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Impact of Emerging Technologies on Regional and Urban Development

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Abstract

The technological changes have brought revolutionary changes in society. All categories of people, irrespective of skills, literacy and economic levels are in the grip of new technologies getting evolved these days. It has affected their personal, social and working lives tremendously. Consequently, their demands and requirements for living, working and travel have also changed. A reflection can be seen in the changing regional and urban patterns. This paper examines the ways in which urban and regional planning is impacted by these new emerging technologies with the aim to enable planners to foresee and visualize the changing requirements of urban and regional planning.

1. INTRODUCTION

Like life in general, new and emerging technologies have impacted urban and regional planning. For example, the excerpts quoted in (Box 1) show one of the possible ways life is likely to be lived in coming decades. Glances of this are already available. Rapid advances made in various technologies and in particular the information and communication technology (ICT) in the 21st century has gripped the whole world. From a small farmer, a kiosk owner, a slum dweller to the CEO of a top company, the whole day living and working at home to office and work places show a strong impact of these technologies. Thus, the society at large has changed in all spheres of life, be it socio-culture, administrative aspects, commercial transactions or industrial production. The government sector and the private sector both are in the process of adapting these technologies though the speed of adaptation may vary. While a large section of private sector, formal as well as informal sector, has already introduced these information technology based devices and working in their systems, the government at different levels has also moved strongly but slowly to introduce modern computer equipment and information technology in an effort to improve administrative efficiency and raise service quality.

All this has been changing the spatial pattern of settlement distribution at regional level as well as the growth pattern at local level. The whole world has been turned into an interconnected global village. People are exchanging information, sending and receiving messages and engaging themselves in e-commerce across the globe while sitting at one place. A significant impact of these is getting reflected through change in spatial distribution of activities, transportation and other infrastructure networks.

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Praveen Jain

34

Institute of Town Planners, India Journal 9 - 2, April - June 2012, 34 - 40



Box 1

AN EXTRACT FROM 'LIFE IN THE GRID'

Tokyo at rush hour, circa 2012: your automated car whisks you off to Narita airport, steering itself through traffic. You are free to work. Push a button on your watch, and an image of your firm's mining operation in Indonesia springs to life in 3-D. You ask the digital assistant in your watch how currency fluctuations might affect the mining investment and a female voice reads the results out loud. Then you ask her to book an eye exam (your glasses recently told your doctor you need a new prescription). As you near Narita, your car announces that the flight is delayed. Care to rebook? You decide to continue on to the terminal, where baggage handlers await, alerted to your arrival by your car.

Source : Rana Farooqar, Newswatch Sept 16-23, 2002.

Assessing impact of new and emerging technologies then becomes imperative whereby we must see how these technologies are influencing the way we do urban and regional planning.

2. TECHNOLOGIES AFFECTING THE URBAN DEVELOPMENT

The advancement in technologies has led to increased urbanization vanishing chimneys from the cityscape have created new locations for jobs, increased demands for auto vehicles, evaporated distance barriers due to communication technology and so on. The present day lifestyle demands are quite different from those which were couple of decades back. Mechanisms of product manufacturing and service delivery have changed drastically raising the bars of efficiency. Living habits, ways of commerce and trade, office operations, transport, method of education, meetings and conferencing, etc.; all have changed. Information technology is allowing various functions to be conducted through telecom networks. Work done on paper and transferred physically, requiring filing clerks, messengers, and couriers, etc.; is being replaced by IT based working. Growing number of offices, establishments, shops and factories have already moved to computerbased systems for a large number of operations. This phenomenal change has affected every sphere of urban development - the industrial, the commercial, educational, transportation, residential, recreational, etc.

Recent evolution of the communication systems dovetailed with information technology has been at the top of these technologies. A wide variety of electronic communication networks and their easy adaptability by the common man has revolutionized the society by bringing in dramatic changes in the working systems, socio-economic and geographical patterns. Continually and fast evolving technologies have made it imperative for the planners to think about the visualization of new spatial dimensions of urban planning and development. The networks which link workers together in offices, homes, etc.; through LAN, Wide

Praveen Jain

35

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Institute of Town Planners, India Journal 9 - 2, April - June 2012, 34 - 40

Area Networks (WAN) across multiple locations and multiple organizations across the globe have not only enabled large functions to be done at decentralized locations for organizations but also enabled services being available at the doorsteps of the individual customer-citizen efficiently. This is already showing effects on changing urban patterns at the regional and global scales besides the local level which has led to coining of terms like global village. The technological advancements and liberalization of economy in various parts of the globe has provided ample opportunities and options for location of economic activities and employment centres in any part of the world or the country. As the internet develops further, 'all machines and people will become nodes on one network, and any one computer will be able to tap the power of all. It is scary. Today 95 percent of PC power is idle; the grid will tap it all' (Foroohar, 2002).

Networks have made it possible to substitute communication for trips and face-to-face meetings through tele-work, teleconferencing, telecommuting, tele-purchasing, telemarketing, tele-medicine technology, tele-education, networked libraries, educational institutions, research laboratories, etc. This has led to intensive and optimal utilization of space reducing the building space requirements for different activities, moderated the densities of population, workers and redistributed employment centres. Similarly the techniques like GPS, ITS, telemetry, security systems, etc.; have enabled optimum utilization of capacities of urban infrastructure and brought in efficiency in their operation and maintenance.

In nutshell, the present day impact of technologies on the urban and regional development can be seen in following ways:

- **Global and Regional Level** - where the dispersal and concentration of activities have been redefined due to new locations of job opportunities.
- **Master Plan Level** - where the spatial distribution of land uses is getting redefined along with changing urban physical and social infrastructure requirements.
- **Traffic and Transport Sector** - where the capacities of roads and traffic management are getting enhanced and can be supplemented with the increased use of NETWORK services, GPS, GPRS and other ITS enabled technologies.
- **Building Level** - where space requirements have been redefined due to adoption of new techniques for different functions and operations.

3. REGIONAL ASPECTS

New technology can change the spatial distribution of industry, commerce and people in several ways. Widespread distribution of new types of physical infrastructure in terms of communication systems, high quality surface transport systems, power distribution systems, etc.; makes new locations accessible and

Praveen Jain

36

Institute of Town Planners, India Journal 9 - 2, April - June 2012, 34 - 40



cheaper. Technology and adoption of high quality infrastructure has also allowed more of the economy to be operated at a distance. For example, the construction of the golden quadrilateral highway system has allowed manufacturers (that were traditionally dependent upon rail and water) to locate linearly along the highways and turned settlements along these highways into potential economic centres. All highways have thus become investment corridors. Development at regional level is getting converted into linear corridor development. Transshipment through container service and the development of dry ports has de-linked the necessity of linking rail, road and air transport at one place.

Cities have risen and grown as centers of transactions and commerce largely because of economies of scale and the need for physical proximity among firms, suppliers, and customers. Agglomerations of people, infrastructure, and industry allowed for efficient production, transport, and distribution of goods and services. Advances in technology in every sphere, particularly in IT networks and transportation networks are no more compelling the concentration of activities in mega and metro cities and made locations feasible which are physically far apart and disbursed. In the 21st century new information technologies are creating closer connections among economic activities despite enabling them to be physically farther apart, although the location of certain economic activities, facilities and amenities still continues to be determined by their critical determinants.

Economic sector is being increasingly dominated by service sector rather than manufacturing. In case of India, the service industry is on high rate of growth due to its potential strength in knowledge industry, young human resource base and cheap labor and land. Growth of BPOs and call centers in India amply demonstrates the impact on regional development of the technology. Residents of London, New York or any other city in the world call to inquire about various products and services but the calls are processed in a small city in India. Thus a query is generated somewhere else in the world and answered from thousands of kilometers away. Many of these remote functions are now being performed by consumers directly from home or office or even when on travel. Thus major banks, software companies, and information service companies are all gearing up for what they expect to be a major new market in distribution of financial services using the information superhighway.

In general, the spatial pattern resulting from above has been leading to debates about dispersal and concentration of activities at regional level. The following are the factors which will alter the location of industry and employment centers which in turn determine the regional pattern of development:

- Activities and operations which can be cost-effectively transformed into electronic flows facilitated by telecommunications;

Praveen Jain

37

Written by Administrator

Wednesday, 18 July 2012 00:00 - Last Updated Monday, 03 June 2013 08:17



Institute of Town Planners, India Journal 9 - 2, April - June 2012, 34 - 40

- Activities which require spatial proximity to suppliers, customers, competitors, and other units in the firm.;
- Productions and commercial functions which have to be physically handled; and
- Other advantages in the form of amenities and facilities.

Based on the above, we could suggest that the information technology is eliminating the effects of distance, and that this in turn will have profound implications on the spatial organization. As a result, it is argued that this new technology system will create an even more spatially dispersed and footloose economy, which in turn will cause metropolitan areas to be larger, more dispersed, and less densely populated. In contrast, the other way of thinking is that technological change is reinforcing the position of cities as 'nodes' on the information superhighway. According to this view, the increased innovation and information processing in advanced industrial economies is leading to an increase in the importance of agglomeration economies and the advantages that cities possess. Thus, in the existing metro and mega cities, despite dispersal taking place due to technological advancements, planning shall have to be based on the integration of both the viewpoints. However, in case of upcoming metro and new cities, dispersed nodes within the metro region can be considered by integrating them with network planning particularly the transport systems.

4. IMPACT ON MASTER PLAN

Impact of information and communication technology is very strongly felt in city planning. Enforcement of environmental provisions is compelling the polluting industries to be environmentally friendly by adoption of required processes. It has changed the production systems and with the coming of environmental laws, made them to be compatible with different urban activities. Such development has reduced restriction of locating industries only in industrial areas and for relocation of existing industries resulting changed spatial distribution of such activities.

Changing pattern of employment from manufacturing to service sector is increasingly changing the employment centers within the city. Instead of getting concentrated in certain parts or nodes within a city, these are getting dispersed in the entire city since a large number of these service industries are being considered as compatible with most other use zones. IT sector industries are no more being considered as incompatible industry and can be seen coming up in every part of the city. Earlier, the jobs would get concentrated in the industrial areas but today a more strong demand for mix use zones has been created. Developments in computing technologies, database access, and telecommunications have increased the share of services that can be sold without physical proximity to the customer, although functions involving some transmission or manipulation of physical goods are likely to be bound up with locational considerations.

Internet technologies have also made it increasingly possible to locate telemarketing in distant locations. Online shopping and trading is expected to

Praveen Jain

38

Institute of Town Planners, India Journal 9 - 2, April - June 2012, 34 - 40



increase. Because of savings in real estate and labor costs, some economists estimate that it may be possible to serve customers in the home for the same price as grocery store shopping. A significant share of activities such as banking, travel, reservations, insurance, consultancies in law and financial services, shopping, etc.; is being increasingly replaced by electronic transactions. These are likely to locate in lower cost regions and lower cost areas of the metro usually outer suburbs.

Another view is that the intensity of employment has increased as compared to earlier times due to efficient use of space and density is leading to increased traffic generation on the roads. This view raises a concern that roads shall get congested very fast since these are not designed with such heavy traffic demands. But since the jobs are now more intensely located though quite dispersed in different areas, traffic generated is more evenly spread at the city level.

Increased demand for high quality living standards due to modern gadgets, communication technologies and internet is also leading to modified residential locations. People are now residing in areas where their living is comfortable, the environment is good and pollution free. There are amenities and facilities for recreation and leisure. Since high speed auto vehicles are available, they prefer a distant location if these facilities are available rather than in close proximity to jobs provided essential social, cultural, educational and medical facilities.

5. URBAN TRANSPORTATION

Information technology applied to vehicles and transportation infrastructure (Intelligent Transportation Systems or ITS) make it possible to increase the productivity of traditional transportation infrastructure. ITS is identified as the means to achieve sustainable and environmental friendly transportation systems for the 21st century. These include Wireless Communication Systems, GIS, Global Positioning Systems (GPS), Sensors, Smart Cards, etc. This enables controlling and managing traffic, handling fleet operations (public transport and private carriers), emergency management and assisting users in their travel related decisions. Benefits of ITS include reduction of traffic congestion, enhanced safety, enhanced energy performance and improved productivity.

Spaces particularly in core areas are congested and are becoming more and more difficult to access for efficient working and living. In almost every situation roads cannot be widened after a certain limit. Similarly new roads cannot be built to keep up with the growth in transportation demand. But with the use of ITS, things can be improved and their traffic handling capacities can be increased through management techniques.

Increased use of internet has been reducing overall trips on all roads which otherwise would have taken place for communication and physical transactions. People are increasingly getting accustomed to using the Internet when working in commercial organizations, government offices, public utility services and

Praveen Jain

39

Written by Administrator

Wednesday, 18 July 2012 00:00 - Last Updated Monday, 03 June 2013 08:17



Institute of Town Planners, India Journal 9 - 2, April - June 2012, 34 - 40

companies of all types. The citizens will no longer have to spend time on the road even for commuting to work. Companies in India and abroad have already developed flexible working hours. The employees can operate from their homes or go to office only when it becomes necessary. It relieves them of the driving tension and so on. On the company's part, such flexible working system is enabling them in multiple ways of utilizing limited and costly resources and space resulting in economies. As a result a large number of physical trips are getting reduced on the roads. E-transactions, the development of call centres, high quality delivery of services which do not require physical transactions, have all been contributing to the indirect increased capacities of roads.

6. IMPACT AT BUILDING LEVEL

Huge space requirement of industries has been squeezed to small, compact and beautiful buildings with appealing aesthetics due to not only the developments in the ICT sector but also due to advancements made in various spheres. Space requirements of a number of activities have been drastically reduced. For example, telephone exchange buildings have been brought into one room. Electronic processing has reduced the physical storage space enormously to few computers and electronic storage devices which are no more than a paper notebook. The IT sector industries require a very little space for storage as compared to the work generated within them. Online education system of teaching, examination interviews and selection is changing the scene on roads in every city where it used to cause a very heavy traffic and creation of large number of centres, etc. Large sized production machines have been converted into smaller sizes with the introduction of electronic chips. At residential level, the TV does not require large space and wall hung screens are available. There can be numerous such examples. In brief, the technological advancements have also modified and rationalized the space requirements at the building level.

7. CONCLUSIONS

Pace of technological revolution has outpaced the capabilities of urban planners for efficiently incorporating them into the futuristic plans. It is likely to continue to diminish locational constraints while increasing the efficiency in space utilization. Given increased choice of location, changing spatial requirements at micro and macro levels from household to city level, what will become of core cities, the old industrial era metros or the country side, is little known. Thus in conclusion it is urban professionals' capability to visualize and dream about the impacts of the information superhighway, digital society, and emerging cyberspace on society as a whole, and integrate this visualization into physical plans. The plans shall have to bring in more flexibility to meet the requirements of these rapidly changing developments. Long perspective periods will be a bottleneck in visualizing these impacts of fast evolving technologies and thus visualization period shall have to be reduced substantially.

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Praveen Jain

40