

TELECOMMUNICATIONS AND THE 'DEATH OF DISTANCE': SOME IMPLICATIONS FOR TRANSPORT AND URBAN AREAS

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I would like to talk about telecommunications and the 'Death of Distance', a concept I will explain in a minute. Much of what I am going to say is based on a paper "Telecommunications, Cities and Technological Opportunism" published in the *Annals of Regional Science* (1996). Should any of you want the full two-hour presentation, it is available in the journal version.

The Great Expectations

The first thing that we need to do is try to identify the major issues we should talk about, and I like to talk about the great expectations, many of which are nurtured by the media. Here we must mention "The Death of Distance", the cover story of *The Economist* (September 29, 1995).

Distance does not play a role according to *The Economist*, and hence some 'great expectations' are envisaged. We can talk about a 'nonmobile accessibility' which is congestion free, pollution free, accident free, and dispersed urban settlements noted by the previous speakers. We can talk about a global economy, global cities, and global villages, and we can talk about the information or knowledge society, all those great expectations that would emerge as telecommunications become more and more commonplace. In my view if distance is dead, we need to ask the question whether there is still a role for cities, and if there is a role for cities, what are its implications for transport.

Some Definitions

A brief set of definitions is in order. There is sometimes a confusion between the terms knowledge and information. Information is really the collection of bits which have some meaning to someone. Knowledge is the accumulation of information which allows us to make choices, unlike information. So information can just be a hard copy or diskette that has some information on it and that has a meaning for someone, but it is not really knowledge.

Another term is telecommunications, a set of technical facilities and services which allow us to communicate information electronically. Telematics is a marriage of telecommunications and information systems or computers. There was an alternative term suggested in the early '80s of 'compunications' that did not really catch on, and telematics which is originally French is widely used. Technology is a collection of hardware and services which are adopted by a society. A variety of adoption patterns are

evident and diversity is the name of the game.

The Issues

We hear, certainly in the media, and to some extent in professional discussions, about the spatial effects of telematics in the information age. There is much confusion about geographical scale in this discussion: the intracity scale, the regional scale, and the global scale; we need to be aware of it and be cautious about what we are in effect talking about.

I would like to present some approaches to the study of technology in the city. If we look at the literature from the 1960s through the 1980s much of the discussion was focused on the dichotomy between the dispersion and concentration. Will telecommunications bring about dispersion or dissipation of the city, or will they increase or strengthen concentration? It seems to me that this is really too limited a way to pose the question because there seem to be at least two intersecting processes. One is the dispersion/concentration dichotomy, primarily at the urban and regional scales, and the other is the globalization versus localization dichotomy which may take effect at all scales. The intersection between these results in a diversity of effects. What we need to do is not to try to find a generalization of what will happen or what the bottom line impact of telecommunications will be. We need to understand what are the factors affecting telecommunications' impact and what are the potential benefits and costs, which are likely to be very diverse. The concept of diversity will be repeated in my lecture.

The ultimate question that we face in the present context is:

- i) How different will the urban world be, and what are the implications for transportation that we will need to cope with?

To respond to this question, some additional issues must be studied:

- ii) What are the underlying assumptions in the debates concerning globalization, localization, and dispersion concentration effects?
- iii) What are the social implications, who benefits from them and who loses?
- iv) Are there any policy tools which we can wisely use in order to obtain the objectives that seem to be desired?

As researchers in the fields of transportation, technology and urban systems, I suggest that we also address the following two questions:

- v) Should we expect a single impact of technology? As I have already hinted, we probably should not.

- vi) Do we need a new research paradigm to study the impacts of telecommunication on cities and transportation?

The present context will not allow us to address all the above-mentioned questions.

What I am doing in this lecture (as in the paper I cited) is very much speculation. I have not done in-depth analysis and quantitative, empirical research in these areas, so I can talk about an interpretation that I give to the extensive reading that I have done in this area. I also might try to be somewhat provocative in this session to feed or nurture the discussion in the next couple of days.

Let me very briefly respond to the last two questions and then go on.

I certainly think that we should not expect a single impact of technology, and as I have noted earlier, variety is the name of the game.

A very interesting question deals with the need for a new research paradigm or can we live with what we have. I would like to recommend a very good book, by Stephen Graham and Simon Marvin, *Telecommunications in the City*. It is an excellent review of everything that has been written in this area. They recommend a new research paradigm, or the need for a new research paradigm, claiming that previous research paradigms we held for studying urban structure and urban transportation do not fit the situation where telecommunications really introduces totally new notions of time and space. I choose to disagree with them. I think that the notions that we have, as I will explain, or the paradigms that we have to deal with these notions are sufficient, and that we do not really need to throw everything away and start all over. So let me try to answer in more detail former questions.

The Dispersion of the City

The city is basically a transport-based phenomena. City structure and transport technology have been married together since the days of the walking city and certainly since the introduction of the automobile that brought dispersal to suburbia. Telecommunications, along the same line, may bring about further dispersal, into exurbia. But what I find is that travel time is to a great extent a constraint on how far people are willing to go. People want to, or have to participate in urban activities such as work, maintenance, and leisure, and although we see much suburbanization going on, there is a limit to how far people are willing to go. I think Genevieve Giuliano referred to it this morning. On the one hand, they want the amenities of rural life styles, but they also want the opportunities offered by urban life, be it shopping, work opportunities, or leisure activities. So they will not relocate too far away from the city. The process of suburbanization was clearly facilitated by transportation technology.

Now we return to the question: will telecommunications change the city? The information age logic talks about the transition from manufacturing to knowledge and information, and from transportation to telecommunications. So we have a variety of tele-activities: telecommuting, teleshopping, tele-learning, telemedicine, and 'tele' what have you. We are talking about a variety of concepts that have emerged to describe this nonmobile accessibility: cyberspace, the virtual city, the rural wired

society, or the electronic cottage, much of this jargon taken from the science fiction literature. The latest in this series is 'hypermobility'. So we have all of these notions of what is going to happen. Peter Drucker said in 1989 that within 20 years commuting to the office will be completely obsolete. Twenty years have not yet passed, but we observe little dissipation of the city. Some of the reasons are discussed below.

The Underlying Assumptions

Let us look at the assumptions that underlie the information age logic. I think that there are four assumptions which need to be discussed. One is the primacy of the information economy. It suggests that we are moving into an age of the information or knowledge society where everything will be information, and there is a substitution of information for material goods. We will not eat anymore, we will just consume information, and I will refute this assumption in a minute with the support of some numbers.

The second assumption is that of substitution of telecommunications for transport, namely that the more we consume information, the more we work with information, and use information for leisure activities, the more we can reduce the demand for trips, because the information can reach us by telecommunications and we don't need to travel to the store or the cinema and so forth.

The third assumption is that there is a ubiquitous supply of telecommunications. Truly, the dynamics are such that increasingly we have telecommunications available almost everywhere. But, it is not completely true, as the economics of telecommunications will preserve the spatial variation, in part in access, but more so, in quality. Urban centers will always have better telecommunication facilities than rural areas and the farther out you go, as the economics of telecommunications imply, suppliers are not likely to facilitate the same quality and quantity of telecommunication services as in areas of high demand density.

The last common assumption is that there is a prevailing preference for spacious living conditions over urban living conditions, again as Genevieve Giuliano has noted earlier, I am not sure how widespread this is but there is a clear preference for suburban living. The assumption implies that if given the choice, households will relocate in the periphery.

Approaches to Technology

Given these assumptions, we can take a supply-side view which is very much technology driven, looking at technology in the sense of a technological fix. We have a congestion problem, we have an air pollution problem, so let's telecommute and we will solve these problems. The notion held by many suppliers is that they have the 'technology to fix', and they often believe that supply drives demand. If we supply all of these facilities and services, we should expect a change in demand.

The demand-side view looks at cities as very complex systems. Aside from economics, employment and transportation, cities have some other problems as well, such as the quality of the environment, poverty, crime, health, congestion. The intensity of these varies from one place to another and over time. If we take a behavioral approach, and this is what I strongly recommend, and try to understand the behavior of households, the behavior of firms, and the behavior of political institutions, we would find that the ability and desire to use telecommunications, or other technological fixes to solve urban problems are not so clear. The introduction of new technologies into complex social systems and institutions is hampered, among other reasons because it is not clear that such fixes bring immediate remedy and change.

Cities will change very slowly because they are very complex systems; they are a mix of activities. I think that Sassen has nicely stated that the global economic and the local social and political forces shape the cities, so it is not just the global economy that will change the cities. The local political and social forces, very much localized, are as powerful as the global economic forces in changing cities. The city has multiple functions and a multitude of players, and hence no simple and fast changes can be expected. Evolution is more likely than revolution.

We have another view of the urban future and technology that is brought forward by architects, who play a major role in the town planning arena. Genevieve Giuliano has already made some comments about how architects view the world, let me continue in that way. Architects often hold views of idealized design, of what can be or should be done in cities and they tend to overlook the politics of a location, they tend to overlook market forces, and they tend to overlook the slow changes in the tastes of people. Let me show you two architectural designs, one out of a 1922 story, “The Contemporary City,” by Le Corbusier: There are high-rise buildings, the transportation system of surface vehicles is in underground tunnels, and what you see in between the buildings are airports, as he envisioned small aircraft as urban vehicles. This is one form of idealized design of what the transportation age will bring about and it has not materialized.

Likewise, the city design titled “The Plug City,” by a group called Archigram, shows what the telecommunications city will look like. It is all connected with ultramodern structures. I have not seen those around, and they certainly do not fit what we have heard this morning about the neotraditional design of cities. So I am afraid that architects' views reflect what they think should be or would be nice, but not necessarily what conforms with the actual processes in the city.

The Persistence of Cities

If we try to summarize what I have presented up until now, the ideas of a ‘virtual city’ characterized by ‘nonmobile accessibility’ are nurtured from a number of directions. One is what we call the utopian futurism literature, which on the one hand is a science fiction literature, and on the other hand emanates from futuristic architectural images of the city. Another source comes from the notion of the ‘dematerialization’ of society. There is some very interesting evidence that in the aggregate materials use is declining, but it is declining in share not in quantity, and it is very important to make that distinction. Nevertheless, this notion is nurturing the virtual city concept. There are also many (industry)

interests who suggest that the city will be different and that we need to invest in technology. The ongoing process of globalization of the economy also often suggests major changes in urban structure. But, it does not necessarily mean that all cities will change and that such changes be of similar vein.

So, we may talk about the persistence of cities. I think that centrality and agglomeration economies will continue to play a major role. Being located close to other services, other providers of similar or complementary nature will continue to be a major drive in the location decisions of economic activities.

I would like to discuss briefly the production and consumption of material goods, and the concept of dematerialization as part of the notion of the substitution of information for material goods. In my view it is not taking place, and let me demonstrate this. I would go back to a 1968 paper by Wolman, published in the *Scientific American*, where he talked about the metabolism of the city. In an hypothetical city of one million residents, Wolman shows the material input and output of a city (water, sewage, food, refuse, energy, pollution etc.). He shows, for example, that 2000 tons of food enter the city and a similar amount of refuse leaves the city daily. Likewise, coal, oil, natural gas, and motor fuel enter the city, and leave it in the form of particulate matter and air pollutants, and so on.

So much of what is going on in the city is actually material change from one form to another and this will probably continue to be so. Let me very briefly demonstrate this with a few more numbers. A decade or two ago, we heard that one of the outcomes of the telecommunications or telematics revolution would be the transition into the "paperless" society. That has not happened because simultaneously with the advent of telematics, the photocopying machines were invented and popularized. The photocopying process "produces" paper in the sense that it significantly increases the amount of paper consumed in conventional white-collar activities. The worldwide growth of paper production is much faster than the growth in population (some 4.6 percent annual growth in paper production). Paper is not just used for information. Paper is also used for packaging, but much of it, and I think an increasing share of it, is used for information. The idea that the information will be stored on magnetic media and inside the computers and that we will not hold hard copies does not seem to work; it was certainly a premature and wrong assumption or forecast.

Paper needs to be transported in cities. A quick look at freight movement statistics shows that goods movement has grown between 1950 and 1990 by roughly fifty percent in ton miles delivered, and that between 1960 and 1990 there was more than a threefold growth in urban truck vehicle miles. Much of it is, I think, the result of a rising standard of living. We consume more products and these products need to be transported from one place to another. Even if we use teleshopping, and do not travel to the store ourselves to pick up the goods, someone travels to distribute them to us and others. The vehicle mileage is still produced. Most probably, it may be done more efficiently than when we do it with our own private automobiles with an occupancy of 1 or 1.1. But then the question is whether by the rising standard of living and the quality of life that we want, do we also demand higher levels of service of the delivery system?

Do we expect and demand speedy delivery? That may be counter productive to the efficiency of distribution systems.

We should also look at some employment forecasts, as a preview to the discussion of telecommuting in this conference. We tend to think that jobs are more and more footloose because they can telecommunicate. This is true in part for some jobs, but certainly not for all. If we look at the forecasts produced by the Bureau of Labor Statistics (BLS). According to a recent article, BLS forecast a growth in employment between 1992 and the year 2005, of a total of roughly 26 million people. Roughly half of them will be in the 30 largest growing (as opposed to fastest growing) occupations. Examining each of these 30 largest occupations in this 13-year period, we find that of the 13 million jobs in this group, 87 percent will be what we call “location dependent” jobs. I do not believe that within this period we will have brain surgeons or nurses who telecommute. The largest growing occupations include salespeople who need to be in place in the retail industry, registered nurses (3/4 of a million), cashiers, general office clerks, truck drivers, waiters, nurse’s aides, janitors, and so forth—a very large number of jobs which are clearly location dependent. The first occupation which is a candidate for telecommuting is system analysts and they are ranked in 10th place in the list of growing occupations. If you look at the grand picture for employment changes, we are not in the right trend for more substitution of travel, but instead less substitution of travel. We need to consider the fact that the cost of distance of traveling will be quite persistent.

The last point that I want to make is the one of network flexibility and its implication for location. We are in a network society and we tend to use the term of flexibility particularly in reference to telecommunications. But flexibility may not be so simple a concept. We are a network society because we rely on water and sewerage networks, and transportation networks which include roads, rail and air networks, and telecommunication networks, of course. These, combined, have brought about the concept of the network society. Location decisions are very much affected by those networks; we cannot locate where we do not have water or where we do not have sewerage, so this is one constraint on our location. But the general belief is that the more flexible networks are, the more flexibility we have in our location decisions; I want to claim just the opposite. True that telecommunications are relatively flexible networks. We can literally put a university or a research center in the middle of the desert and provide it with a satellite link and have all the information transported to them with no problem, so they are very flexible.

The argument that I want to make is that location decisions are determined by the *least flexible* elements of the network, and I think that in the context of cities, the least flexible elements of a network are airports. The nodes of the airline network, which we cannot move or expand very easily because they impose certain requirements and constraints like land requirements, lead time for implementation and severe environmental impacts. This is one reason why existing cities will continue to flourish and telecommunications will have a very marginal effect, because it is the inflexible elements that determine location.

Technological Opportunism

Much of the great expectations of telecommunications and cities builds upon what we call the technological determinism school of thought. I do not believe that we should use or accept too much of this technological determinism. Jean Gottmann has said, "It all depends on what people decide to do with technology, it is a humanized or social technology." We should focus on the process and outcome of the adoption of technology. We should thus search for the alternative to technological determinism.

Telecommunications are a facilitator of change, but do not in themselves create change. The change in cities is generated by a variety of other factors which we have called location factors.

I think that we need to look at two different schools of technological "isms" as alternatives to technological determinism. We need to understand the concept of technological 'possibilism', whereby technology facilitates change, and the one that I like and would like to develop is that of technological "opportunism", the process by which agents seize an opportunity to use technology in a way which suits them well. Opportunists seem to be a relatively small group in society, so we are not going to see a major change of urban cities, but we are going to see these research centers which are based on a hill in the middle of the Rocky Mountains or in other unexpected places.

The factors that affect the impacts of telematics on cities can be divided yet another way, by distinguishing between knowledge activities and information activities. This will result in another classification of types of cities.

Some cities are knowledge cities and they include university and research and development towns like Cambridge, Oxford and the Japanese Technopolis. They also refer to cities with major cultural centers and government centers, as well as world cities. There is a new term, coined by David Batten, that refers to network cities. We also have the information cities where basically information is being processed but not where it is produced or consumed. Here we find back-office activities that we see in many cities, sometimes in the major cities, but very often in peripheral areas. They do the back-office activities of the information economy, and these appear at the urban scale, in some places we see the neighborhood with the back-office activities. But, also at the regional scale (and even at the global scale where suddenly the back-office activities are being done in the Caribbean somewhere or in India) rather than close to where the information is produced and used. Due to the time constraints, I will not dwell on the two other types of cities.

Conclusions

What I am suggesting is that we should study the impacts of telecommunications (a facilitating technology) armed with the concept of technological opportunism. It may allow us to understand how big business and industry change from a single plant to the multinational; how governments deal with technology in different ways at different levels; and most importantly I think, how individual entrepreneurs exploit technology to reduce the costs of distance in location decisions.

Entrepreneurs find fantastic opportunities to develop activities which could not be done 10 or 20 years ago. My favorite example is of a software firm that is located in my own city in Jerusalem that works solely for the Japanese corporate market, producing software in Japanese in Jerusalem, (Salomon & Tsairi, 1995). Why? Because there was one young person who identified an opportunity and decided to develop this particular software house, where he desired to live (Jerusalem). Much of the communication between the market and the producer is by telecommunications, but they also need to travel on occasion. The need for face-to-face communications eventually led to the establishment of mutual liaisons, so there are some Japanese in Jerusalem and some Israelis in Tokyo. This case exemplifies the notion of opportunism that could not have been realized ten years ago. But does that mean that Tokyo will dissipate because it is running business globally? Most probably no. Tokyo will persist because the bonds holding it together are independent of telematics.

Telecommunications can be used by entrepreneurs in so many different ways and we will see more and more of it. We will not talk about the policy implications, but these should be a target of some studies, along with various other studies on the behavior of entrepreneurs in the face of new technological options.

In conclusion, cities depend on multiple networks and not just telecommunication networks, Technologies of transportation and telecommunication are complementary more than substituted. We need to realize that the dematerialization may be true in the aggregate, but there is a great and rising demand for material goods, and they need to be moved. Cities are much more efficient than dispersed settlements, and telecommunications open new options for very diverse applications. There is a growing role for opportunists in all this. We also need to remember that social processes are slow and thus urban changes are not revolutionary.

So if we go back to the opening statement taken from *The Economist*, that “suddenly distance no longer mattered”, I choose to disagree. Distance is alive and well, but changing in character, stretching for some (opportunists), but persistent for others. Most of the cities that we are going to see will be very similar to what we have today. I think that what *The Economist* did was a premature pronouncement of the death of distance. Distance is staying with us.

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