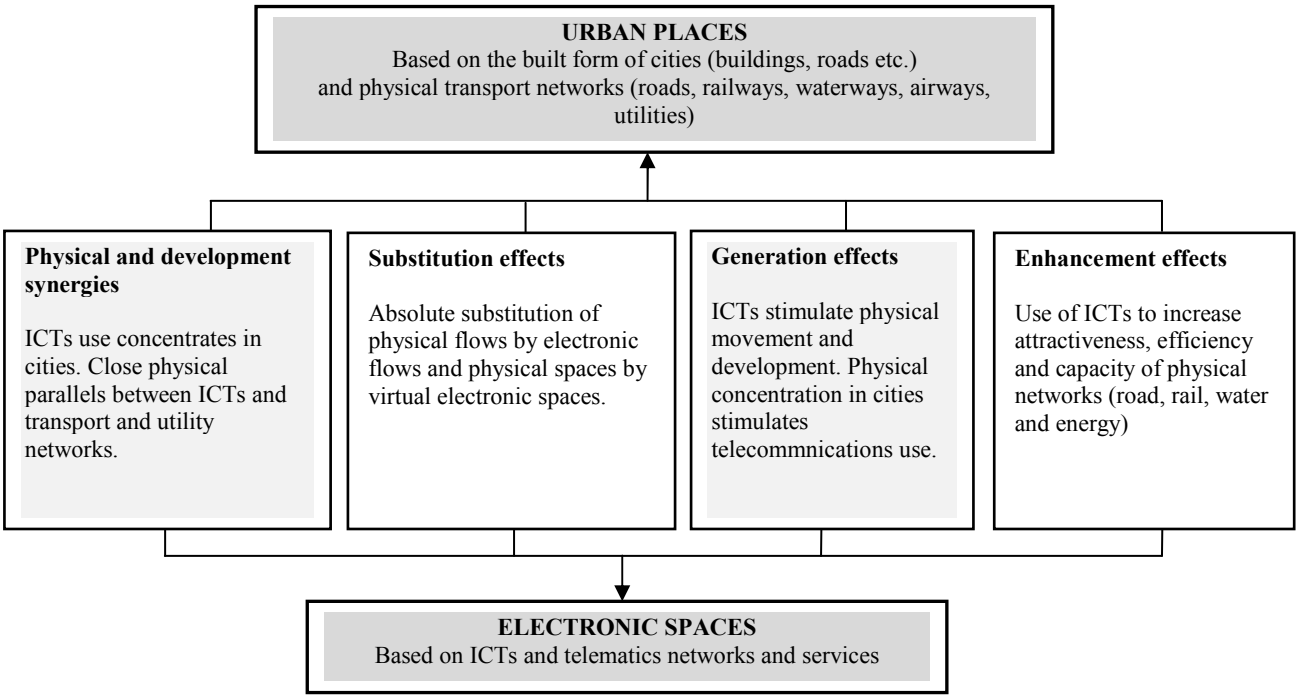

Figure 3. The relations between urban places and ICTs [46].

"The growing teleworking debate, for example, centres on the degree to which telecommuting to work can replace the cost, stress and environmental effects of physical commuting. Other business debates consider the amount of expensive city centre office space that can be substituted by people working in new patterns, linked up within electronic spaces while being physically mobile or separated. Can teleconferencing technologies allow people to substitute for physical conferences? Can back offices be developed in cheap locations to service small headquarters? Possible substitution of electronic flows and spaces for physical flows and spaces can be seen as only one element of a complex interrelationship between the ideas of simple of simple substitution to be a myth" [46].

3. THEORETICAL APPROACHES ON INFORMATION AND COMMUNICATION TECHNOLOGIES AND PLANNING

Graham and Marvin identify four dominant perspectives to city-telecommunication relations; technological determinism, futurism and utopianism, urban political economy and social construction of technology [46]. The complexity of the interactions between information and communication technologies and urban development challenges existing theoretical approaches and models; they are presented from Maeng and Nedovic-Budic have both advantages and disadvantages for explaining the causes and effects of ICTs on urban development patterns [28] (Figure 4).

Theoretical Perspective	Advantage	Disadvantage
Technological determinism	- Simple, straightforward logic - Widely accepted	- Lack of a sufficient proof - Limited depth in theoretical explanation of technological cause and urban effect
Futurism & utopianism	- Simple, straightforward logic - Providing visions for the future - Emphasis on the important role of ICTs in urban enhancement	- Idealistic and speculative -Simplification of the complex interactions between ICTs and urban form
Urban ecology	- Recognition of technology as part of the overall change in urban form - Understanding of where and how different activities occur	- Simplistic approach -Basic assumption of a collective way of adaptation (rather than an individual process) - Lack of understanding of causal factors

Urban political economy	- Understanding of economic forces and the unequal social relations of capitalism as the main factors in explaining ICTs and urban settings	-Overemphasis on the restructuring of capitalism at the macro level -Exclusion of technological development as a social process
Social construction of technology	- Emphasis on the social shaping of technology at the local level	-Limited attention to the social structure and power relationships -Lack of understanding of the identities of different social groups

Figure 4. Theoretical Perspectives on ICTs and Urban Patterns [28].

Technologic determinists, the urban effects of ICTs are straightforward, linear, direct and simple. Decentralization, the free availability of highly capable communications in everywhere, the shift towards city economies based on information and immaterial urban life, the growth of culture based on cyber-interaction and the growth of teleworking [46]. According to Maeng and Nedovic-Budic, the logic of technological determinism is limited in assuming that technological innovations are the determining growth factor in society and urban development. This approach's lack of sufficient proof and of depth in theoretical explanation reduces the complexity of ICTs and of their spatial effects. However, technological determinism is accepted by many planning scholars and professionals [28].

Technological determinism, futurism and utopianism are simple and straightforward logic. The interactions between ICTs and urban development patterns are not clear in envisioning how the development of ICTs will shape cities. Utopianism dates back to the late nineteenth century, when technological promises for a better urban society and quality of life were relied on to deal with negative aspects of industrial cities [28]. The logic of futurism and utopianism tend to take relatively optimistic view of the future effects of ICTs on cities and urban life. Electronic spaces and networks are seen to have very positive effects both for the physical aspects of cities more widely and negative effects can be solved through new technologies [46].

Robert Owen and Charles Fourier (early socialist utopians), sought to create a new society, largely in reaction to the social problems created by industrialization. Although these thinkers were anti-technology, they retained a faith in technology while providing a critique of industrialization. For instance, utopians argued that technology could help deal with the negative impact of industrialization on labour by helping return workers to rural agriculture [54, 55 cited in 56]. To Ebenezer Howard and Frank Lloyd Wright who are following the long-standing utopianism, industrial cities are seen to be sick or unnatural. Advances in ICTs, as the cause of urban decentralization or even dissolution, are heralded as solutions to many of the ills of contemporary urban society [46]. Ebenezer Howard, Frank Lloyd Wright and Le Corbusier (later utopians) were likewise fascinated with the power and order of technology, which they hoped would lead industrial society to a just, ideal form [57 cited in 56]. They looked to employ technological innovations to engender social progress, and this way of thinking has continued throughout the history of planning [56]. The most futuristic analysis of the effects of ICTs on cities was developed by Toffler [46].

Technological determinism, futurism and utopianism approaches provide visions of a better future. However, they remain speculative and idealistic. According to urban ecologists technology specifically is a part of the overall change in urban form. Their basic assumption is that a collective process of adaptation occurs, rather than individual processes. This assumption does not reject individual activity. However, urban ecology focuses on the consequences of actions at the macro level. Furthermore, urban ecology describes urban form by examining where and how different activities take place, rather than explaining why they do [28]. Pitkin states that there has been a dominant technocratic culture in American society that has largely infiltrated planning, with scattered examples of challenges to this ideology. He contends that planners have largely exemplified technocratic ways of thinking by looking to technological innovation to solve urban problems without considering its possible limitations and unintended consequences [56].

According to Graham and Marvin another range of analytical approaches to city and information and communication technologies relations can be grouped under the heading urban political economy. This approach defend that the development and application of ICTs are not separated from society. They are fully inscribed into political, economic and social relations of capitalism. ICTs and electronic spaces are not seen as simple determinants of urban change and also they are not cast as panaceas technical solutions to urban problems. The followers of this approach argue that ICTs relations cannot be understood without considering the political, economic, social and cultural relations of advanced industrial society and how they are changing. The fourth approach to city and ICTs relations is the Social Construction of Technology (SCOT). Similar to political economists, scholars in the social constructivist camp has arisen from a rejection of technological determinism. They reject the notion ICTs have some autonomous logic which affects on cities an external force. However, scholars in the social constructivist camp also do not accept many of the discussions of political economy, with its stress on the central importance of the structures of capitalism and the overwhelming power of political economic forces in

shaping how telecommunications develop in cities [46]. "In identifying technological innovation as part of social processes, both the political economists and social constructivists present an important challenge to technocratic ideology. They reject the technocratic assumption that technological innovation leads directly to social progress, arguing that the development and adaptation of technologies is 'socially constructed.' Technological innovation does not happen in a vacuum; rather it is always part of a social, economic and political context. Technology on its own does not lead to social progress, but as part of a larger social process it can have a role in bringing improvements to society" [56].

4. FIELD SURVEY

The purpose of the field survey is to evaluate the approaches of urban and regional planners towards ICTs and its effects on spatial change; their perceptions and suggestions were sought. In other words, the field survey aimed to determine the level of parallelism between the views of urban and regional planners and the views suggested and discussed about the effects of ICTs on cities in the literature. In this context, the views of planners on the suggestions developed in the paper were evaluated in the field survey results.

4.1. Methodology

The methodology of this paper was built on the study realized by the urban planners of Talvitie in Finland in 2003. In the Talvitie study, the spatial effects of new technologies were evaluated based on the ideas of Finnish urban and regional planners [11]. The reason for the target group was simply the fact that urban and regional planners are on the frontline of those who have to deal with the new trends in spatial development. This study has used the suggestions developed in the above-mentioned study within the scope of field research, a survey was developed in line with this model, and it was implemented on Turkish urban and regional planners. The survey form developed according to urban planners included different suggestions regarding the spatial impacts of ICTs on cities. There are approximately 4500 urban planners registered at the Chamber of Urban Planners in Turkey [58]. Therefore, the survey was applied to 100 urban planners forming the sample of the study, and this constitutes approximately 2% of the target group. The survey was applied to urban planners working in various cities of Turkey chosen through a random sample method in February of 2010. A Likert scale was used in the preparation and evaluation of the survey. The questionnaire form contained 68 different statements about the effects of ICTs on spatial development and urban and regional planning practices. The opinions on 47 statements were evaluated in this study. In the questionnaire form the planners had access to five alternatives in reply: totally agree, somewhat agree, cannot say, somewhat disagree and totally disagree. The results were analyzed by using the SPSS 16.0.

4.2. Field Survey Results

The majority of urban and regional planners were males, 65%. The age structure was representative of the urban and regional planner population at large. The share of 50- year-olds and over was 12%, 41-50- year-olds 49 %, 30-40- year-olds 37% and under 30- year-olds only 2%. 24% of the respondents were at the service of municipalities, 32% worked for public and 38% worked for private sector. 6% did not give information on their employer.

In this sense, it can be concluded that the blurring of distinctions between rural and urban areas in the literature has not yet been realized by the planners. However, as discussed in the previous section, as a result of the decentralization that has come about through the changes in location choice factors, rural areas are now understood to have urban characteristics and the differentiation of rural-urban areas have began to be more blurred (Table 1).

Table 1. The opinions of Turkish planners on the statements of some possible consequences in the spatial development caused by ICTs (n=100)

Totally Agree %	**Somewhat Agree %**	**Cannot Say %**	**Somewhat disagree %**	**Totally disagree %**	$\overline{X}$	**S**
The move of activities to cheaper places is the consequence of increasing competition						
23,7	49,5	17,2	7,5	2,1	2,1	0,9
Living conditions will improve in rural areas as a result of the use of ICTs						
22,6	43	17,2	14	3,2	2,3	1,0
Distinction between urban and rural areas will become fuzzy						
7,5	30,1	28	29	5,4	2,9	1,0
The urban sprawl of city regions will increase						
18,3	44,1	23,7	10,8	3,1	2,3	1,0
Structural changes are slow and they can be adapted to the existing urban structures						
12,9	49,5	23,7	9,7	4,2	2,4	0,9
Old urban structures and traditions will soften the pressure for change						
9,7	36,6	29	23,7	1	2,7	0,9
The significance of cities and centers as the central for of life and activities will remain						
20,4	56	12,9	7,5	3,2	2,1	0,9

The application of ICTs will change slowly but steadily existing community structures						
25,8	43	16,1	14	1,1	2,2	1,0

While planners in Turkey strongly agree with the opinion that developments in ICTs will mean that distance will lose its importance and will change location choice factors and working styles, they only half-believe that such freedom will highlight the important characteristics of the space. This case may indicate a separation of the planners' views from those expressed in the literature (Table 2).

Table 2. The opinions of Turkish planners on the statements about the impact of ICTs on some principal location factors (n=100)

Totally Agree %	**Somewhat Agree %**	**Cannot Say %**	**Somewhat disagree %**	**Totally disagree %**	$\overline{X}$	**S**
Distance loses its importance measured in time and length						
43	38,7	10,8	6,5	1,1	1,8	0,9
Location factors of different activities will change						
37,6	49,5	6,5	5,4	1,1	1,8	0,8
New working ways of organizations and people will change the working ways of communities						
23,7	47,3	18,3	7,5	3,2	2,2	0,9
Freedom of location will emphasize the significance of the features of a place						
20,4	33,3	23,7	20,4	2,2	2,1	0,9
The significance of the role of ICTs as a location factor is not yet recognized						
20,4	33,3	23,7	20,4	2,2	2,5	1,1
The application of ICTs has no spatial consequences						
5,4	15,1	18,3	34,4	26,9	3,6	1,2

More than half of the planners support the suggestions offered to them; however planners to a certain degree either do not have any view or do not agree with these views. Therefore, they are observed not to have a clear view about the effects of ICTs on housing areas (Table 3).

Table 3. Opinions of Turkish planners on some possible impact of ICTs on housing (n=100)

Totally Agree %	**Somewhat Agree %**	**Cannot Say %**	**Somewhat disagree %**	**Totally disagree %**	$\overline{X}$	**S**
The demand for detached houses increases						
20,4	48,4	21,5	8,6	1,1	2,2	0,9
The parallel use of urban and rural/leisure homes will become more common						
12,9	50,5	22,6	8,6	5,4	2,4	1,0
The attraction of locations offering good opportunities for leisure time activities as permanent place of residence will increase						
18,3	44,1	24,7	10,8	2,1	2,3	0,9
Companies will locate to the vicinity of good housing areas because of the competition for quality labour						
20,4	41,9	21,5	14	2,2	2,3	1,0
The broadband connection becomes standard equipment of homes like plumbing and electricity systems						
19,4	38,7	31,2	8,6	2,1	2,3	0,9
ICTs have no impact on housing						
10,8	19,4	8,6	31,2	30	3,5	1,4

Furthermore and in conclusion, planners accept that with ICTs, there will be changes in the work place and in office location choices; however the company decision making mechanisms will remain in the metropolis. In this sense, a parallelism can be said to be present between the views in the literature and the ideas of planners (Table 4).

Table 4. The opinions of Turkish planners on some proposed spatial impacts of ICTs on the location of offices (n=100)

Totally Agree %	Somewhat Agree %	Cannot Say %	Somewhat disagree %	Totally disagree %	$\overline{X}$	S
Auxiliary functions of head offices will be relocated to cheaper premises						
29	44,1	19,4	6,5	1,1	2,1	0,9
"Call center" practice will become more common						
29	51,6	10,8	7,5	1,1	2,0	0,9
Remarkable number of central government offices will be relocated						
11,8	36,6	31,2	16,1	4,3	2,6	1,0
Locations of the key decision makers will remain in big cities						
32,3	43	12,9	8,6	3,2	2,0	1,0
Companies create offices to environmentally good places for short term team work						
16,1	44,1	21,5	16,1	2,2	2,4	1,0
Offices will be relocated from city centers to cheaper and functionally better places to avoid traffic jams and commuting problems						
24,7	40,9	16,1	16,1	2,2	2,3	1,0

These results indicate that planners in Turkey do not hold views that parallel the views, opinions and suggestions discussed in the literature about the effects of ICTs on production and services (Table 5).

Table 5. The opinions of Turkish planners on some proposed spatial impacts of ICTs on industries and services (n=100)

Totally Agree %	Somewhat Agree %	Cannot Say %	Somewhat disagree %	Totally disagree %	$\overline{X}$	S
Without the internet and the ability to use electronic services current service. Standard will decline regardless of locations						
23,7	30,1	16,1	18,3	11,8	2,6	1,3
Electronic commerce leads to the disappearance of permanent shops						
26,9	33,3	16,1	19,4	4,3	2,4	1,2
ICTs affect the location factors of industries						
16,1	40,9	22,6	19,4	1,1	2,5	1,0
ICTs improve the competitiveness of small companies in the enlarging markets						
15,1	53,8	17,2	12,9	1,1	2,3	0,9
ICTs help to eliminate problems caused by remote locations						
11,8	40,9	21,5	19,4	6,5	2,7	1,1

The spatial impact of mobile (wireless) communication on urban patterns has not been discussed very much. According to Kopomaa, the place where one uses a mobile phone should be called 'a third place' [59]. "Wireless communications tools can form a mobile work station not only in a car, but also when travelling on foot, by train, bus, ship and air, with some restrictions. One can also work with good connections to home base in hotels, airports etc. Ordinary people can also benefit from this development. The possibility to order the latest news or weather forecasts to a personal mobile phone, to send a query about the nearest restaurant, service station, bank etc., or to ask how to get from one place to another by public transport and get a reply which includes the route and schedule information, are some examples of these services. Only imagination will limit the development of these services and of course the costs that customers are willing to pay for them" [11]. The majority of participants agree with all the presented statements. The opinions show that wireless and mobile communications increase the freedom in work and play and in some cases the freedom in selecting the locations of companies and homes. Mobile communication also makes life easier when one can get services when needed and on the road (Table 6).

Table 6. Opinions of Turkish planners on the spatial impact of wireless and mobile communications (n=100)

Totally Agree %	Somewhat Agree %	Cannot Say %	Somewhat disagree %	Totally disagree %	$\overline{X}$	S
Work regardless of location will increase						
44,1	39,8	9,7	3,2	3,2	1,8	0,9
Increased freedom of location for companies						
39,8	33,3	12,9	12,9	1,1	2,0	1,0
Increased freedom on the location of homes						
24,7	32,3	24,7	15,1	3,2	2,4	1,1
Navigation services will save time and pains						
33,3	50,5	8,6	6,5	1,1	1,9	0,8
Increased freedom in work and leisure						
29	45,2	16,1	6,5	3,2	2,1	1,0

A large proportion of planners (83%) support the suggestion that the use of the home as a workplace will increase. While 75% of them agree that activities will become widespread seven days a week and twenty four hours a day, 68% of them agree the idea that ICTs will support the use of cheap foreign labour in teleworking. Nonetheless, fewer planners (57%) agree with the assumption that the type of teleworking applied several days a week will become more widespread. While 36% of planners agree that teleworking will not become a working type commonly used among workers, 31% of them gave the answer 'I have no idea' (Table 7). The results indicate the consensus of planners on the idea that teleworking will become a working type commonly used in future. Therefore, teleworking will constitute an important proportion of the work force and emerge as a main factor that needs to be examined in relation to the location choice factor in planning.

Table 7. The opinions of Turkish planners on some statements of the spatial impact of teleworking (n=100)

Totally Agree %	Somewhat Agree %	Cannot Say %	Somewhat disagree %	Totally disagree %	$\overline{X}$	S
Teleworking will not become a common practice among employees						
11,8	24,7	31,2	25,8	6,5	2,9	1,1
"Teleworking a few days a week" will become more common						
17,2	39,8	26,9	12,9	3,2	2,4	1,0
The role of home as a workplace will increase						
43	39,8	10,8	3,2	3,2	1,8	0,9
24/7 phenomenon, 24 hours a day and seven days a week activity will become more common						
37,6	38,7	14	6,5	3,2	1,9	1,0
ICTs will enable the use of cheap foreign labour for teleworking						
24,7	43	16,1	10,8	5,4	2,3	1,1
Efficiency will benefit from the different time zones in different work phases						
22,6	47,3	18,3	9,7	2,2	2,2	0,9

Sixty one percent of planners agree that ICTs have no effect on the transportation system. Seventy five percent of them believe that ICTs should be considered in the planning stage of public transportation systems and 66% of them agree that together with the decrease in travelling, ICTs activities will change location choices. The increase in evening and night traffic is accepted by 37% of planners. While 49% of planners do not believe the suggestion that video conferencing will not reduce the number of face-to-face meetings, 31% of them agree with it (Table 8).

Table 8. Opinions of Turkish planners on some possible impact of ICTs on traffic (n=100)

Totally Agree %	Somewhat Agree %	Cannot Say %	Somewhat disagree %	Totally disagree %	$\overline{X}$	S
Videoconferencing and the like do not reduce face to face meetings						
8,6	22,6	19,4	33,3	16,1	3,2	1,2
Evening and night time traffic will grow						
3,2	33,3	20,4	32,3	10,8	3,1	1,1
ICTs make it possible to locate activities so that commuting will diminish						
14	51,6	24,7	9,7	0	2,3	0,8

The impact of ICTs should be taken into consideration when deciding about public transport systems						
29	45,2	12,9	9,7	3,2	2,1	1,0
ICTs have no impact on conventional traffic						
9,7	16,1	12,9	31,2	30,1	3,6	1,3

Pitkin point out, planners need to be sensitive to the effects of ICTs, especially their possible unintended consequences. Planners need to be wary of the hype surrounding new information technologies in the information age. These can be important tools for planners but, they are not going to lead to better planning or better planned cities on their own. These technological instruments must be designed and used by persons well versed in, and concerned about, making cities more liveable. Technological innovation is socially constructed and technologies have been held by planners to be instrumental in deconcentration policies. However, it is clear that the causes of suburbanization were varied and complex. It is the fact that energy and automobile technologies encouraged suburbanization [56]. Additionally, social and economic forces such as housing finance programs and consumer preferences converged to stimulate suburbanization. As Graham and Marvin point out, simple technological determinism "is attractive because it creates powerful scenarios, clear stories, and because it accords with the dominant experience in the West" [46 cited in 56]. In this context, field survey results show that urban and regional planners should take into account and be careful about arguments discussed in the literature.

5. CONCLUSION

When the development of cities is examined as a historical process, it can be seen that technology affects urban space at every level. Industrial society has emerged as a result of the introduction of technological developments to the economy and the production process, and the disintegration of traditional society which had been based on agriculture. With the separation of housing from the workplace, a dense traffic emerged between homes and work places. Nowadays, a similar process occurs to the one brought by industrial society to humankind. The last quarter of the 20th century was the period in which this process began. Currently, people have the opportunity to access a wide range of information via technology and there is the chance to make use of it.

The development of ICTs has affected countries, regions, cities and the use of urban spaces. According to many researchers conducting studies of this subject, the spatial effects of these technologies occur in many dimensions. In this context, the role of urban planning is a subject to be discussed at this stage while ICTs continue to affect urban areas. Experts and academics researching the role of planning have determined that insufficient attention to, and emphasis on the importance of the urban and spatial effects of ICTs was not given. These technological developments have been seen as an opportunity for economic development, however until today, the effects of these developments on the urban environment could not be fully understand in the planning phase. Urban policies and strategies depend on the relationship between ICTs and the urban development patterns; attempts are made to make this clear to regional and local authorities. Despite the problems encountered by urban and regional planning, this discipline will have a role as an active institution in formulating the uses of ICTs in urban spaces. The integration of technological innovations to the planning system is a somewhat problematic process. ICTs have various effects on spatial structures and planning and include different dimensions. In this sense, ICTs should be examined in terms of the social, economic and physical dimensions of urban planning.

This article serves to discuss possible impacts of ICTs, which quickly change with the information age, on cities and urban change and the results of its expansion in terms of urban and regional planning. The results of the field survey realized with urban and regional planners in Turkey indicate that they are of the similar opinions as experts and academics in the field in supporting that ICTs are an important element that should be considered in spatial planning. In addition, they believe that ICTs will lead to swift and quick spatial changes occurring gradually. Briefly, ICTs, which is the basic driving force of the information society, is a new dimension that should be considered within the urban and regional planning discipline. It is vital for urban planners to be aware of this change. New technologies will affect spatial development; this absolutely must be taken into account in spatial planning. The effects of ICTs on cities, regions and spatial development and also on urban planning are key subjects to be discussed by urban planners.

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