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Review Article

DEVELOPMENTS IN URBAN SPACE IN THE AGE OF INFORMATION TECHNOLOGY

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ABSTRACT
Information technology and communications have been proposed as the major axis of change and development in the third millennium. In this area, the city is also changed by the development in the concept of urban space and the emergence of new infrastructure of information technology and communications.
The importance of the achievements of the age of information technology and communications is far beyond its means (the Internet, GPS, etc.) It technology makes it possible for the person to be at once present in both real and cyber dimensions, and manage to understand the space beyond the boundaries of space and time of its seating. That's why the nature of urban space which depends on the two factors of environment (physical and non-physical) and culture (the collection of material and non-material achievements of a society), will change by the new technology.
On the other hand, the form of the city, function, composition and the distribution of activities have always been heavily influenced by the capabilities of its infrastructure network. So, as the industrial revolution led to basic developments in the city and its texture, the infrastructure of information technology and communications also brings about widespread developments in the body of the city.
Given the depth and breadth of these changes, it is necessary that we re-direct this flow by identification of new capabilities and investigation of the physical changes of the city under the influence of this new technology. Since what has brought about the existing worries regarding the negative effects of the new technology, is the result of unplanned effects which occur in the opposition of cyberspace and real space.
In this paper, by avoiding the abstract approach to the subject of information technology and communications, we investigate its impacts on the urban space, body and face of the city and in the end, a new definition of city designing in the age of information technology and communications is presented.

***Keywords**: Urban Space, the Age, Information Technology*

INTRODUCTION
We have entered a new technological-cultural area and the basics of our thoughts regarding space and urban space (where we live) are challenged by means of the growing presence of information technology and communications in our daily life. The fact that people spend more time in front of the computer screen, has informed them of the issue that in fact the space of their work has taken form in the boundary of architecture and urbanism. So, gradually the space of architecture and urbanism changes so as to adapt to new activities and provide access to the Internet.
Technology makes it possible for the person to travel at once in both real and cyber dimensions. For example, the devices equipped with GPS technology and wireless internet, present technical and visual information related to that space in any urban space, and the user could understand the space, beyond the scope of its physical establishment.
The new technology has so much penetrated into the sphere of the users' thought that the means of identification and experience of life space has become actualized and the user, by analyzed information and images, achieves a knowledge not much creative and independent of environment. "So, the Internet has intended to change the way we view and understand the space." (Ananda & Lynn, 2005)
As the space and our notion of it depends on the concept of Presence, Lombord & Ditton (1997) argued that different technologies cause different experiences of the space and Presence. This attention to special

development could also be observed in the works of other early writers like Barbatsis (1999), where it says: " Like it or not, the space, as a metaphor of our mentality, changes in the territory of the digital realm." (Pour – Ali, 2008)

Thus, this information technology creates a new space by making a new attitude and a new life, which is the result of opposition of traditional ideas and real space to the new technological possibilities and cyber space; a composite space which is called by the title of cybernetic space.

On the other hand, the possibilities of this new technology change that into a new infrastructure for the future city; an infrastructure that, besides increasing the capabilities of urban environment and definition of new functions, also changes the body and face of the city.

In the urban literature, in recent decades, the mutual influence of urbanism and information technology under titles such as "Digital City", "Parallel City", and Recombinant Planning (which confirms the ICT combination and traditional urban planning and management), have been studied.

In this paper, with the aim of identification and best use of the effects of information technology and communications on the area of urbanism, we investigate the developments of the city body in the three dimensions of city space, body and face:

In the first part, to identify the developments of the urban space in the age of information technology, firstly with an inquiry of the nature of the future urban space (cybernetic urban space), we investigate a comparative study of the spatial continuity and hierarchy of the traditional city and the digital city. Then the developments of kinds of urban spaces (street and square) are investigated.

In the second part, by considering the information technology as the new urban infrastructure, we study its effects on the body and face of the city.

Analysis of developments of urban space in the age of information technology:

Cyber space and cybernetic space:

"Digital space (cyber) is an causal-argumental space." Mitra says. " when the recognition of space elements, by means of writing and visual contract elements, could be easily achieved. But this doesn't mean that it doesn't have certain limits and constraints; the limits and constraints of the cyber space are in the form of the name of codes and entries which control access to the sites. The infrastructure of cyber space is technology. What Steve Jones refers to under the title of "infrastructure". (Steve, 2009)

Concerning the difference of cyber space with which the supervisor communicates through the computer monitor and the real space, with an inspiration from the comparison of architecture and cinema which Ayzenshtain has stated in the late 1930s, we could say: in the monitor, opposing effects and interpretations pass the viewer's view but in the real urban space, the viewer moves within a collection of phenomena which could be seen, and understands them with their five senses by a system based on the previously organized mental structure.

Heim says: " the cyber reality is ideal and the cyber space must have the capability to take the user beyond the reality of the real world. " consequently, the real space is relegated to the background and cyber attains importance." (Ananda & Lynn, 2005) Whereas, human interactions, sympathies and face to face conversations are human needs which are actualized only in the real world.

On the whole, it could be said that cyber space and real space are two sides of the same coin in which the presence of one leads inevitably to the weakness of the other-with all its consequences.

But the digital urban space- the evolved product of mutual relationship of cyber space and real space- is a cybernetic space and not a cyber. "the contrast between real cyber and cyber brings about a new combined space which has its own specific features and we refer to it as cybernetic space." (Ananda & Lynn, 2005)

Cybernetic space, with all its realism (real space characteristic) is more powerful, due to lack of limitations and constraints of the real space.

The attitude of a system rules the understanding of cybernetic space and the system must be considered as a whole; in this regard, Weiner draws our attention to the notion of feedback and that how a component of system affects the whole cybernetic space.

Cybernetic urban space:

"Different approaches to urban space, have different emphases which allow them to investigate one of the several aspects of a multifaceted phenomenon," (Pour – Ali, 2008)

this paper focuses on the physical aspect of urban space and its developments in the present age.

The nature of urban space depends on the two factors of environment (physical and non-physical) and culture (the collection of material and non-material achievements of a society) which are both changed by the new technology.

Decretive says:" Spaces are mostly created in the way they are used." So, the IT infrastructure and digital technology change the face of the city by creating new capabilities, needs and activities. Thus, the definition of urban space changes as: the urban space is part of the general physical open space and the cybernetic space available to the city which becomes the place of social interactions.

A comparative study of the hierarchy and spatial continuity of the traditional city and the digital city:

Spatial hierarchy includes: 1- open, semi-closed and closed space, 2- public, semi-private and private space.

1- Open and closed space:

Interaction of full and empty space (open and closed space, mass and space) gives a physical nature to the city system. Regardless of the historical trend, which in periods of evolution of architecture and urbanism thoughts, space is preferred to the mass or vice versa (contrasting emphases of modernists and post-modernists on space and mass), these two are of the same value and have been classified as such only to facilitate the design case. What is used in the physical city as the open and closed space or mass and space, could be considered as equivalent to accessible and non-accessible space of the cybernetic space.

2- Public, semi-private and private space:

The public and private space of the physical city is defined with spatial privacies, boundaries and realms based on the boundaries of possession and physical obstacles. But in the cyber space, these privacies and realms are related to the sphere of activity of each space and the way it is accessed. In the cyber space, although the accessibility hierarchy obeys a different pattern, it is divided into the three groups of public, semi-public and private, as in the hierarchy of the physical urban space. (for example some sites are private and ask for a special code for entry, some are semi-public that are entered with an invitation and entry code and some are public and accessible to the public.)

The spatial continuity is based on the experience of space in time, which could be understood in both real and digital urban space- but in two different ways. (in the digital space, the understanding of spatial space occurs by viewing the images and induced interpretations by the monitor.)

Kinds of urban space:

With a change in the life system and city structure, the urban space is also changed; here, the two basic elements of urban space, Krier street and square, will be studied.

1- street:

New technology has blurred the boundary between public and private --- - space, in a way that the effects of each space could be searched in the other space.

-the city walls of the present negative situation become penetrable and flexible. (Frenchman & Seitinger, 2007)

-the city signs, pictures and city furniture will be changed? Non-physical city signs are added to the city system. Navigation by means of GPS eventually leads to omission of constant city pictures. The city furniture equipped with the digital system.

-concerning the electronic trade system, the stores become smaller.
-by a reduction of request for city journey and also more appropriate transportation systems, the street once more- after industrial revolution and age of cars- joins the passers-by's territory.
-the street becomes an alive space, variable with the capability of information communication- in the local and beyond-local dimensions. (digital pictures which form the street city wall, besides creating variety for information communication and advertising, are also used as city signs and marks).
-control of traffic and smart parking
-increase of safety as a result of continuous digital supervising
2-the square:
Due to elimination or change of many modern users, the change in the city furniture and the mingling of users, the city form will not be, as heavily as the past, bound to the transportation network. And social-symbolic function of the square will be preferred.
-city walls(weather square or street) will be in the form of a cover of digital images- for communication, advertising or creating changeable city facades. As a result, the square space of a cybernetic space will constitute of physical and cyber dimensions which provide the capability for simultaneous presence in different spaces and times.
-public urban spaces become the area of imposition of visual-informative data. (Through artistic- digital expression of city walls)
-the new space qualities will affect the aesthetic standards.
-the square will turn into a space for meeting and benefiting from digital equipments (A space where social interactions in both local and global dimensions-at once- occur.)

Information technology of new city infrastructure:
Given the network plans of previous infrastructures- like water providing network, rail lines, etc. in bringing about the structure and pattern of city texture- and given the point that usually introduction of a new infrastructure leads to a basic change in the city and its trend of development; (Mitchell, 2001) the impact of this new infrastructure- high speed digital telecommunication- or what Steve Jones refers to as infrastructure- will be at least as much as revolutionary impact of old infrastructures.
Generally, city infrastructures affect the city in two ways:
1- they increase the capabilities of environment: new city infrastructures lead to the increase of life quality, communications, providing information, development of participation, economic development and change of city space. 2- They support the activities: the relationship of the user and body has changed in different historical periods. The new technology infrastructure of communications which has been formed on the body of the modern city- with the idea of the body's obeying of the activity- fulfills the idealistic notion of modernism. The future city, due to the revolution that has occurred in the kind and way of presenting city services, focuses on the activity and not the body.
Dr. Jalali explains the electronic infrastructure in three sections: (Jalali, 2010) 1- electronic life (e-life): electronic teaching, recreation, communications and distribution. 2- Electronic organization (e-organization): trade, services, programming system of sources and management of electronic relations.3- electronic governance (e-governance): government, management, electronic government and international challenges.
Thus, the city texture and the future city space will be organized so as to adapt to these three major areas of activity.

Studying the physical changes of the city in the age of information technology:
Below, a part of the major impacts of information technology infrastructures on the city body are presented:
-decrease of daily trips- due to the change in the way of presentation of services, combination of work and life place, new facilities of public communications and transportation- causes the image of road and

network transportation to be dimmed and the city form to be released from the constraints of the way of transportation,

- According to the "close relationship of communications and transportation" (Steve, 2011) and goals of stable development, the future city will be the passers-by's city.

-we will witness the maximum mingling of the users; to an extent that work and residence spaces are mingles and many of the users are eliminated or decreased.

-the huge modernist city blocks- service, office, trade, etc collections- decrease due to their functional change and generally the user map of the city ground is changed.

-social-economic classifications of the old city are gradually broken and the area is provided for fulfillment of ideals of early reasonable city-builders, that is, the public ownership of the city ground is provided. (since gradually with the decrease in importance of body against activity, the ground will no longer be a capital good.) this important revolution fact is considered in the area of fulfillment of city plans and city management.

-globalization and the new city infrastructure affect the residence pattern and neighborhood units: 1- the possibility of building single and isolated country houses in the country, equipped with communications technology, is provided. 2- " due to shattering and re-combining of the city structure, the possibility of making the favorable pattern of neighborhood unit which was harmed in the industrial city, is provided. " (Mitchell, 2001) in fact the ideal of new urbanism, regarding the neighborhood units and emphasis on the access to passers-by's territory, is put to action with future developments. The zoning of the modern city and its problems (lack of organized distribution of city activity in the time dimension: office-trade areas that lose their activity and life at night, the increase of city trips, etc.), are gradually changed due to the combination of users and change of the city activity pattern.

The concept of accessibility in the future city is challenged:

The pattern of availability as one of the ways to control the public space, is put forward in two aspects of physical and digital city space. "Accessibility is one of the most important common topics in urbanization and internet". The extent of the society's access to internet is one of the indexes of development in modern cities. Firmino divides the city spaces into three groups based on the accessibility of the internet:

Non-plugged: places which lack the infrastructure of new communication.

Adaptive: traditional spaces which have been changed to be able to accept the new technology. This adaptation is either complete or partial (juxtaposition or adaptation of spaces).

Transformation: there are new spaces which have certainly been designed for providing access to new technology and as a portal to enter the cyber space (the physical infrastructure supporting the digital city).

In the industrial city, the urban fabric is coarse. The change of the type of activity and creation of synthetic user spheres in the cities causes the parts of this fabric to become smaller. As an example, commercial activities, depending on the type of the product and the extent of distribution, lose their concentrated form. Selling small products, which are valuable and non-perishable will not be limited to the shops and stores and centers of distribution (intelligent post system), will be scattered throughout the city. as a result, the extent of the infrastructure of the commercial units will decrease. In addition, by integrating users and management systems and electronic services, face-to-face connections and its needed office space decreases noticeably.

The effect of digital infrastructure networks has neither been centralized nor decentralized. But it is a complex process of dissolution and re-formation of the urban fabric (like a chemical reaction through which some of the bonds are broken, some are kept, and some other are built anew). Nevertheless, this new infrastructure makes the creation of a concentrated city possible (as one of the approaches of constant development).

The consideration of the urban façade developments in the age of information technology:

Legibility of public space which is analyzed with 5 factors, including way, edge, knot, sign and neighborhood, will go through drastic changes with the change of these factors in the future city:

Way: instead of this term, the term "accessibility" is chosen which includes all different meanings of way and other ways of space access. The type of access to the physical and informational space and the clarity of the process of the space movement, guarantee the legibility of the space in the future city.
Edge: the borders of the neighborhoods and urban streets will disappear and become impermeable, in a way that there will be a trace of every space in another space. The same thing happens in the cyber space, that is, there are no clear lines to distinguish between the spheres of activity of sites, however, the activity of each one encompasses a range which depending on the topic, disappears or is highlighted in each space.
Knot: the concentrated centers which come into existence due to the crossing of different accessibility currents or due to the overlapping of the sphere of activity of each space.
Sign: the urban sign as a factor to facilitate navigation, finding the rate and identification can be non-physical (digital). Sign is a factor which helps us understand the city space (which is a relational and relative). Thus, in the dynamic city space of future, the urban signs lose their hardened and static forms and direct the movement in the city space and the sings themselves move with the whole city with a slower rythem.
Neighborhood: in the new structure, neighborhoods provide the place for face-to-face social interactions – though they have extra-neighborhood connections. Regarding the weakening of class- economic factors in the future cities(in regard with the public ownership of lands), the settling of similar sub-cultures in the separated neighborhood units, and the promotion of physical- social identity becomes possible.
The possibility of reinforcing the public transport – which is one of the ways of constant development- is made practical with the change in in the concept of accessibility, the change of urban streets, the reduction of the moving of vehicles and the change of city activities.
Though participation was the primary goal of building the first digital city (the digital city of Amsterdam), practically lost its primary importance, being exposed to other abilities of the new space. The digital infrastructure of the city – regarding the "the role of computer simulation, especially in collaborative planning, the possibility of creating a two-sided relationship and active notification- will make the participation of people in all of stages of planning and designing possible.

CONCLUSIONS

with the digital revolution and the role of information technology in creating a contrast between the real space and the digital space(cyber) and the creation of a synthetic space called the cybernetic space – which has the characteristics of both real space and digital space- the urban space of the future will also be changed. With a change in the concept of urban space – which is the topic of urban designers' work - , a new definition of urban designing will be presented as follows:
Urban designing is an interdisciplinary and group process whose aim is to organize the space of the public sphere of the city, so that it will bring about the improvement of the functional and environmental qualities and the aesthetic experience of the urban spaces.
On the other hand, regarding the effect of the new infrastructure of information technology and communications, the physique, the urban façade, structure and the process of urban development will also change.
Thus, using these term, "recombinant urban design" regarding the synthesis and contrast of aspects of urban designing and IT, indicates the gradual dissolution and re-synthesis of urban spaces and urban fabric, which occurs through new definitions of cybernetic urban spaces and the infrastructure of digital communications.

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