TELECOMMUNICATIONS: THEIR DEVELOPMENT AND

IMPACTS ON URBAN PATTERNS

by

Rebecca Kam-Hung Luk, B.A., M.Sc. (Pl.)

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ACKNOWLEDGEMENTS

CHAPTER I

METHOD OF APPROACH

The need to know the future is basically an urge from the society that is fundamentally concerned with economic growth to raise the standard of living, to set planning direction and to control social change. As the society increasingly demands more planning from the public sector, policy-makers are committed to study and to predict the long range perspectives of various elements of our society as well as to formulate specific policies to guide future growth and development. Realizing that policies formulated now will have significant impact on the society in the next few decades, it is necessary to anticipate future trends and possible problems that might appear.

The present paper aims to deal with the impacts of a telecommunications technology - the multiservice coaxial cable system - on the future development and growth of urbanized areas and to find what possible policies planners could anticipate in light of the possible implementation of this technology.

To anticipate what the future holds is a difficult task as there are always unexpected developments which may change the attitude and values of our society. This is especially applicable to our North American society where technology and innovation are introduced at such a rapid rate that prediction of the future, especially in regard to social values, is far from accurate. Similarly, long range planning, which depends on how accurately we have predicted the future is difficult.

In the past, predictions of the future have been mostly speculations of individuals, sometimes based on imagination, sometimes on trends and

projections, and sometimes on a combination of these. In general, predictions about matters of science and technology have proved to be easier than about social matters. Predicting the social effects of technological innovation has proved very difficult. How will a given culture use a particular invention?

In order to anticipate the future, we need specific methodological approaches. Robert Theobald in his article 'Alternative Methods of Predicting the Future' proposed three major methods. They are:-

    1) Objective

    2) Subjective, and

    3) Systemic[1]

The objective method depends on the sophisticated projection of existing quantifiable trends into the future. This method is useful for projection of population, recreational demands, etc. Such issues can be easily extrapolated with some degree of accuracy.

The subjective method depends upon an understanding of what new developments are taking place. It is mainly speculative work by the individual and is not very scientific.

Finally, there is the systemic method which accepts the necessity of subjective, speculative, objective, and analytical methods. It also aspires to producing alternative futures and thereby enables policy-makers to initiate change in the desirable direction. It seems this systemic method is the ideal methodology of approach, since it allows systematic projections

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[1] Theobald, Robert, Alternative Methods of Predicting the Future, Futurist, April 1969, p.18.

of certain quantifiable trends, such as population growth, technological development, and so forth, while at the same time it includes the speculative and imaginative efforts of the individual. It is a combination of systematic analysis and interactive speculations.

The scenario is a methodological device similar to the systemic method as suggested by Robert Theobald. It derives systematic extrapolations of trends and from these, makes speculative statements about the future. It is a method useful for stimulating and disciplining the imagination.[2] It is also useful as an aid to thinking as it serves to call attention to the larger group of possibilities that must be considered in the analysis of the future. It encourages the mind to extend its scope and plunge into the unfamiliar and rapidly changing world of the present and the future.[3] By developing different alternative futures, policy-makers will be given a wider range of choices and possibilities about our future.

The author has adopted a kind of scenario approach to deal with the topic of this paper. However, due to the time constraints, only a partial use is made in that the author is unable to make any kind of quantitative statements about the future. Many statements made in the following sections are speculative in emphasis.

Transportation technology will continue to modify the shape, the size, the form and the pattern of our urban areas by increasing physical mobility and the distance man can travel to perform his daily routine. The development

2
 Kahn,Herman;Weiner,Anthony J.,Year 2000, MacMillan Co., 1967, p.263.
3
 Kahn, Ibid., p.263.

of the new telecommunications technology, the switched coaxial cables which permit instantaneous transmission of information is likely to produce similar effects. The interactions of the transportation and telecommunications technologies together with the social and cultural changes are likely to result in more drastic change in the growth and development of our urban areas and their regions than ever before.

Thus, by examining the impacts and potentials of both transportation and telecommunications technologies, certain scenarios or statements concerning the future of urban development are deducible. It is expected that the present decentralization tendency of urban areas will continue and that the size of the urban area will therefore expand tremendously beyond the existing municipal boundaries. Assuming that these scenarios will materialize with the implementation of the new telecommunications technology, urban planning in the future may involove a great deal of regional planning.

Certain possible patterns of urban growth are examined later in relation to the decentralization concept in urban growth. It is felt that a certain degree of physical concentration of human activities will still be necessary not only to allow economy in providing adequate municipal services and amenities but also to preserve open space and to allow ease of control. Development of new telecommunications technology also favors some degree of concentration with regard to the need to have a spatial location for processing and transmitting information to individual

users. New industries and services directly and indirectly related to the new telecommunications technology may be clustered together to serve an predetermined population size.

In essence, decentralization of the urban area does not necessarily imply evenly distributed, low density development. Future nodal development at points and low density development surrounding these nodes may provide great flexibility and variety of choice. It is through careful planning of these new clusters that we may achieve an 'ideal' living environment (i.e. adequate living space, low density, ease of accessibility, availability of all kinds of services and facilities, etc.)

CHAPTER II

TELECOMMUNICATIONS: PRESENT, POTENTIAL AND FUTURE

The concept of 'wired city' has been the subject of much discussion and speculation in the past few years. It is envisaged by many as a city with a 'total' communication system, where 'total' implies a telecommunication system would provide a great number of services to subscribers. At present all Canadian cities are to some extent 'wired cities' in that they have telecommunication systems that provide telephone, data and cable television services. However, the conceptual 'wired' city of the future implies a city with more than the conventional telecommunications or cable television systems. It will be an integrated system that provides not only the existing services but also creates new services to users.

For example, if existing 'paired wire' switched telecommunications systems were to evolve into switched coaxial cable systems, all Canadian cities would become 'totally wired cities'.[1] Such an evolution, if economics permitted, could occur on a widespread basis in Canadian cities in the 1985-1990 period.[2] This new system would be capable of providing many more services than existing telecommunications or cable television systems, as it could provide a combination of video/voice/data services. Of course these services provide interesting possibilities for substituting physical movements, both in space and in time.

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[1] Canada,Department of Communication, Final Report of Telecommission Study 8 (d): Multiservice Cable Telecommunication Systems - The Wired City, Department of Communication, Ottawa, 1970, p.57.

[2] Canada,Department of Communication, Ibid., p.9.

The following is a brief summary of the existing telecommunication services now available.

Services:-

A. Existing services as in the present telephone type telecommunication systems and CATV systems.

1. CATV services are unidirectional and area selective. There is no switching involved other than channel selection by the subscriber. Information transmitted is in the form of video and voice. In addition, extra channels it provides can be used to provide more video services on a closed circuit basis.

2. Telephone service is point selective and bi-directional, and requires sophisticated switching. Information is in the form of voice, long distance and inter-networking are possible.

3. IRTV or information retrieval by television is a new type of service that is becoming available. Audio-visual programs are requested from a central film and videotape library by phone and transmitted to TV monitors in schools via coaxial cable. Information is bi-directional.

4. Data Processing services at present are available on the switched voice telephone network for both on-line and off-line computer use. Transmission can be one way or two ways. The service can be switched or dedicated.

The present telecommunications system employ highly sophisticated switching technique, but they have been optimized for voice traffic and low

speed data signals only. Furthermore, telephone systems can only offer narrowband services. On the other hand, cable television systems are not bi-directional and can handle only one way services with limiting switching. The suggested switched coaxial cable system embodies known technologies, and includes the capabilities of both telephone and CATV systems but eliminate their short-comings.[3] It has additional service capabilities in that it has the feature of a usable band width two orders of magnitude greater than the existing telephone system, and thus can accomodate many more services. Thus the use of coaxial cable in place of or complementary to copper pairs would transform a telephone system into a high speed broad band switched system capable of both uni-directional and bi-directional transmission services and therefore 'total' telecommunication to users.

B. Services under Multiservice Switched Coaxial Cable Systems.

1. Broadcast (one way)

   Commercial and Instructional TV

   Commercial and Instructional Radio

2. Real time point to point switched service (two way)

   Telephone

   Videophone

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[3] Canada, Department of Communications, Ibid., p.28-31.

Telephone and Teletype

Certain Computer Services

3. Store Forward

Computer Services (time sharing and instruction)

Facsimile (Newsprint and magazine, library access)

Financial Transportation (banking and electronic shopping)

Interrogative (Polling and meter reading)

Mail[4]

Potentials

The list of services that the new system could offer can be inexhaustible. It opens up new potential for possible change in life style and may lead to new development in the society as it furthers the possibility of substitution of physical transportation by telecommunications.

This technology is capable of making substitutuions in education, shopping, commerce and banking; and most of all, in work capacity.

A. Work

Workers may find it possible to do much of their work at home provided that telephone, picturephone, closed circuit TV and terminals linked to central computers are installed at home, economically. These facilities would enable rapid data transmission between worker's home and central office, between home and central computer and between worker

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[4] Canada, Department of Communication, Ibid., p.57-58

and fellow worker. This has the obvious advantage of freedom from commuting and comfort. Similarly, business trips could be replaced by video conference and thereby reduce the necessity of business executives making long distance business trips. At present, only the thinking and managerial functions are able to take advantage of this substitution. Some activities or occupations are more suitable than others to use telecommunications for the exchange of information. The following is a list of occupations in which substitution may be suitable. They are:-

1) Salesman

2) Teacher

3) Accountant

4) Stenographer

5) Lawyer

6) Engineer

7) Business Executive

8) White Collar workers, and

9) Clerk[5]

Thus, the substitution of physical movements by telecommunications is essentially suitable for:

a) the brain and paper workers, and

b) the individual or firm with widespread work

connections such as the salesman.

On the other hand, manual occupations that require the physical

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[5] Healy, Timothy J.,'Transportation or Communications, Some Broad Consideration,' The IEEE Transactions on Communication Technology, Vol. Com.16, No.2, April, 1969, p.195-196.

presence of the workers such as a fireman's job, cannot be replaced by the use of telecommunications. He must travel to work.

It may also be technically feasible in the very near future for the manufacturing operation to be remotely controlled by computers. This substitution may relieve us from the dull, time-binding routine operations and give us more time for decision-making, management and creative thinking. This is one of the challenge and promises of the computer utility.

A revised location theory dealing with future locations of firms and industries is now necessary as telecommunications allows such organizations to become more 'footloose'.

The prospect of exchanging communications for physical transportation suggests many exciting possibilities beyond the first level of application. It is possible that the time will come when man's work would be once again task-oriented rather than time-oriented. The extensive use of telecommunications services in the future may introduce flexibility into work in that the worker can choose his own working hours and his own working place. The day may come when it will be difficult to distinguish between the leisure activity and the work activity.

If automated work is coupled with shorter work week in the future, it may imply the possibility for workers to reside at greater distance from the place of work than at present. The interaction of telecommunications with the short work week for example may permit workers to spend three or

less work days in the city and the remainder of the week elsewhere. Certain occupations, such as computer operators are already working 12 hours shifts with a three-day work week. This leaves the individual a great deal of leisure time. This possibility provides great flexibility in the choice of residence. The traditional location theory which assumes a relatively close work/home relationship has been modified by the motor car and expressway, and is now further revised by the advancing telecommunications and computer technologies which afford a new type of accessibility - the ease of rapid information flow. This allows rapid interaction between people largely regardless of distance.

In spite of the great potential, the limitations of the technology must not be overlooked. The substitution for physical movement to work may create psychological problems among workers by creating isolation from fellow workers and business associates.

It is worthwhile here to mention that future development of 'total' communication systems in our cities depends on a complementary development in computer technology. Today, information reaches users quickly by revolutionalization of information transmission through the usage of computer and telecommunications systems. The use of time sharing techniques for digital computers permits the emergence of a computer utility which has tremendous potential for processing, storing and retrieving information, on a widespread time sharing basis without an individual user having to 'own' his own computer.

Time sharing is a term used to describe a processing system with a number of relatively low speed, on line, simultaneously usable stations,[6] allowing different subscribers to use the computer simultaneously. The subscriber pays for the processing service in much the same way he pays for his telephone service. Because of similarities with public utilities, such time sharing services have been called information utility and computer utility.

Thus, computer utility is a data processing service, and the computer utility provides service either by retrieval or storage of information, computational functions via stored programs, and industrial control functions on existing programs. The following are some of the services offered by the computer utility:-

1) Storage and Retrieval of Information from Data Banks

   - legal services, case precedents and statute law, etc.,
   - technical publications, patent records, etc.,
   - video-educational, entertainment, business information,
   - audio-educational, entertainment,
   - government information, such as census,
   - library information.

2) Computational and Processing

   - time sharing for computation of technical problems and computer debugging
   - accounting, bookkeeping

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[6] Sanders, Donald H., Computer in Business, an Introduction, McGraw Hill Book Co., Toronto, 1965, p.47.

- Inventories

- Investment forecasts and calculations

3) <u>Industrial Control of Manufacturing or Service Functions</u>

4) <u>Dedicated Systems</u>

- airlines, hotel reservation,

- computer-aided instruction,

- banking,

- insurance record[7]

Computer utility has an enormous potential market among small businesses, professional men and home users, but at present the cost of such time sharing services is too high for ordinary small scale users. However, if the utility is given a larger user market, it may be economically operated.

Telecommunications provide the media for rapid data transmission between computers, between computers and users and possibly between computers and plant equipment. They allow computer power to be available on a widespread basis including remote areas such as the Canadian North. The potentials of the interaction between the telecommunications and computer technologies will be fully realized when their marriage is complete.

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[7] Ontario Northland Telecommunication Committee, Telecommission Study, Section 5, <u>Information & Data Systems</u>, March 1970, p.4.

B. Education

The new telecommunication system can also provide educational tele-vision to every home with video/audio/data links; thus it provides opportunities for widespread adult education. Education can take place at home while the school would only be needed as a place for laboratory work, a certain number of school trips is thereby eliminated. If the multi-service coaxial cable system was needed to provide all these new possibilities, there would be a change in the movement pattern of people that would influence planning decisions regarding physical transportation and the development of cities.

C. Socializing

It is envisaged certain purely social visits could be replaced by the use of picture phone. The acceptability of such substitution is highly doubtful since social interaction relies heavily on face-to-face contact. It is doubtful whether a complete substitution of personal contact is desirable or could even occur, since psychological problems may arise. Picturephone is bi-directional but information transmitted is linear and not simultaneous, thus picturephone cannot provide an interactive process for users. This limitation is likely to affect in certain instances the social acceptability and usefulness of this medium. There has been much written on alienation and social disorganization in cities where personal contacts are numerous; others maintain that overcrowding in cities has the effect of creating stress and strain in people exposed to such an environ-

ment. The substitution of social visits and other social interaction is not a solution to all these problems. Telecommunications cannot substitute for many of the ingredients present in the face-to-face exchange, and the direct observation of reaction to any perception which is crucial to what Calhoun called the sense of 'compassionate understanding'. However, tele-communications and computer systems can help to enhance human experience by extending, expanding and focussing our perception in contrasting diversity.[8] It cannot be assumed that all the social effects these new technologies will be good. The exodus of middle and upper class from the cities is expected to continue. With geographical and economic stratification, the affluent population of the suburbs are required less and less to enter downtown for work or recreation. Lack of concern and alienation could easily deepen with effects that could cancel out the benefits tele-communication could and should bring to the core areas of the city. At the least, such possibilities as outlined above must be foreseen and taken into account by city planners.

It is important that we identify and attack problems associated with substitution from a sociological, political, economic and psychological viewpoint in complement with purely technological consideration.

The potential of new telecommunications may well cause cultural shocks to people, since their way of life may be changed drastically. However, the potential of telecommunications is beyond physical substitution as the

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[8] Kyo, Izumi, 'Some Thoughts About the Environment and Telecommunication,' Plan Canada, Vol. 1, No. 1. TPIC, 1970, p.32.

strong dynamics of the western society will exploit this technology further. The new technology also has potential in that it may:

1) Increase in society's wealth as the result of increased information flow among people. Transactions are increased and consequently new wealth is created.

2) Increase flexibility and choice among individuals in decision-making. This may lead to the further explosion outwards of urban areas.

3) Bring about social change much faster than has been the change of even the last few decades, as people have greater accessibility to information. It may also open up people to wider perspectives. Consequently they may become more susceptible to social change, such as accepting more leisure time, shorter work week and automation.

It is important to classify the kinds of communities and situations in which the prospects for change in the communications-transportation relationship is likely and should be emphasized.

Types of communities:-

1) Older portions of cities are characterized by high population densities which tends to encourage mass transit. There is a continuous out-migration of middle and upper middle class to the suburbs and beyond. In their place, incoming poor people take the old housing. Most of the work done by these new citizens was manual. For this electronic substitution is not always suitable. However, downtown offices provide numerous clerical jobs which

CHAPTER III

TELECOMMUNICATIONS: IMPACTS

Technology brings change to the social and physical environment. A change in technology and subsequently in material culture is usually accompanied by social changes. Although culture determines the acceptability of a new technology, nevertheless, the powerful potential of innovative technology is too attractive for any society to reject, as this technology usually implies the bringing of advancement and efficiency to the society.

New technology alters the life pattern of man by giving a mix of choices. Its consequence is derivative and indirect.[1] It is derivative in that it depends on the prior efficacy of technology in creating new technological possibilities and it is indirect in that the removal of options is not a consequence of technology but of the activity of choosing a new option that the new technology has created. Thus the industrial society gives the option of urbanization requires concentration of human resources. The airplane and car create mobility at the expense of stability and constancy of personal relationship. Thus the adoption of a new technology is likely to bring changes to the society and in a way can be considered as a matter of replacing the old for the new. Telecommunications technologies will have similar seperation effects as other transportation

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[1] Mesthene, Emmanuel G.; How Technology will Shape the Future, from Environment and Change, ed. by William R. Ewald, Jr., Indiana University Press, Bloomington, 1968, p.133.

could easily be substituted for telecommunications.

2) The suburbs are usually populated by middle and upper middle class citizens. Some of their jobs may be suitable for a certain degree of communications-transportation substitution. The density development in suburbs is low, transportation is more complex. The substitution may be useful to solve some of the transportation problems.

3) New cities provide the best prospect for testing new technological concepts.

4) Non-centralized configuration is the most exciting and daring possibility but the least likely to occur soon. It would involve a new system of companies - 'fluid companies', requiring no central geographic location at which employees could gather. People could live anywhere but would still be able to work.[9] Such a possibility offers an exciting promise for the Canada of the 1990's and beyond, and should not be overlooked.

[9] Healy, Ibid., p.196-197.

technologies have by providing efficient and rapid communication between points at the expense of continuous spatial seperation of man. Innovations of telecommunications technologies such as television, have been applied haphazardly, following what the market will take. There is always a drive to exploit an advantage in our kind of society. The use of the motor car is another example of exploitation and misuse. The problem facing planners, telecommunications experts and politicians today is the careful planning for this emerging aspect of telecommunications - a 'total' communication concept, such that the society as a whole will receive the optimum benefits.

Impact of Transportation Technologies

The innovations in transportation and communication technologies have brought numerous changes to the pattern of our urban settlements.

Dr. Hans Blumenfeld commented that transportation technologies allow vertical, horizontal or interstitial expansion of cities.[2] Briefly, the elevator allows vertical growth of buildings and gives us skyscrapers in our city scape. The railway lines allow horizontal growth within the city and development of suburbs along railway stations. And lastly, the motor car allows interstitial growth by filling up spaces between suburbs and encourages low density development and expansion of city size.

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[2] Blumenfeld, Hans, The Modern Metropolis, ed. by Paul D. Spreiregen, M.I.T. Press, Cambridge, Mass., 1967, p.31.

This will be dealt with in greater detail later in this chapter. The extention of telecommunications technology is likely to provide more choices and possibilities for people in regard to locations of residence, commercial and industrial activities since information can be obtained easily irrespective of location and certain physical movements can be substituted. One of the many effects of a multiservice coaxial cable telecommunications system on the city may be the continuation of low-density city growth outward. Before tackling the impacts of coaxial cable systems, it is helpful to examine briefly how the development of transportation and telecommunications facilities has affected different stages of city development.

The present pattern of the modern metropolis is essentially a product of growth of transportation and telecommunications technology which at different stages developed centralizing and decentralizing tendencies. Human activities fundamentally involve interactive communication and therefore, physical movement. Transportation facilities are essentially directed to achieving accessibility to all parts of the city.

The first stage was the innovation of steamships and railroads to rationalize interurban traffic. Manufacturers found it profitable to locate at the terminals of these facilities to take advantage of rapid and cheap long-hauls of raw material and fuels. Concentration of industries drew in a large labor supply. This in turn drew in more industries and localization economics were developed. Transportation technologies at this

stage were acting as a centripetal force, bringing resources and labor to a few selected points. Urbanization took place around factories and was confined to relatively small areas within the city since intraurban movement was done on foot or by horse. Overcrowding and congestion were problems of these early industrial cities. Communication in the city was done by messenger although the invention of telegraph allowed long distance intraurban communication.

In the second stage of technological revolution, intraurban mobility was affected. The suburban railways, street cars, subways, buses and motor cars have overcome distances within urban areas allowing people more freedom of movement and choice of residence and factory locations. Subsequently, industrial cities experienced a spread of their urbanized area although at the same time these nodes still acted as focal points attracting people from around to concentrate in them. Apparently, then, two forces are at work, one centralizing economic forces into the city and the other decentralizing residences and economic activities within the city through improvement of transportation facilities.

It is necessary to elaborate the above further to find how each of these intraurban transportation modes influence the layout and size of the city. The introduction of suburban railways brought changes to trips made by people. Formerly, it was more convenient for people to live near to their place of work so as to reduce travel time. With the coming of the railways, the individual could travel at relatively high speeds and

thereby free himself from the old distance and time constraints, and could have a wider choice of place of residence. Bead-like developments occured at railway stations. The settlement pattern radiated from the city core to the suburbs along the railway lines, a star-shaped development. The next stage of development commenced with the introduction of development of electric street cars which ran on rails laid in the city's streets and moved at a somewhat lower speed. Commercial and residential developments occured along streets where street cars ran, urban growth was confined to relatively small areas in the city as the speed limit a street car could travel restricted the distance workers could travel to work. The use of rapid public transit such as the subways has removed the speed constraint but has provided new problems since such a system can only be operated economically in high population density areas where a high passenger usage is assured. Nodalized developments tend to occur at subway stations and this trend will be likely to continue.

However, all these facilities are not responsible for the extensive urban growth as experienced by our cities today. The shift from railway to motor car marks the new era of urban development. It provides a greater freedom of individual mobility. Consequently the location of residential, industrial and commercial activities which were formerly clustered in and near the core of the city to take advantage of the public transit system was considerably effected. The motor car makes low-density development possible, though the availability of electric power, gas and telephone

is also a major factor allowing such outward expansion of the urban area. The location of work and residence becomes more footloose than before, and a new set of location criteria replaces the old. There is a great deal of throwing out of economic activities from the city core to the periphery. Warehouses, railway yards, wholesalers, etc., are moving to the peripheries of cities to avoid the traffic congestion in the core. Since the use of telephone and other means of telecommunications allows rapid interaction anywhere within and outside the urban area, location of economic activities in the peripheries where easy accessibility to major highways is available, is an asset rather than an inconvenience. Similarly, major residential developments also expand out from the core and grow faster along expressways and rapid transit lines. Thus physical and activity components of urban spaces expand and result in the spatial dispersion and consequently fusion of urban areas.

Many cities are getting senselessly large because most people desire low-density residential development, and the motor car has become the means to achieve this end. Although the car is a high-speed transportation mode, traffic congestion has reduced its advantages considerably during rush hours. In order to solve this problem, more expressways are built, but these in turn stimulate urban expansion and low-density development; the whole thing then evolves as a viscous cycle, each phase aggravating the problems of its predecessor. With increased reliance on communication and increased mobility, people are willing to take the option of greater

physical isolation to gain larger living space. This tendency is likely to continue, and the city will continue to grow and spread over large areas, with decreasing tie with the central location.

The third stage of urban development is marked by further de-centralization within and beyond existing urban areas. The development in telecommunications plays a major role in such development. Already, the use of telephones has aided the dispersion of human activities. It is likely that further improvements in the telecommunications technology will reduce the distance constraints imposed by the present transportation systems and thereby allow people to go beyond existing limits and expand further from the existing urban area. This implies a transportation system will have to provide even greater accessibility to all parts of the city and the region. A question is whether such expansion should be accomodated or whether certain controls should be imposed if expansion is allowed. The concept of decentralization by telecommunications will be dealt with in greater detail later in the next chapter.

From the above discussion, it is apparent that development of a new transportation mode acts as a substitute for an older mode. For instance, the motor car substituted to a great extent for suburban trains and public transit services for intraurban traffic. Yet this is not to infer that it has completely eliminated the use of the first transportation mode, it merely indicates that a heavy emphasis has been put on automobile use. Furthermore, there is a recent trend in trans-

portation planning to aim at a more balanced transportation system by using different modes. The GO-Train in Toronto is an example of such attempt. The substitution of one mode for another is not complete and is never a one-to-one process. Although the above discussion may not be true for every type of telecommunications service and its corresponding substitution for physical movements, one must therefore be aware of the inadequacy of the substitution concept.

The Concept of Substitution

The conventional concept of substitution is the substitution of movement of objects by the movement of information.[3] It may also mean a substitution of time and space made possible by rapid data transmission. The development of data transmission and telecommunications technology gives possibilities for new things to be done. For instance, the linking up of computers via telecommunications allows widespread machine-to-machine interaction that did not exist before. This kind of substitution is likely to generate stimuli for new development in human interaction. The use of telephone through substitution of messenger and mail, has increased business transactions and social interactions. These, in turn, generate physical movement of people, goods and services. Dr. Dakin suggested a redefinition for substitution

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[3]
Dakin, A.J.,Exploring the Concept of Substitution, Wired City Seminar Transportation Panel, Ottawa University, June, 1970, p.1.

as:

> '....a change in the ratio between the movement of
>
> objects and the movement of data in relation to
>
> variation in time and space.'[4]

The relationship between movement of data and movement of people and goods is not necessarily inversely proportional. The significant factor of the new telecommunication technology is that it allows new possibilities in what can be done and the distance over which it may be done.[5] The use of the car and telephone made possible the physical expansion of the city by enabling people to travel greater distances than before for daily contact. Thus by substitution it will tend to expand the area of close interaction - the city. An information explosion may be directly responsible for the further physical growth of the city and allow better decisions to be made over greater distances. Physical movements of people and goods are still essential for the functioning of the city, although we have to move them over a greater distance. This will push us in the direction of seeking ever better means of physical movement and more efficient transportation planning.[6]

Furthermore, transportation studies have shown that with increase

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[4] Dakin, Ibid., p.3.

[5] Dakin, Ibid., p.3.

[6] Dakin, Ibid., p.5.

in affluence, there has been a corresponding increase in trip making.
Since it is assumed that telecommunications technology may bring more
affluence to our society, more physical movement will be generated. Thus
the expectation that by substitution of telecommunications for
information transmission, physical movements will be reduced or eliminated
is unlikely. It is likely, however, that they will be changed in their
nature. Of course, certain physical movements, including some work trips,
school trips and shopping trips may be reduced, but stimulus given by
new telecommunications systems may well result in more and not less
physical movements in cities and their regions.

Scenarios

In view of possible 'total' communications for Canadian cities as
could be provided by multiservice cable telecommunication systems, a
number of scenarios can be suggested.

1) Equal Distribution of Social Services via Telecommunications

There will be an increased use of telecommunications for data
transmission. Computer technology will emerge as a new utility providing
widespread services for information processing, storing and retrieval
to home and office users via cables telecommunication systems. Many
social services, including education, health and library services will
be able to take advantage of the two technologies and make possible a
better distribution of services to all in the society. The quality of
social services will be greatly improved in remote areas which formerly

suffered isolation. The use of telecommunications for rapid information transmission is vital for communities such as those in the Canadian North, as well as newly developed communities.

2) Tendency toward Decentralization of Urban Areas will Continue

The trend toward decentralization has been present for several decades and is likely to continue. The use of multiservice coaxial cable which extends the distance over which meaningful interaction can take place, is likely to accelerate the rate and the extent of the decentralization tendency.

Decentralization in the near future will consist of the interaction of social, technological development and human behaviour. It is the interaction of:-

1. The emergence of computer utility and telecommunications technologies,

2. The availability of information for all as a result of the above technologies,

3. The development of better transport modes and routes, the increase in use of truck for freight,

4. The emergence of a leisure-oriented society,

5. The emergence of a shorter work week society,

6. The decline of the protestant ethic - the virtue of work attitude,

7. The decline in the role of work in the distribution of goods

and services through automation,

8. The desire to escape all the 'nuisances' of the cities,

9. The desire to return to nature, and,

10. The desire for the greater living space and lower property
taxes of non-urbanized areas.

The above factors are not meant to be exhaustive. With the changing
patterns of communications that are imminent, we can expect the individual
locations as well as the overall spatial structures,which are reflections
of human interactions, to change. For it is interaction, not place, that is
the essence of city and city life. The ability to interact over great
distance affects the possibility of location in a geographic space since
people can live further away from their place of work. The locations of
firms and residences can become more footloose than before.

With the use of various communications facilities, there will be
certain substitutions for physical movements including certain working,
shopping and school trips. These new possibilities have consequences
for the present life style. As the use of new telecommunications
technology enlarges the area of close interaction - the city, by allowing
a greater distance over which close interaction can be achieved - the
desire to live in a low density rural environment will likely continue as
some people will still hold the view that the city is to be avoided.
The potential of telecommunications will enhance the desire to disperse.
Many people can become exurbanites as distance between home and place of

work becomes a less important issue. Although economic considerations of transportation costs and servicing are still major criteria in industrial location, they are of declining importance. There is already the tendency for certain offices and industries which do not demand a central location for business to move to the suburbs to take advantage of the availability of cheap land and less traffic congestion. As new means of interactions provided by multiservice cables become available, a new set of location criteria emerges, urging individuals seeking better environment to move beyond the peripheries of urban areas to areas previously rural or recreational. It is anticipated that the periphery of metropolitan areas will experience waves of urban growth in the near future. The metropolitan area will continue to expand until it includes its hinterland. Planning will have to cover the greater metropolitan region rather than just the city or the metropolis as normally defined by present legal boundaries. [7]

3) <u>Downtown Core will Decline in Importance</u>

With the increased tendency for dispersion and low-density development, the city core or downtown of the city will increasingly lose for many its attractiveness as the hub of social, economic and cultural activities. The old pattern of concentration of commercial and business enterprises will be modified as these enterprises move to the suburbs and peripheral areas to serve people who have already moved out. The core of the city will become a center for highly specialized services, while

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[7] Sydney, Australia already has planning on the new scale.

subcenters developed in the suburbs or the peripheries have less special-
ized activities.

4) Transportation will orient to the Urban Region

If technology and telecommunication mean increased automation for
many dull, time-binding routine jobs, the economy will become more
productive but less labor may be required. It is anticipated that by the
year 2000, work may be reduced to a 1000 hour work year.[8] This is roughly
half of the time we devote to work nowadays. With a shift in emphasis from
work to leisure, there will be more travelling for recreational purposes.
It is likely that transportation planning in the future will be oriented
towards the region for recreation users.

5) Demand for More Efficient Transportation Planning

The expansion of the city into the greater region will imply more
physical movement of goods and people over greater distances than before.
Increasing wealth allows an increasing number of people to become
exurbanites or to simply have two homes, one in the city and a cottage
in a recreation area. They may be expected to spend as much time in their
outlying cottages as in their city homes, and the use of coaxial cable
system and the new communication facilities makes it possible for them
to work from both locations. The change in location of residence necess-
itates services and goods to move with people. The result is more
vehicular movement of people and goods by road. The outcome is to call for

[8] Ruste, R.G., American Heritage Prognosis AD 2000. Exposition Press, New York,
1967, p.39

more efficient transportation planning to accomodate the dispersed
population. This improvement attracts further traffic and the region expands
physically. This in turn stimulates the need for more telecommunications
facilities in newly expanded areas. Transportation and telecommunications
are therefore in fact mutually stimulating each other's growth.

6) Increase in Land Value

With increase in accessibility to all parts of the metropolitan
region as a result of improved telecommunication and transportation
facilities, land costs will rise generally. This will further encourage
high-density development in certain areas especially along major arterial
roads or at intersections of expressways or at transit nodes. However, the
general development will be low-density development over the region, and
if this growth remains uncontrolled, urban sprawl is inevitable.

The above is not necessarily exhaustive. There may be many new
possibilities related to the implementation of cable telecommunication
systems. Planners must come to grips with and understand the advances of
telecommunications technology and its significant implications for planning
of city regions.

PLANNING IMPLICATIONS

Planners' Concern

Since it is anticipated that multiservice coaxial cable systems are likely to be available in the 1980's and that this new tele-communications technology is likely to allow and encourage further dispersal of the urban areas, planners who are aiming at improving the urban environment, are concerned with the type of pay-offs that the new telecommunications technology can offer.

Can telecommunications technology help to create a sense of community, a sense of togetherness which is presently lacking in our alienated cities? People still look forward to living in a pastoral setting although the myth of a rural life is completely unrealistic in today's context, as inputs from new technologies are moving up into a new kind of urbanism in which the rural-urban dichotomy is fading.

The pay-offs of multiservice switched coaxial cable must be considered before implementing. The increased television channels may enhance the level of entertainment and educational opportunity for the vast majority. It may also raise the level of public participation in politics and local affairs, as information is readily available. With the combined usage of computer utility, it may also be a means of seeking to improve performance in social, educational,

health, crime prevention, recreational and cultural programs. The use of telecommunications may also allow wider dispersion of businesses and industries, and thereby bring about a desirable multiplicity of small communities where people can both live and work in comfort. On the other hand, this new technology can bring very rapid social changes. People may suffer from the impacts of these changes. Alvin Toffler in his book "Future Shock", uses the same term to describe the shattering stress and disorientation induced in individuals when they are subjected to excessive social change due to technological advancement.

Life style is likely going to change because of the use of new telecommunications technology. However, the extent to which a life style will be changed should be examined, in particular with regard to the use of telecommunications in work, shopping and education.

As already noted, multiservice coaxial cable telecommunications systems will provide the possibilities of substitution for certain movement among occupations, namely, the think-type, clerical and managerial type functions. If work can be done at home or at ' neighborhood remote work center'[1] where terminal facilities are available, employees could choose their time for work, or at least have flexible working hours. This would free them from the time and distance constraints of the present work-residence location relationship.

Although it is anticipated that the use of picturephone can in part

[1] Healy, Timothy J.;Transportation or Communications, Some Board Considerations; IEEE, Transaction on Communication Technology, Vol.Com.16,No.Apr.1969,p.196.

replace the salesman's visit, it may not be accepted by many, as society still values personal contact. The success of many business transactions often rely on the personal contact and persuasive power of the salesman in face to face contact with his client. Nevertheless, telecommunications have the potential for substitution for many business trips. Not least of these is the ability of the sales representative to live a considerable distance from the working loacations and use telecommunications for 'selling'. It is felt that the viability and social acceptability of such a method must be further studied and researched before such technology can be implemented.

It is anticipated that shopping could be done electronically. It is however, mainly a continuation of the present catalogue shopping and shopping by telephone, and may not mean a reduction of shopping trips as indicated by the building of integrated and highly sophisticated shopping centers in the suburbs.

Shopping by phone or by computer will not entirely replace personal shopping, since the present socio-psychological needs of individuals require people to come together. Attitudes of hostility, indifference and alienation arise when there are stress and strain in the environment. When such is minimal in a stimulating and highly sensuous environment, human beings incline to each other's company.

Today, shoppers are both catalogue shoppers and personal shoppers. As society is becoming more affluent, buying power is likely to continue

to increase, and more goods are sold. Electronic shopping in the future is going to relieve certain portions of merchandizing, such as grocery shopping, but is unlikely to substitute for personal shopping completely.

It is also anticipated that educational television and other electronic means of education will replace a great number of school trips in the future. The extent to which educational televisions shown at home can substitute for school trips may differ at different stages of schooling. At the high school and university level, a great deal of electronic substitution may not impede the learning process; in fact, the use of computer may allow individualization of instruction and allow students to advance at their own capacity. Laboratory work and discussion can take place at school. However, in the elementary school level, the daily meeting of school children may have an important impact on the normal socio-psychological development of children. A great deal of the time spent by elementary school children is in playing and socializing. The effects of electronic education on young children must be investigated before it can be implemented. To realize the potential of telecommunications in education, experimentation with programing and teaching technique and aids must be investigated.

To conclude, the social acceptance of electronic substitution for work, shopping, social visits and education, needs careful consideration as our society still values personal contact; although the drive for efficiency may encourage some sacrifice at the expense of human values.

Another area that needs investigation is the exploration of the
usefulness of the new telecommunications technology to the society at large.
Gordon Thompson of the Northern Electric Co. suggests three areas in
which communications effectiveness should be measured. They are:-

1) the ease with which stored human experience can be accessed,

2) the size of the common information space shared by the communica-
tions, and

3) the ease with which the society using the system can discover
and develop a plurality of new and fresh consensus.[2]

There are only a few areas that we can use to explore the potential
of the new technology. We cannot misuse the new technology as we have
the motor car, which is used as a tool to further rationalize and
justify the spatial and hence time-seperation of man.

As information is becoming readily more accessible because technology
has provided an enormous capacity in electronic data processing and
transmission, we are now entering the age of information explosion. With
increased transactions, there is an increase in wealth. Richard Meier
in his communication theory hypothecated that the capacity of society to
generate wealth is dependent upon increasing the rate of information flow.
If rate of information flow increases, then there will follow economic
growth.[3] Gordon Thompson goes further by saying that information is wealth.

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[2] Thompson,Gordon, Moloch or Aquarius, Northern Electric Co.,Ottawa, 1970,p.40.

[3] Dakin,A.J.,Introductory Address, Colston Symposium, 1969, p.13.

This type of wealth is generated from more business transactions and income collected from processing and transmission of information via telecommunications. There are many indirect and direct pay-offs from this new technology that can affect human activities and subsequently affect the locations of these activities.

Planners need to realize the limitations and potential of the new telecommunications technology and plan from there.

The Area of Physical Concern

The concept of a 'wired city' in the near future can be realized if switched coaxial cable systems are installed. It is necessary to define what is the boundary of the 'wired city' if such is anticipated.

In the middle ages, cities were easy to identify because they were physically identified by fortification. With the invention of motor car, urban areas expand and spread beyond the legal boundary of cities. The boundary of modern metropolitan area or city does not necessarily define the built-up area. The boundary lines are merely for jurisdiction purposes and they seldom take in the entire urbanized area. The metropolitan area of city may have its trade area and sphere of influence extending to other cities as in the economic dominance of Toronto over the whole of Southern Ontario. Thus when we are talking about wired city in the future, it is important to state clearly whether we are referring to the urbanized area bounded by legal boundaries or an urbanized area that spreads beyond these lines. If we accept the

latter definition which is somewhat crude at this stage, we are talking
of not a city or a metropolis, but a city region which includes the
city proper and the surrounding area that experiences the urban growth.
Certain urban studies have examined the sphere of influence of the
metropolitan area. Donald J. Bogue of the University of Michigan found
that the sphere of influence of a large metropolitan area usually
extends 60-100 miles from the center.[4] The region includes a number of
industrial satellite towns that draw on the resource of the metropolis,
which in turn relies on these for recreation, park facilities and so forth.
This is pertinent to the concept of urban field developed by Friedmann and
Miller. They postulated that a two hours driving time on a modern highway
or approximately 100 miles out from the core may be deemed to encompass
this realm of urban activities which they define as intensive weekend
and seasonal recreational activities of the urban dwellers.[5]

This concept is supported by a study of cottaging in the Toronto
urban field by Gerald Hodge of the University of Toronto. It is found
that a peripheral zone of 60-100 miles out from the core has become

[4]
Blumenfeld, Hans, The Modern Metropolis, ed. by Paul D. Spreiregen,
M.I.I.Press, Mass., 1967, p.70.
[5]
Hodge, Gerald, Cottaging in the Urban Field: A Probe of Structure and
Behaviour, (Urban Field Study) Center for Urban and Community Studies,
University of Toronto, April 1970, p.2.

under extensive use by city dwellers for leisure. There is also a trend toward winterizing these cottages as a result of growing popularity of winter sports. As society becomes more affluent and moves toward shorter work week and become more leisure-oriented, the urban area will include the urban area 'proper' as well as the outlying area frequented by urban residents for recreational purposes.

As the present design of wired distribution systems can cover an area of 200 miles or more radiated from a single head end, there may be a wider explosion of the city into a region. The planning area in the future may involve not only an area extending to 60-100 miles radius, but an area with 200 miles or more in radius including a hierachy of urban centres and open spaces between them.

It may well be that the urban field concept is already obsolete. Furthermore, a redefinition of the urban area may be necessary with the advance of development in telecommunications. Presumably, with coaxial cables, Vancouver is as near Toronto as Mimico. So, to define the city is getting more and more complicated. Urbanity in the modern sense is a way of life and not merely a definition by land use patterns and buildings, etc. Urbanity means an increased flow of information and participation in all activities - social, economical, cultural, and political. Today, urbanity extends not only to city dwellers but to suburbanites and ex-urbanites. Melvin Weber distinguishes two types of urban communities as, the 'place communities' where human interactions occur in a particular

metropolitan community; and the 'non-place communities' which extend to widely scattered places over the face of the earth. He uses the term 'urban realm'.

Modern transportation and advanced telecommunications have the effect of stretching distances, allowing more and more individuals, firms, organizations and institutions to make contact on a global basis. With increased human interaction extending to the 'non-place communities', it is to be expected that the present metropolitan areas will extend into larger urban regions.

An important question planners must resolve is whether there is a danger of 'cities' becoming too large. Under the present technological constraints, economical and efficient operations of municipal services, social services and transportation facilities require a certain density of population and some degree of concentration of human activities to achieve some acceptable level of efficiency.

There have been researches[6] on the optimal size of cities, but they do not provide a definite answer. However, it is found that when cities become too large, problems of congestion, overcrowding, social disorganization and diseconomics of scale are likely. On the other hand, small communities sacrifice efficiency and variety. The ideal situation

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[6] John Dyckman in his article 'City Planning and the Treasury of Science' pointed out that empirical studies have found that cities with 250,000-500,00 population have facilities that satisfy the demands of urbanites. However, correlation analysis on cities over 500,000 are clouded and inaccurate.

lies somewhere between these two extremes. A multi-centered urban form that can ensure the efficient operation of municipal services and other services throughout the planning area on the one hand, and nodalized developments of human activities on the local scale on the other may be a possible compromise.

As the concern for environmental quality gains public attention, there is a call for 'balanced' development between the developed areas and open space.

This paper stress the idea that decentralization of urban areas is inevitable but that control and guidance must be applied, especially when the new telecommunications technologies are utilized for the optimum expansion and dispersion of human activites.

CHAPTER V

BASIC CURRENT PLANNING ISSUES

Concept of Decentralization

The metropolitan areas of the 1940's exploded into the larger
metropolitan regions of the 1950's. There are indications that another
explosion of the metropolitan region is imminent due to the progress
in social, economic and technological developments.

The interaction of new transportation and telecommunications
technologies and the related social changes will permit and encourage
the present decentralization tendency of cities to continue since
technologies increasingly release the urban dwellers from the necessity
to be in close proximity to the locations at which they interact. Since
the switched coaxial cable system can easily serve an area with 200
mile radius or more, and since a high-speed train travelling up to
150 miles per hour is already close to the implementation stage,[1] it
is very possible that the future urban area could extend to as far as
200 miles from the central city. Planning for this area with, say a 200
miles radius, is certainly going to be different from the planning
of the present city size whose legal boundary may extend for 20-30 miles
from the central core and whose sphere of influence or 'urban field' as
Friedmann and Miller have termed it, is only 60-100 miles from the

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[1]
Regional Economic Development Institute, Inc., Pennsylvania, Transport-
ation Requirements and Effects of New Communities, Prepared for U.S.
Department of Housing and Urban Development, Washington, D.C., May 1968,
p.71.

central core. Planning in the future will involve integration of broad regional and city planning.

Planners searching for new greater metropolitan regions have examined different patterns of settlement for the future.

(1) Decentralization may favour a low-density pattern, spreading out in all directions.

(2) Decentralization may be bunched into relatively small units, each with an internal peak of density, each seperated by low density development.

(3) Decentralization may follow major transport corridors with intensive development at certain nodes.

(4) Decentralization may penetrate into nearby recreational areas, making them dormitories or satellites for the larger urban areas.

(5) Decentralization of human activites and spatial structures may penetrate far into remote rural areas.

(6) Creation of new towns near existing urban areas may be a common form of decentralization.

(7) Decentralization may be a combined or mixed form of the above.

The above possible patterns of development are discussed in some detail in the following sections.

1. <u>Decentralization in all directions</u>

Since the use of multiservice coaxial cable allows urban man to expand outward, and since he desires spaciousness, expansion may take the form of low density development in all directions. If such development is allowed, the fusion of cities will occur, producing the appearance of continuous urbanization across the continent. There are certain desirable and undesirable aspects pertaining to the continuous decentralization of our urban areas. It is necessary to find out whether such spread development is desirable in social, economic and planning contexts. The following is a list of desirable and desirable aspects that calls for attention.

Desirable aspects:-

a. Open space for family life will likely be adequate.

b. The access of rural land becomes unnecessary, since outdoor recreat- ional facilities are close at hand. Permanent low-density residence may displace summer cottage living.

c. Less air pollution is likely because of dispersion of human activities.

d. Absence or diminution of bad features of big cities, such as traffic congestion and overcrowding.

e. 'Better' contact with nature and a 'better' quality of environment.

f. Smaller social units and consequently better social interaction. It gives flexibility, local participation, personal comfort and

independence to a maximum.

g. Capacity increases in the region for urbanization.

h. Accessibility may be good provided that high speeds of travel and low terminal times (convenient parking, rapid starting) are available.

Undesirable aspects:-

a. Some loss of physical accessibility as a result of low-density development. The problem of multi-point access is likely to occur as the system of flow would have to be highly dispersed because population is spread out evenly, and there would be no outstanding nodal points.

b. Costs of physical movement increases as it is more expensive to serve the dispersed population. It is too costly to operate public transportation facilities, as a result, reliance is greatly on individual transportation.

c. Reduction in attractive features such as some cultural facilities of big cities, and failing to produce a visually vivid and well-knit image of the environment.

d. Loss of focal point in the community and dimunition of the sense of political identity in the metropolitan community.

e. Loss of genuine rural areas, with possible upset of the prevailing ecological balance.

f. Loss of economic operation of municipal servicing, mainly water

supply and sewage systems. Present municipal engineering still require a certain degree of concentration before operation is economical.

g. Low-density development presents problems in the municipal tax base. If low-density development is envisaged, reorganization of municipal government is necessary.

The above list is not meant to be exhaustive. This area leaves a great deal to be explored and analyzed. Planners need to consider both desirable and undesirable aspects of decentralization and must formulate appropriate policies to guide and control future growth.

2. Decentralization may be bunched into relatively small units, each with an internal peak of density, each seperated by low-density development.
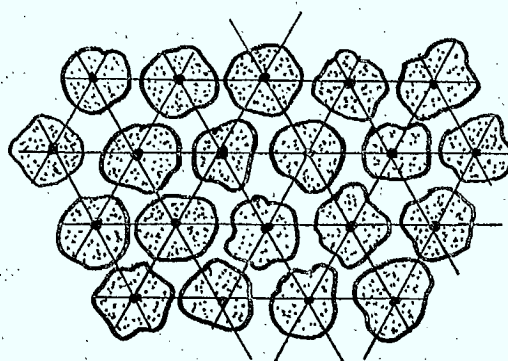

Fig.1 The Urban Galaxy[2]

[2]
Lynch, Kelvin, The Pattern of the Metropolis, The Future Metropolis, ed. by Lloyd Rodwin, George Braziller, N.Y. 1961, p.108.

As shown in Fig. 1, there is no center of domination or core area that dominates the urban area. Urban activities are concentrated at different small centers. Kelvin Lynch terms this type of urban development, the 'urban galaxy'.[3] Again there are desirable and undesirable aspects pertaining to this pattern of development.

Desirable aspects:-

a. It will retain the advantages of the dispersed pattern such as comfort, independence and stability.

b. It provides a wider range of choice of location than pure dispersal or the evenly-distributed, low-density development.

c. Absence of bad features of big cities such as traffic congestion and overcrowding.

Undesirable aspects:-

a. Costs of physical movement increase, although they are not as expensive to serve as compared to an evenly-distributed population, because transportation flow is concentrated at small nodes.

b. The factor of time-distance remains high because people travel to work out of the nodes or clusters of relatively high-density developments.

c. The smalleess of each cluster of concentration lessens the opportunity for intensive, spontaneous communication, and for very specialized activities that might exist in larger centers. It lacks

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[3] Lynch, Ibid.,p.108.

the variety and diversity of the larger metropolitan areas.

    d. Loss of economic operation of municipal servicing, mainly water
supply and sewage treatment.

3. Decentralization along major transportation corridors.

    Decentralization may move in specific directions along certain
transport corridors, for instance, industrial and residential
development along Highway 400 and 401 in Toronto, Ontario. If such
development is mainly linear in character and extends into the unurban-
ized areas for long distances, it will have the disadvantage of dis-
turbing the non-urban environment. Intensive and integrated development
of industrial, commercial and residential activities at certain nodes
along major transport corridors seem to be conducive to reasonable
overall urban development since it provides certain economies of
concentration but minimizes the disadvantage of overcrowding and
congestion. An ideal form might be a star-shaped or finger-shaped
urban development which has integrated nodal developments or sub-
centers along major transport routes fanning out or radiating out
from the urban core, while residential developments with careful
detailed design and planning, cluster around these nodes. (Fig. 2
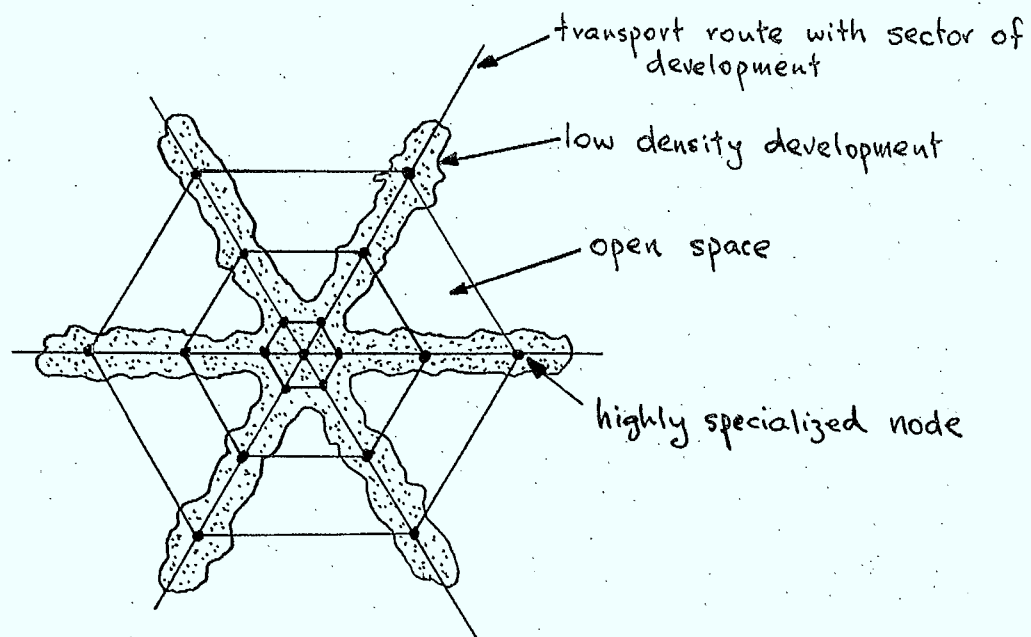and Fig. 3)

transport route with sector of development

low density development

open space

highly specialized node

Fig. 2 The Star[4]

Suburban train service

public transit

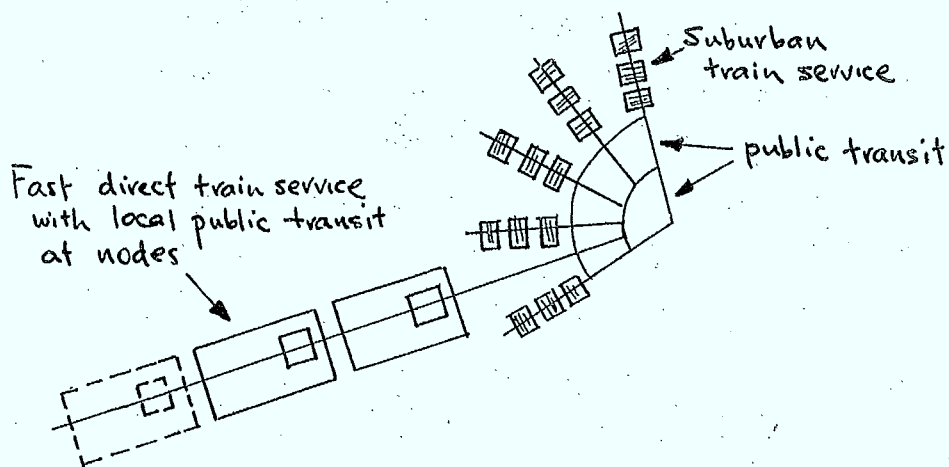Fast direct train service with local public transit at nodes

Fig. 3 The Finger Concept[5]

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[4]
Lynch, Ibid., p.108.

[5]
Blumenfeld,Hans,The Modern Metropolis, ed. by Paul D.Spreiregen, M.I.T.
Press, Cambridge,Mass. 1967, p.108.

Desirable aspects:-

a. Retain a dominant core which contains the most extensive and specialized type of city-wide activities while the subcenters along major transportation corridors have less intense activities. It gives location flexibility to certain types of activities.

b. There is no single dorminant center, but rather a number of strong centers specialized in finance, government, culture, commerce, etc.

c. The system of flow would be organized on the radial pattern along transport corridor with supplementary concentric roads connecting nodes. As a result, movements along sectors are fairly fast and efficient.

d. Efficient public transportations of high capacity could operate along main transport corridors or sectors.

e. Private transportation by car is favourable in all directio s except in the core area.

f. Allows economical operation of municipal services for high-density developments along certain transportation routes with low-density residential developments fanning out from them.

g. Individual choices are wide with regard to living habitat; easy accesses to a variety of services and ease of access to open land which lies behing each corridor or sector of development.

h. Growth could occur radially outward, and future change could be accomplished with less difficulty than in a compact pattern

because densities would be lower, and open space breaks up each strip of development.

i. It unifies the metropolitan area as all transport routes lead to the central core.

Undesirable aspects:-

a. As all transport routes converge on the core, movements at the core may become overloaded and congested.

b. It may have special advantages if central congestion could be avoided and free accessibility maintained, but this form of development is less and less effective as size increases. Circumferential movements or movements between sectors become difficult especially in the outer region where distances between sectors are enlarged.

c. To maintain the benefits of this pattern, massive initiative by the central government to undertake development and control growth is necessary.

4. Decentralization into nearby recreational areas.

Desirable aspects:-

As multiservice cable telecommunications systems increase the distance over which meaningful interaction can take place, many peoplewho desire open space, fresh air and leisure in recreational areas, are able to reside permanently or seasonably in recreational areas near the urban area. Since the working week is getting shorter and

the society is becoming more leisure-oriented, people are willing to move greater distances to commute to work, while residing in the areas where they spend most of their leisure time. The use of more advanced telecommunications technology enables more people to become ex-urbanites.

Undesirable aspects:-

This form of decentralization is least ideal. It merely creates dormitories for the urban area. Unless the tax base is revised such that these recreational areas will be financially capable of servicing the increased population and planning for viable neighhourhood, this form of decentralization is least desirable. Increased population in these recreational areas may endanger the recreational value and natural environment.

5. Decentralization into remote rural areas.

Suburban sprawl and low-density development give rise to problems of transportation, pollution and congestion. Some people feel that urban dispersal should not be concerned with the existing cities. It should be concerned with diverging resources to distant growth points, especially in economically-depressed areas.

Desirable aspects:-

The use of telecommunications may help to materialize the 'growth points' concept as it enables rapid and easy long distance

interaction. It may affect the location of individuals and firms. Telecommunications may therefore allow decentralization of economic activities into the remote and sometimes economically-depressed rural areas. There is already a tendency for the assembly-type industrial activities to decentralize into suburbs of large metropolitan areas. Such a move may help to create economic viability in the depressed areas.

Undesirable aspects:-

The growing awareness of environmental concern may generate objections to the establishment of industrial and other economic activities in these depressed areas despite the possibility of new economic prosperity based on telecommunications. The viability of the 'growth point' concept which aims at decentralizing economic activities from the prosperous regions to the depressed areas, needs a great deal of research and investigation before it can be implemented. Similarly, telecommunications technology, which is believed to have high potential in inducing economic development in the depressed areas, may be difficult to realize. This is because the major cities still attract most of the investments, subsidies, grants and loans. Improved transportation links and government initiative are necessary to supplement the development in telecommunications in order to bring social, economic growth to the depressed areas.

6. Creation of new towns.

As cities seem to be getting senselessly large, telecommunications provide the opportunity to decentralize economic activities into new towns near the urban areas.

To elaborate the idea of new communities in the future enlarged urban region further, it is necessary to discuss the viability of the concept of planning and organizing communities outside of, or at the periphery of existing metropolitan areas. Two factors seem to favor the development of the new town concept. Firstly, the mistakes of the past must be learned. Rapid suburbanization has resulted in urban sprawl. Secondly, new town development is an approach to metropolitan living which reconciles the contemporary hunger for living space with the economics of high-density development through a highly sophisticated process of planning. Thus new town planning can be an alternative form to the current pattern of suburban settlement. Such development may be encouraged in light of telecommunications development extending the distance between work and home, thus enabling more people to live in new towns outside the existing metropolitan areas while at the same time maintaining economic ties with the metropolis through work, business and leisure.

Desirable aspects:-

These new towns can be planned for optimum living conditions and optimum land use. Their industries and source of income diversified.

These new communities at the periphery of urbanized areas have a
satellite relationship to the urbanized area, not only in terms of
geography, but also in terms of regional identities which exist among
cities with common interest. The planning of these new towns offers
opportunity to preserve the natural environment, and to improve the
rural area through planning. New housing, new transportation systems
and new merchandizing patterns, can be tried out in these new towns.
The new towns also provide opportunity for experimenting in new
living patterns.

Undesirable aspects:-

These new communities created to relieve population pressures
on the existing urbanized areas can be linked with the central city by
high-speed train or limited access expressways. Such centers should
be developed as 'self-contained' communities with their own employment
potential, such that the ties with the larger urban area are not
parasitic, but rather a co-existence. To make the new town concept
workable, very strong government incentive and control must be exerted.

7. Decentralization may be a mixed form of development.

In view of the fact that telecommunications technology
continues the tendency to decentralize, and that physical artifacts in
the urbanized areas are to remain for many years to come; decentral-
ization may spread outward from the existing urbanized area, adopting

and modifying the features of different possible urban patterns, namely, the evenly distributed; low-density; star-shaped or finger-shaped patterns; the small unit or urban galaxy development; and the new town development.

This type of development is essentially a multi-centered concept, with a hierarchy of centers or nodes ranging from the highly specialized nodes at the core and major transport routes to the small neighbourhood units which are organized on the rationale of the new information facilities that complement the new telecommunications technology. Low density residential development occurs around these neighborhood centers, while adequate open space seperates these neighborhoods.

It is possible to conceive a viable new transportation system with radiating routes from the core , and circumferential routes connecting these corridor routes. High-density developments occur along these corridors, especially at the intersection of the radial and circumferential routes. This pattern is very suitable for public transit. It is possible to have new or improved transport modes that connect city centers with suburban stops, airport stops, and finally to the new towns within the 'enlarged' urban region of the future. New intercity transportation technology, such as the high-speed train travelling up to 150 miles per hour and tracked air-cushion vehicles travelling at speeds up to 250-300 miles per hour,

are under investigation. Thus, it is possible in the future for people to live at a distance of 200 miles or more from the central city, and still be able to work in the city. Such transportation facilities, however, depend on large volume of traffic for viability. Again, there are desirable and undesirable aspects that must be considered.

Desirable aspects: -

1. There is no single dorminant center, but rather a limited number of strong centers specialized in finance, government, culture, commerce, etc, each having its own economic viability.

2. It has a linear advantage similar to the star-shaped urban development.

3. High accessibility, both to services and to open land.

4. Good foundation for efficient public transportation.

5. Congestion at any single center is avoided, though centers may be of high concentration.

6. Efficient operation of municipal services.

Undesirable aspects: -

1. To control growth and development, it would demand massive initiative by the central government or regional level government.

2. The size of the multi-center urban area may be very large; presenting problems in controlled growth.

3. Considerable initiative in developing public transit must be taken by the government. Heavy subsidization is also necessary.

Possible Pattern of Settlement in Terms of the Application of the New Telecommunications Technology

In view of the possible development and potential of the new telecommunications technology, information and not goods may be the key factor in the new pattern of settlement. Thus in the planning for the future role of telecommunications in the city, the city region can be viewed as a large information system in which much of the work going on is in the access, processing and exchange of information either for the direct use or indirect service to the physical functioning of the city.[6]

In order to adapt the functioning of the city to the new type of flow (information flow substitutes to a certain extent physical movements of men and goods), improvement must be made in the city's capacity to operate as an information center.

If the city were considered as a single totality of its inhabitants with a single organizational information structure to provide specialized services, there would be the possibility of a chaotic information feedback and response due to the intensity of information flows.(Fig. 4) Some kind of heirachical system is necessary to avoid overload.

Thus, some system of information that can serve the individual users efficiently must be devised. If the city is considered to consist of a number of neighbourhoods or subcenters sharing facilities and services (Fig. 5), some orderly organization of the information flow would be

[6]
National Academy of Engineering, Communications Technology for Urban Improvement, report to the Dept. of Housing and Urban Development, Contract No. H-1221, June, 1971, p.25.

individual user

Fig. 4[7]

neighbourhood or subcenter
each with its organized
community information center
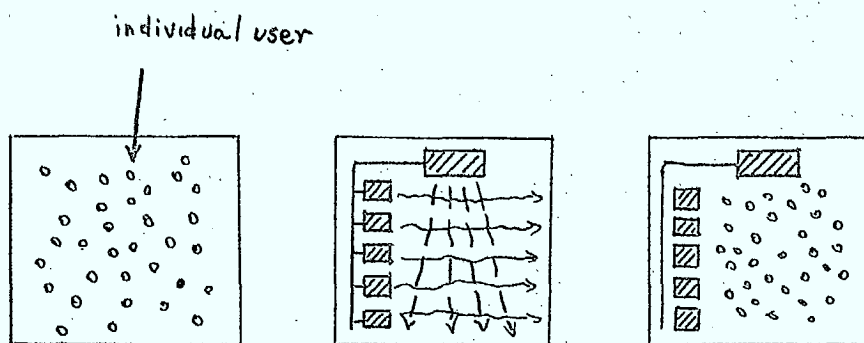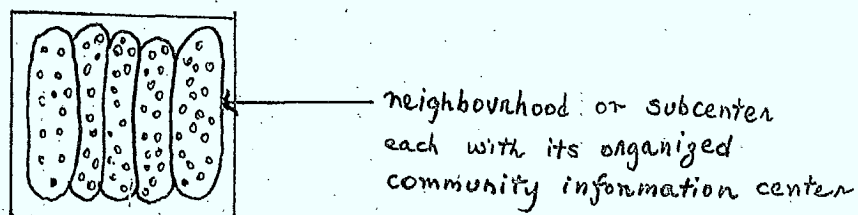
Fig. 5[8]

provided. In order to distribute the bulk of information to homes and

offices, a community information center can be organized in a neigh-

bourhood or subcenter whose population size may be determined by the

capacity of the information center to handle two-way switched channel

[7]
National Academy of Engineering, Ibid., p.25
[8]
National Academy of Engineering, Ibid., p.25

services. Information relays through the community information center from the larger systems (various institutions or agencies in the city, for example, libraries, universities, government agencies, etc.) and the system within the neighborhood (for example, public school, shops, etc.) can serve individual households and offices efficiently. According to the Committee of Communications, National Academy of Engineering, a network with subcenters or neighbourhoods (with 3000-15,000 homes) in the urban area could be designed, and it would be quite possible for a neighbourhood of such size to cater to its own programming requirements and information flows. It appears that new telecommunications technology within its technological constraints favour some kind of nodal development.

Human activities have different degree of concentration. Certain uses, such as the stock exchange and heavy industries, can be highly specialized and centralized in a few locations, while other uses or city functions are centralized locally to meet the local demand. Although electronic substitution can replace a great number of trips to work, to shop and to school, there is still the necessity to have spatial location to contain these facilities, that is, the offices, the schools and the shops.

1. certain schools, such as the public school, may be localized if it is to provide young children with the opportunity to socialize,

2. certain welfare services, such as councelling, may need to be
   localized to serve and solve social problems,

3. health services, such as hospitals, dental clinics, and other
   medical institutions, may be localized to serve a certain
   population size,

4. distribution of goods, retailing and wholesaling, may need to
   be localized to be in proximity to the consumers,

5. distribution of tertiary services, such as a barber, dry-cleaner,
   restaurant, etc., may need to be localized,

6. certain police functions may need to be localized, and

7. fire service.

If the new telecommunications technology could be integrated into
the urban system efficiently by organizing a community information
center in a subcenter or neighbourhood, servicing a predetermined popul-
ation density, it appears that all the activities that are centralized
locally could also be grouped together with the community information
center to serve the subcenter's population.

The emergence of computer utility in recent years may also call
for the development of specialized service centers for industries and
related service industries to be located in close proximity. Develop-
ment in telecommunications and computer technologies, together with
other commercial servicing and industrial activities, could be developed

together in an integrated fashion. The development of secondary centers within the metropolitan area or a series of subcenters and new communities within the future urban region may help to achieve a better work/home relationship by the concentration of many potential trip destinations and thereby reducing the number of trips. A further feature that can be added to this type of subcenter is the 'neighbourhood remote work center', which provides all kinds of computer equipment, terminal facilities, etc., for workers. These facilities are linked to the workers' respective offices via telecommunications. Since the sort of computer equipment required may be beyond the financial reach of the ordinary workers, the idea of remote work centers may be more viable. The development of nodalized high-density features within metropolitan areas also justifies the use of mass transit in the suburbs.

The above discussion on the possibilities of urban pattern is not meant to be exhaustive. The urge for open space, low-density development and the need for privacy will continue to favour some kind of low-density decentralization. However, the advantages of concentrating urban growth at certain nodes to allow economic operation of municipal services and urban amenities, and to provide effective telecommunications services to users by organizing community information centers at the subcenter or neighbourhood level, may well offset the 'total' decentralization concept by diverting growth and city function to certain nodes. It seems that in term of the telecommunications technology, the corridor dense urban form

(the star-shaped), the multi-center urban form, and the new town concept have the advantage over the exurbia or low density development in that they provide:-

1. greater diversity and variety of choice for the growth and development of the urban region of the future,

2. preserve open space from the encroachment of low density exurbanites,

3. economic operation of municipal services, cultural, social, recreational and educational facilities,

4. ease of accessibility, since efficient transportation flows are possible along major transport corridors. Public transport is feasible,

5. may achieve a 'better' home/work relationship by reducing the time needed to travel to work, and also possibly reduce certain trip generations due to telecommunications substitutions.

It is also noted that a balanced development, city, suburb, and countryside, is more desirable than concentrating development at any one level. A national settlement policy for the geographic distribution of economic opportunity, jobs, and people, has been overdue for some time in Canada. The likely development of telecommunications makes national policy for the distribution of population across the country an urgent requirement. The existing dominant metropolitan areas will maintain an important position in the future urban regions, but there will be decen-

ralization of human activities from these large metropolis to the smaller, but well planned communities in the 'enlarged' urban region.

Integrated Land Use Planning

Since telecommunications have the potential of enlarging the area of interaction - the urban and regional land use pattern and transportation links are likely to be modified and changed. Planners need further study and research to find out what impacts telecommunications will have on land use and transportation before formulating policy to effect development and growth of the future urban area and its region.

As already discussed, decentralization of the city is to some extent undesirable from an economic and efficiency point of view. Also the general desire for more space and low-density development is likely to grow. Thus planning must pay attention to both decentralization of the metro areas and orderly regional growth.

In spite of the inherent dislike of cities, people continue to rely on cities for their economic activities. Urban areas, especially large metropolitan areas, are acting as magnets attracting large shares of private and public investments. They continue to be the source of income for the majority of the Canadians. Although there is the recent trend for industries and firms that do not require a great number of personal contacts to move out into the suburbs for the availability of cheaper land and parking facilities, the magnet is still within the metropolitan area. Canadian cities are more fortunate than American

cities in that most are not developed in the direction of extensive decentralization as, for example, Los Angeles has been, but are partially decentralized. The city core or Central Business District remains viable for specialized retailing, administrative and judicial functions, while general retailing, other service industry and some professional functions are done increasingly in the suburbs. The CBD must be preserved and encouraged to thrive not only because many of these have historical significance but also because our communities need certain focal points which people can look up to and proud to be identified with. On the other hand, suburban communities and new centers at the periphery of the urban areas must be carefully planned and designed to meet the various demands of the population.

Canadian cities with a smaller population magnitude also have less intense urban problems connected with transportation than their counter-parts south of the border. However, they are all concerned with the movement of goods and people efficiently and economically. It is anticipated with electronic substitution there would still be relatively more trips made in the future transportation systems, and that the prin-cipal movement for some time will be vehicular movement. Consequently, motor cars will continue to be the major issue. The motor car has enjoyed popularity ever since it was first introduced. Its main attractiveness is that it gives users mobility. Public transit has never been able to compete with motor car transportation.

Large public investments have been poured into our present road system, yet traffic problems in cities continue to mount. Examining the travel behaviour of Canadians, it is found that 89% of urban trips are made by car, and only 11% by public transit. Of these 11% transit trips, 15% are on the subway systems of Toronto and Montreal, the remaining 85% are on surface transit - bus, street car and trolley bus. Commuter rail service is significant only in Toronto and Montreal though this mode has high potential for accomodating large volumes of passenger traffic.[9] Public transit cannot compete with the cost and convenience of the automobile except for segregated transit such as subways in congested areas. Transit systems in both large and small cities, therefore require heavy subsidization to be operational. As most Canadian cities, even the two largest, Montreal and Toronto, do not anticipate massive population growth compared to some American cities (with 10 million population and over), pressures generated from traffic congestion will not be sufficient to make people abandon the use of cars in the downtown districts, although there may be a tendency for decreasing use of the automobile in these downtown areas.

Simulation of the movements of goods and people has tended to show that there is a great deal of resistance toward any attempt to move to a more balanced transportation system than that of today. Patronage level for new systems cannot be estimated at this time because there is

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[9] Parkinson, Tom e., *Passenger Transport in Canadian Urban Areas*, Canadian Transport Commission (Research Branch), Government of Canada, 1970, p.114.

too much uncertainty about people's preferences. The possible shift from automobile use may depend on factors such as the acceptance of improved transit features, future technology, economic evaluation of the auto- mobile would be necessary to achieve a desired shift.

Although planners realize that we need a 'balanced' transportation system yet personal preferenos are difficult to override. The cultural situation largely determines the preference of the majority and conse- quently affects the decision-making of the planning process. The values, the attitudes and the behaviour of population form an integral part of the whole urban system. The cultural lag and inertia to accept new modes of transportation are part of the framework within which the planning process operates. It is felt that if innovations from telecommunications are being accepted by the public, new modicifations to existing trans- portation systems, such as automated highways and small scale automated systems which combine many of the features of private vehicles with the economies of mass movement, may meet less resistance from the public.

The use of telecommunications may provide high potential for development of computerized and electronically controlled public transit. For instance, the dial-a-bus or the demand-actuated road transit does not follow fixed routes or a fixed schedule. It is dynamically controlled by a central computer according to demand. Such bus service can feed into the commuter train stations, subway stations and other future mass transit facilities.[10] The advantage of such a system is to provide ease   of

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    Lee,S.Sims,'Telecommunication on Public Transportation Systems', Wired City Seminar, Ottawa, 1970. p.3-5.

access and flexibility for users. Consequently, such services are likely to be more attractive than the present scheduled bus systems. It is apparent that in the future, urban transportation will increasingly adopt computer and telecommunications technologies.

New towns offer the best opportunities for testing and implementing new transportation technology as existing rights-of-way in developed areas are expensive to acquire, while others require fundamental changes in travel habits of people.

Transportation planning alone cannot prevent sprawl. Land use planning is the major tool in controlling and guiding land development. As the society is accepting more control and intervention from government, government planning agencies can buy up strategic locations to facilitate development in the direction it has anticipated. Zoning and subdivision controls should be implemented throughout the planning region.

To conclude, the city is an evolving entity subject to change as subsystems within itself change and induce change. Thus telecommunications technology may have high potential for dispersion and substitution, yet the economics of concentration and social demand for personal contact may modify the impact. It is very appropriate to ask the question, as Gordon Thompson has asked: 'Are we living in the age of Aquarius or the age of Moloch?' The age of Aquarius represents hope, love and understanding. Telecommunications have high potential for development, should not we as planners use it as a tool to bring closer interaction among

people through shared information and elimination of certain routine
activities?

CHAPTER VI

SUGGESTIONS FOR FURTHER STUDY

The preceding discussion was an attempt to disclose certain possible impacts of multiservice telecommunications cable systems on cities. There are many areas left unexplored requiring future study and analysis. They can be divided into two groups. The first group consists of areas that have been discussed to a certain extent in this paper but may require further detailed probing in order to realize their benefits. The second group consists of areas that have not been investigated in the present paper but may provide interesting topics for research.

Areas that have been discussed but need further investigation and probing are:

1. It is generally assumed throughout this paper that the future urban region may take in a radius of 200 miles or more as existing technology allows a head end to serve an area within this range. This radius is not unreasonable from an urban-region planning point of view. However, further urban form will vary, depending upon local geographic, social and developmental conditions. This aspect has not been discussed in the present paper. The other means we might use to redefine further urban regions needs further investigation. Are the telecommunications constraints likely to be the key factor? Is, say, a 200 mile range, an adequate guideline for defining the future urban region?

2. It is very important to find out through research the likely psycho-social effects of the information explosion and substitution of certain physical movements as these will affect the individual. It is indicated that excessive load of information and rapid technological change may have adverse effects on individuals. There is a need for substantial empirical and theoretical statements to verify such assumptions.

3. What new possibilities are generated by telecommunications technology? In this paper, the potentials of the telecommunications technology with regard to work, shopping, education and way of life have been examined. It is also assumed that with increased information flows there will be increased wealth. A major area of research appears to be just how this increase may be used for the generation of new wealth.

4. If the use of telecommunications technology allows industries and firms to become more footloose in their locations, there is a need to revise and develop existing location theory which has assumed a now obsolete level of information accessibility. What will be the new sets of criteria for determining the location of industries and firms in the future urban areas? This has been discussed briefly. Economic and transportation criteria may decline in their importance in the

location of industries. However, such an assumption must be further studied. New sets of location criteria should be developed through empirical and theoretical studies, such as the investigation of new locations of industries in recent years.

5. Although there have been discussions and studies on the kinds of work that could be substituted electronically, there is still a need for further study in this area. It is assumed in this paper that our society still values personal contact. The social acceptability and the possible social impacts of electronic technology are important aspects that must be investigated before the technology is implemented. New electronic technology will also produce new jobs and make others possible. What new jobs are created?

6. The concept of decentralization and the different possible urban patterns have been discussed but there is a need for comprehensive study of the desirable and undesirable aspects of decentralization of urban areas in its different forms and patterns.

7. The organization of community information centers may become a basis to promote nodalized development. The various aspects of nodalized development, such as the size and the location of the nodes, must be studied in relation to the use of the

computer utility and coaxial cables.

8. New town development should be 'balanced', each new town having its own employment opportunities. Furthermore, new towns should not be 'dormitories' for the metropolitan areas. There is a need for economic planning for such developments. Pilot studies of new town developments in the North American context must also be examined.

9. What are the potentials of telecommunications technology in facilitating growth pole or growth center developments in depressed regions? In some measures they annihilate space and can bring a remote area effectively near to a large population mass. What other factors aside from the telecommunications technology can affect the success of the growth pole concept?

10. Public transit services may be improved by the use of telecommunications. What new technologies aside from those discussed are likely to introduce greater comfort and convenience in mass transit facilities?

Areas that have not been investigated but may provide interesting topics for research, are:-

1. If the future urban region is going to be much larger than at present, is planning going to include the metropolis with its larger region in an unified jurisdiction? What should be the

the size of the future planning area? This question has not been
dealt with in the present study although it is suggested that
a future urban region can cover an area of radius 200 miles or
more. It is an important question planners must seek to answer.
Directly related to this question of the size of the planning
areas, there is a need to reorganize government structures.
Is regional government a possible solution? What other alter-
native government structures are likely? This question of
government structure is a vital one in view of the possible
'enlarged' urban region of the future.

2. If people can live out of the city because of the explosion
   likely to be caused by telecommunications, many will pay
   property tax at a scale much less than in the city. How can
   the metropolitan area make good this taxation loss? There
   may be a need for re-evaluation of the present property tax
   system if the metropolitan population is widely spread in the
   200 mile radius region.

3. What are the economic aspects of equipment such as terminals?
   Can these be installed economically at home? If not, does it
   give rise to the need for establishing specialized service
   centers to provide electronic facilities for workers? What
   is the size of the labour force that can render the operation
   of such service centers economical? And, what will be the

optimum geographic distribution of workers?

4. Planning for the application of technology has been haphazard-
ly done in the past. It is important that a mass medium, such as
television, is carefully planned in its development if it is
to be of maximum socio-economic value. So far, the development
of television has not been planned from a community point of
view. The use of switched coaxial cables give further opport-
unity for development of data processing, information retrieval
and educational television but development planning will be
necessary. There is a need for organizing a 'national' data
bank, educational programs and services such as library inform-
ational retrieval systems.

5. Given a new technological facility, how will the society use
it? The two elements are: the technology and the cultural
patterns. How may they be expected to interact? Our kind of market
economy tends only to develop a technology according to
opportunities open to the market. This leads to the next ques-
tion: Is government control necessary to guide development of
new telecommunications technology? In what ways will the
government exert its control? In what political frame of
reference will it be able to do this?

6. If automated work (manufacturing) is coupled with a shorter
week, there will be more workers potentially spending more

than three days a week outside the metropolitan area. Is the use of telecommunications going to facilitate our society's move toward greater interest in, and time for leisure? What is the interaction of telecommunications with the shorter work week?

There are still many uncertainties in regard to the impacts of telecommunications on our society and environment. It is therefore extremely vital for decision-makers to explore each of these possibilities before the new technology is implemented.

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