TELEMATICS AND THE POLITICAL PROCESS

Michael X. Delli Carpini and
Indu B. Singh

Abstract—Recent advances in communications technology are revolutionizing the speed with which information of all kinds reaches the home and workplace. These advances, which include developments in the computer industry, interactive communication systems, laser and fiber optic based communication, and geostationary space platforms, are also affecting the extent and content of the information which is now accessible, with trends suggesting even greater impacts in the near future. Given the premise in a democratic society that the availability of information is critical to a responsible citizenry, such trends would seem to spell good times ahead for mass politics. A closer inspection of recent trends suggests reasons for concern, however. Patterns of the control of and sources of information; the content, quality and extent of information, and access to and use of information which is becoming available through the new technology show evidence of little change from the previous state of affairs. In addition, what change does exist demonstrates as much potential for adding to social, economic, and political inequities which already exist as for helping to reduce these inequities, leading to a society of the information rich and the information poor. The solution as to whether technological change in communications is a positive or negative addition to democratic politics depends ultimately on our willingness to learn from past mistakes and see this technology as a resource which needs to be carefully integrated into the larger social, economic, and political environment.

Much has been written about future developments in communication technology. From the perspective of an arm-chair thinker to actual practitioner, the future of telecommunications holds bright prospects. Recent innovations in electronics, computer science, communication engineering, and related fields have provided a springboard into practical "futuristic" telecommunication systems.

The present technological innovations will have significant impact on the development of telecommunication systems of the next decade. The key innovative technologies of the 80's include microelectronics, computer graphics, speech synthesis and voice recognition, database management, and the on-going computer revolution. These and many other technologies provide the wherewithal to ensure effective and efficient telecommunications in the decades ahead.

The emerging telecommunication technologies and systems will have significant impact on the office of the future and the home communication environment. The future communication systems for the office of the future will provide the capability to transmit voice and data to any worldwide site or computer network. Business and corporate structures will be equipped with teleconferencing studios, abundant computer terminals, central communication control, and roof-top earth stations. It has been predicted that by 1990 well over half the total communication dollars spent by business will continue to be in voice-based technology. Computers will play a larger role and there will be increased use of time sharing, interconnected data banks, distributive processing, and electronic funds transfer.

The home communication environment will blur current distinctions between home and the workplace, time and distance, transportation and communication. In the area of education, we

will see emphasis on continuing education, via satellite television, transmitted to homes. These and many other new services will be available for the office of the future and home of the future.

Future predictions about the impact of communication and information technologies on society are both fascinating and mindboggling. To an optimist, the sky is the only limit in deriving benefits from the "information society." To a pessimist, however, the unforeseen consequences of using these technologies are full of doubts and dangers. One thing seems crystal clear: to a very large extent, technologies are *neutral.* The positive and negative consequences are not linked to innovations but to applications.

This article examines development in the major communication technologies and systems for the rest of the century. It also explores the potential impact of these changes on the dynamics of mass politics in advanced industrial societies such as the United States.

FUTURE TELECOMMUNICATION TECHNOLOGIES

The communication revolution, according to Anthony Smith, has passed through three overlapping technological stages that have taken place during the last 150 years. The first or these was the Wire Age (1844-1900), the second was the Wireless Age (1900-1970), and the third is the one we are now entering-the Integrated Grid Age, in which wire and wireless technologies are brought together to form the structure of the future global information utility.[1]

In the Integrated Grid Age, one can examine two levels of technological developments. One deals with new technological innovations and the other with continued development in existing communication technologies. Although man's intellectual curiosity and desire to explore new technological frontiers will continue to produce innovative forms of telecommunications, it is our belief that most future development will be greater extension of the present technologies. This does not indicate a defeatist attitude, but a reflection on the simple logic of technological development. In the past, the basis for most new technologies has always been the structural framework of the existing systems. The major progress in communication technologies and systems for the 1990's and beyond can be grouped into the following four categories: (1) development of high speed, efficient, user friendly and super intelligent computer systems; (2) development of advanced interactive communication systems; (3) development of advanced laser and optic fiber based communication systems; and (4) development, launching, and establishment of geostationary space platforms.

The structural framework for these technologies exists now. Thus, the continued growth in technology will multiply our ability to create new communication systems to perform new functions.

Computers

The science fiction of the past two decades is fast becoming the reality of today. In the computer field, especially, the dynamic relations between man and the machine are being intertwined in the most stimulating way. Computer technology and systems are experiencing exponential growth. Computer applications are becoming omnipresent in individual households and multinational corporations as well as in governmental and educational institutions. For example, at the end of 1982, computers were in about 4 million homes, less than five percent of all households. The estimates are that by the end of the century, their numbers may run as high as 80 million. The sales of computers for the home will soar from 2.4 billion dollars in 1983 to more than 7 billion dollars in 1988.[2] In some ways, therefore, computers may define and determine society’s future for decades to come.

Computers are the main engines of post-industrial society. The supercomputers are fast becoming the life-blood of the post-industrial, high-technology oriented society. Since its inception, computer technology has passed through three phases. They represent the changes from vacuum tubes to transistors and from transistors to large scale integration (LSI) and very large scale integration (VLSI). Today's VLSI chips represent, in the views of many scientists, the physical limits of miniaturization.

Aside from the mechanical and circuitry changes of the past, modern computers are changing physically. The first electronic computers were large, free-standing information storage and calculating boxes without outside links. Subsequently, computers were developed with the additional capability to store programs and interconnect remote terminals. During the mid-sixties, computers became more sophisticated, being able to facilitate interactive networking at higher speeds and efficiency. Today's computers are equipped with extraordinary memory capacities which have the ability to perform independently of a main computer and can provide linkage to vast data networks. These networks store, process and retrieve huge amounts of information accurately and rapidly.

The 1990's decade can be classified as the era of supercomputers. As Lloyd Cowling notes, we are on the verge of delivering large scale computing power and world-class data bases into the hands of anyone who can carry a briefcase, or less.[3] Current research on the Josephson Junction Computer (JJC) will change the face of large scale computation significantly. Josephson Junction Computer circuits use superconducting metals. At very low temperature, these metals lose all resistance to electricity, enabling computation in trillionths of a second. At this speed, JJC will be a hundred times faster than existing computer circuits. This cryogenically cool mass of circuitry will outrun and outstore anything we have seen thus far. Some have predicted the arrival of JJC by 1985; others have targeted 1990. We believe that JJC would become reality by the early 1990's.

Amidst the myriad of changes in computer technology, it seems obvious that the computer industry has shown evolutionary rather than revolutionary changes. Designs of future computers will continue to be fast, efficient, compact, user friendly and intelligent. The 1980's launched the evolution of the so-called personal computers. This has been made possible through developments in microelectronic circuitry, minicomputers and their terminals. These computers are capable of talking and listening. They can understand spoken instructions and provide feedback with synthetic speech. They are capable of storing voice messages in digital form.[4] The 1990's will witness the evolution of more advanced forms of intelligent computers. The introduction of intelligent copiers by the Xerox Corporation signifies only the beginning of an era that is bound to expand our creative imagination and intelligence.

Cowling points out five major factors that will continue to influence the future development and use of computers.[5] First, in his view, corporate marketing strategies have been known to produce interesting products in the past. The marketing force often affects the product that the end user sees and feels. Second, home services are now, and will continue to be, a most rewarding end user field. The demands of the home will be the drive behind many innovative computer products and directions. Third, increased demand for business data bases will spur the need for new computer systems. Fourth, increased demand by the scientific and research community will enhance the requirement for large memory sizes in large scale computers with increased speed. Fifth and last, the human factor—the need to overcome the feeling of being separated from others and from this world—will increase the demand for advanced intelligent

computer systems capable of providing human-like interaction. These are some of the driving forces behind future developments in the computer technology.

Interactive communication systems

The decade of the 1990's will see a continued advancement in the interactive telecommunication systems for homes and offices. These systems are called videotex. Videotex is a generic term for systems that transmit textual information for display on television screens. It involves two new technologies for carrying information over long distances—Videotext and Teletext systems.

A videotext system makes the connection via telephone or two-way cable lines and thus is interactive. This allows users to perform various transactions with the main computers. Teletext, on the other hand, is a one-way system that relies on signals broadcast over the air by television stations. Since it is a one-way system of communication, no transaction can be performed by its users.

We are currently witnessing the growth of many different types of videotex systems, some with proven capacity and others still in the experimental stage. For example, videotex systems such as Prestel, Ceefax, and Oracle of Britain; Antiope and Telematique of France; Captain of Japan; and Teledon of Canada are becoming known to many individuals and institutions around the world. Most of these systems have progressed beyond the experimental stage and have entered the commercial phase of their operations. The next decade will witness a rapid growth in such interactive systems for the purpose of providing news and information, home shopping and banking, electronic mail, and other services.

In the United States, the videotex systems are in an infant stage. As a matter of fact, there are no commercial systems operating in the United States today, although many such systems are in the planning stages. It seems reasonable to predict that within a few years, we will see the commercial operation of videotex systems in selected areas of the United States. And perhaps the beginning of the 1990's will see its market penetration rapidly increased.

In most cases, where videotex systems have been set up for residential use (in countries outside the United States), videotex services have fallen short of the anticipated level of success. Perhaps these early systems were not very user friendly; or perhaps the information was not all that gripping. In the United States, however, the popularity of computer games may be the ticket to promoting videotex as a home information and education system. In the corporate world, however, electronic message receptors, word processors and electronic mail are now saving time and inducing more critical thinking. Telecommunications and microelectronics will continue to set new standards of productivity for individuals as well as for businesses and industries.

Fiber optics

Fiber optics, a new type of cable technology, promises to bring about radical changes in the wire communication system. The optical fiber or optical waveguides, as they are also called, is a hair-thin strand which transmits information in the form of light waves. The fiber itself is typically made of glass (silica).

According to Pastelis and Stubbs, today fiber optic systems are proving themselves. Improvements have been made in terms of long wavelength transmission, larger bandwidth, lower attenuation, and greater repeater spacing.[6] Now systems are available which transmit a longer wavelength (1300 mm), and feature a higher bandwidth (over 1 GHz) and lower loss (less than 1 dB/km). Also, greater distances between repeaters are possible, reaching up to the 25-km range.

There has been a variety of applications of fiber optics. Although in the beginning the technology was used primarily by the government and military, its commercial applications have recently bloomed. It is being used for instrumentation, in equipment boards, sensors, medical equipment, and interferometric devices. Optical fibers are frequently being used in local data communications for point-to-point links. In the future, interactive communication systems including cable television and telephone companies may emerge as heavy users of this new technology.

The extraordinary signal capacity of optical waveguides has been the main reason for its wide application in communication systems. For example, a one-quarter-inch diameter containing two optical fibers can carry the same volume of communication as a three inch-diameter communication cable containing 20,000 copper wires. This size advantage is further augmented by fiber optic's characteristic of being lighter, smaller and more flexible than copper cable as well as having large bandwidth, and lower losses.

In the future, a number of new market segmentations will emerge for the use of fiber optics. We should see its widespread application in long-haul terrestrial routes, customer premises usage and local area networks, cable television and satellite business system networks. Overall, fiber optic transmission offers significant advantages over copper and microwave transmission of the full range of voice, video, and data. As a result, the future applications of optical waveguides for telecommunication systems will increase by leaps and bounds.

Geostationary space platforms

There have been two proposals for the creation of U.S. space platforms. They are called small space platforms and large space platforms. However, according to today's standards, even the small space platform will be larger than a typical-size satellite of 1,000 kilograms. The basic structure of this proposed platform will be made of light-weight metal. The small platforms will carry large antennas and a variety of equipment packed into separate modules. These modules would be designed to perform missions such as mobile telecommunication, meteorology, point-to-point telecommunications, space broadcasting, navigation, geological survey, etc.

Artists' concepts and drawings of geostationary space platforms have shown them bristling with many antennas of different types and sizes. Thus, the platform has been termed "Orbital Antenna Farms" (OAFs) by Edelson and Morgan.[7]

The proposals to erect and establish large space platforms are even more far-reaching and intriguing than the concept for small space platforms. The large space platforms will weigh hundreds of thousands of kilograms and will span several square miles. Some envision these platforms to be as large as Manhattan Island. As Pelton writes, such space platforms would be manned and would serve a different range of functions. These missions might include energy concentration, generation and distribution, manufacturing in space, and on-going research projects. Products manufactured in space would be those which require zero gravity, a near-perfect vacuum, extreme temperature differentials or a combination of these qualities.[8] The large space platforms, thus, could give a new meaning to the existing concept of the space-industrial complex.

Both small as well as large space platforms are predicted for the 1990's. However, their realization would depend on finding solutions to problems in three major areas. According to Edelson, these areas are related to: (1) a number of problems involving interconnection, mutual support and prevention of interference between and among payloads; (2) technical problems in

erecting and assembling large structures in space, and combining the payloads of several orbitals; and (3) institutional concerns regarding the ownership and control of such structures.[9]

The solution to many of these problems is being sought. NASA is currently developing an experimental space platform system in conjunction with the Fairchild Industry targeted to be launched at the end of this decade. The NASA experiment will serve as a model for operational geostationary platforms.

Although many critics argue that the space platforms are merely figments of imagination in the minds of technologically-inclined individuals, it is our belief that the birth and operation of space platforms is only a matter of time.

Overall, the future technological trends can be summarized in the following way:

(1) An increased trend toward the technological development of telematics principles. This would create an increased emphasis on the convergence of telecommunications and computers;
(2) Continued development of the small, portable, user friendly, superintelligent computer communication systems;
(3) An increased emphasis on the integrated digital communication and data processing networks;
(4) A changing emphasis from quantity- to quality-oriented communication systems;
(5) Development of advanced satellite communication systems for the purpose of massive transfer of data and information;
(6) Continued development of advanced, intelligent, interactive communication systems for the home communication environment;
(7) High-level integration of communication systems with everyday life. For example, an increased alliance between telecommunications and transportation systems, and between telecommunications and the health care systems; and
(8) A new partnership between education and telecommunications where home will become a center for education and training.

THE POTENTIAL IMPACT OF THEMATICS

Technological change has always had both planned and unintended impacts on the social and political systems in which it takes place. The printing press increased the availability of great works of literature, religion, and philosophy, and led to a wider and faster dissemination of news about current events. It also became a central tool in first the maintenance of authoritarian forms of government and later the demise of many of those same systems.[10] The mechanical innovations of the industrial era had profound effects on the distribution of economic and political power (both within and across nations) that went far beyond the anticipated impacts on the efficiency of production.[11] The development of first radio and later television forever changed the way citizens of advanced industrial societies choose their political leaders[12] and think more generally about politics[13] in ways unimagined by the early developers and sponsors of these new entertainment media.

The recent technological developments in communications described before are also having (and will continue to have) impacts on political and social structures and norms. Central to these changes are issues which revolve around the concept of information. More specifically, mass democratic politics can be affected by changes in the home information environment in three critical areas: control over or sources of the information provided by the new technologies; the content, quality, and extent of the information provided; and, perhaps most importantly,

access to the new technology itself. These three aspects which have been affected by the growth of telematics, in turn affect the democratic process in three ways: the formation of attitudes and opinions; the nature and locus of political deliberations; and the extent and type of political participation. The flow of this relation is presented schematically below.

In the remainder of this paper, we explore the theoretical linkages among telematics, information, and mass politics as outlined above, focusing on several critical junctures where the direction we move as a mass democratic society will depend upon the way telematics evolves in the next decade.

Information and the new technology

Central to the democratic political process is the availability of information for citizens to use in evaluating the world in which they live and in acting upon those evaluations. At the heart of the recent advancements in telematics is the availability of more information, the availability of information in less time than ever before, and the availability of information directly into the homes of a large and growing sector of the population. While much of this information is largely entertainment oriented, some is not. The availability of 24-hour news from either cable stations, satellite news stations, or directly from wire services is one example. The electronic transmission of newspapers, journals, and books is another. Databank services such as COMPUSERVE provide instant access to thousands of different information sources on topics ranging from adult education to job openings to world news. As advanced societies move from an industrial base to a more mixed, service based economy, information becomes a critical currency which rivals capital and labor in its importance.[14] The information explosion, of which telematics is a critical part, is both a cause and a result of this new balance of power.

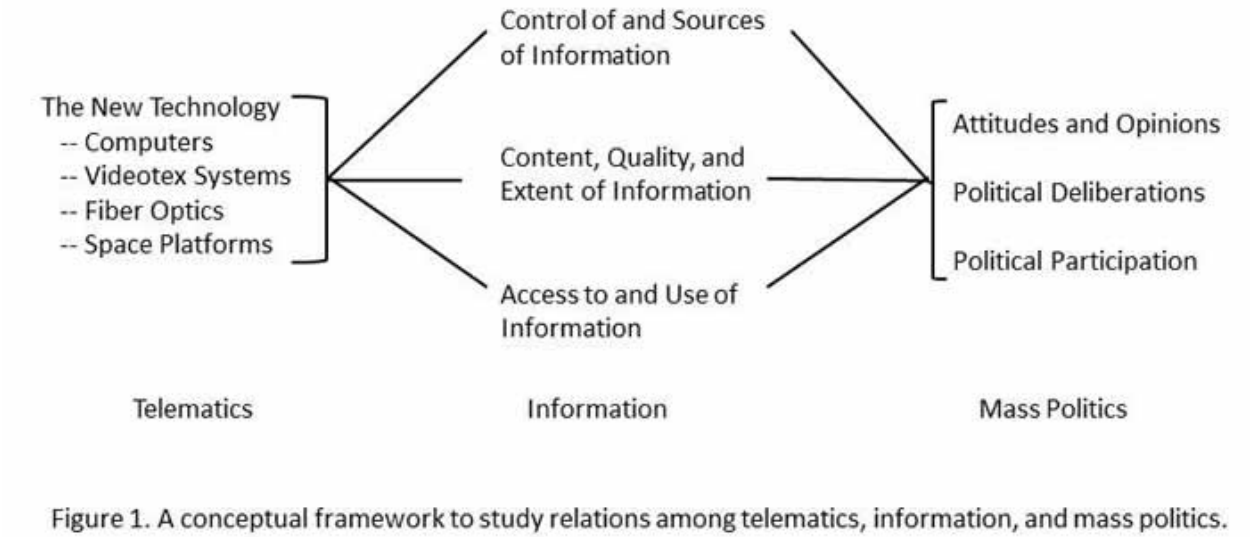

Figure 1. A conceptual framework to study relations among telematics, information, and mass politics.

Availability of information is not the only issue to consider, however. It is one of the ironies of today's society that information of all kinds is more available today than ever before, but because of this very fact, information is more difficult to store, synthesize, and use in the way normally available to the average citizen. The changing home information environment provides a geometric increase in the ability of citizens to both obtain and to store such information, and ultimately, to use it. These technological changes, while clearly offering the *potential* for a more informed body politic, are not unambiguously positive, however. The three issues of control, content, and access need to be examined in more detail.

Control. Of critical importance when anticipating the possible effects of the evolution of telematics is the diversity of information sources. Focusing solely on the user-end of the process reveals a seemingly endless variety of hardware and software options, scores of cable and satellite stations, and a multitude of data bases and information services. One must be clear, however, on whether this represents greater and quicker availability and potential use of information which has, in recent times, always been relatively accessible (not an insignificant accomplishment in and of itself), or if it truly represents an expansion of various dimensions of public information itself: the type, quality, amount, and sources of information. This is centrally an issue of the control of information.

Consider, for example, the expansion of the news which has resulted from several related changes: the availability of 24-hour cable news stations such as CNN; the success of Independent Nightly News; the actual or planned expansion of PBS's McNeil/Lehrer show and the network's evening news to an hour; the availability on some cable systems of direct linkage to the wire services; the development of "focused" news shows such as those available on the Christian Broadcasting Network; and the availability of major newspapers and magazines through video database services. On the surface, it would appear that information about the world which is available to the average citizen has increased dramatically in the last few years. And yet what does this information explosion really mean? Does it mean more information? To an extent it does since not all the various outlets duplicate the story selection, lengths, or the order in which they are presented. Yet the degree of variation is less striking than the overlap. The 24-hour news stations depend on repetitive 18 or 20 minute cycles, based on the same structure as the network news broadcasts, with a few new items (usually features) added each time. The expansion of the length of both local and national news has always meant more of an increase in canned, special segments than in hard news.[15] And the video newspaper/magazine services simply ease access to already available sources—they do not add to them.

At the core of this issue is the question of the sources of information. The major wire services (AP, UPI, Reuters, NY Times) still dominate the information gathering and dissemination process as they have since the late 19th century,[16] while the prestige publications (the *New York Times* and the *Washington Post)* and to a lesser extent the networks still dominate the news agenda process.[17] The availability of actual wire services in the home eliminates one or two layers of the news distillation process, and also expands the direct availability of information; but again, the source remains ultimately unchanged.

Perhaps most important in the actual expansion of information available are the database services which, in combination with home computers, allow detailed searches for information on specific topics. While, again, most of the information which is gathered in this way was available prior to the recent telematic developments, it can now be gathered and processed by the

individual him or herself rather than by a single network, journalist, or editor. It allows the user to receive a more complete array of facts and opinions on a single topic from sources ranging from the *Encyclopaedia Britannica* to government publications. Equally revolutionary, it allows this access to take place when the individual citizen is in need or is interested. It is important to realize that even in this case, however, what is different is the ease and timing of the accessibility of information, not the sources. The structure of the control of information in telematic societies has changed very little. Perhaps the one possible exception to this is the Congressional News Station (C-SPAN), which presents largely unmediated broadcasts of congressional hearings.

Content. A related but essentially distinct issue is that of the content of the information presented. In particular, we are interested in the effects of telematics on the points of view available. Seldom is information truly neutral, especially information of social and political import. Either by the choice of what information is made available or by the way it is presented, agendas are shaped and options are foreclosed. Have recent developments in telematics expanded the points of view available to users? In most cases the answer is no, at least not yet. The expanded news programming has remained committed to what has been called the social responsibility theory of the press[18] and has therefore, been reluctant to present extremely distinct viewpoints or take controversial, partisan, or ideological stands. The expansion of information outlets could potentially signal a return to a more libertarian approach to information, in which citizens learn by exposure to diverse opinions and arguments. To date, however, this has not occurred. The one partial exception to this is the Christian Broadcasting Network, which to some extent shapes its news agenda and form of presentation in a way consistent with its religious perspective.

This middle of the road approach has led some critics of the current information environment to argue that the media preserve the dominant social order rather than observe and report on it.[19] To the extent that telematics serves to increase the dissemination of this information rather than to help expand it, it is subject to the same criticism. The information which is available through the database services does little to challenge this critique. Most information available through such services is either largely factual documents, government reports, or mainstream publications. Little effort has been made to date to include information sources that are ideologically very far to the left or to the right of center.

Access. Most revolutions in communications have relatively quickly expanded to include the entire population of the societies involved. This is so because the costs of production decreased rapidly with further technological development and with increased demand and the related economics of scale. Also, the technology tended to require little technical skill on the part of the user and to involve few choices beyond the decision to "buy in" (one, for instance, simply acquired a telephone, radio, or television set). While the more recent telematics may follow a similar pattern (indeed there is evidence that at least concerning certain aspects of cost it is following such a pattern), certain qualities of the technology suggest alternative scenarios. Costs are much greater relative to income than with prior communication developments, and even with drops in cost, will continue to be a relatively large expense for many. In addition, hardware varies in quality and capability in ways that arc fundamentally different from the choice of, for example, a color versus a black and white TV, or a dial versus a touchtone phone. What one can process, at what speed, what information one can access, etc., are all still critically linked to the capabilities of the hardware purchased, and the decision of what to purchase requires both

financial resources and it knowledge of the options available. In addition, the separation of hardware and software as distinct aspects of the home information environment means that even with similar machines, access depends on a knowledge of at least what software is available and a desire and ability to purchase it and use it. Such decisions are not "one shot deals" either, since software is upgraded and developed at a rapid pace, as are the number of and type of databases available. Finally, the ability to program oneself, while not a necessity, is a tremendous advantage in fully exploiting the advantages of telematics.

The current communications revolution, it would seem, has the potential for moving advanced industrial democracies in two very different directions. To the extent that access and use is equalized, one can imagine a systematic upgrading of the quality of democratic decision-making. To the extent that different sectors of society benefit from these developments at different rates however, the effect could easily be to accelerate rather than close the gap between the haves and the have nots, between the information rich and the information poor.

Telematics, information and mass politics

Thus far, we have focused exclusively on the linkages between telematics and information, arguing that information is critical to the democratic process, but leaving the specific ways in which both telematics and information translate into politics largely unstated. Let us now examine these linkages in somewhat more detail. Since the deliberation process and the formation of attitudes and opinions are closely linked, we will consider both of these political processes together.

Deliberations and the formation of political attitudes and opinions. Politics in a democracy is based fundamentally on the open exchange of ideas. How might the aspects of telematics discussed above affect such a deliberation process? Deliberations require information, and the extent to which more information, better information, or more accessible information is available should contribute to the deliberation process. Again, however, unequal access and the limits to the type and source of information are critical. Consider, for example, the issue of toxic waste disposal. Discussing this issue requires technical, political, and economic information. It also requires the summation of this information, along with personal values and more general political attitudes into a coherent opinion that is both internally consistent and consistent with other opinions which make up the individual's political outlook. A citizen, armed with factual information and exposed to a wide range of arguments concerning the problems, solutions, and tradeoffs involved in dealing with toxic waste, is a citizen who should be able to develop coherent opinions and discuss them intelligently with fellow citizens and, ultimately, with governmental decision-makers. A less informed and involved citizen is at a clear disadvantage in such a process, and if such a citizen develops opinions at all they will tend to be less crystallized and consistent, and perhaps more superficial and subject to easy manipulation.

The deliberation process itself may be affected by the growth in telematics. Recent developments have continued trends toward moving the loci of work, education, and entertainment/social environments away from the workplace, school and public square and to the home.[20] Such a movement shrinks the amount of time spent directly interacting with other people and replaces it with much more indirect interactions and reality tests. Deliberations become much more of a process of self-deliberation. The extent to which this is a negative development (beyond the argument that direct human interaction and contact is good in and of itself) for the political process depends centrally on the ability of telematics to present the citizen with diverse

opinions, arguments, and bits of information, and on its ability to react to and interact with the individual in an iterative process that can supplement or supplant the traditional process of opinion formation, expression and reformulation. Interactive systems have some potential in this regard, but they are clearly the most complex and least developed aspects of telematics. In addition, unlike direct human interaction, where both (or all) parties involved are simultaneously learning and developing, interactive systems are usually designed with particular goals or outcomes in mind. They are, therefore, necessarily better at teaching particular skills, knowledge *or preordained values and opinions* than having opinions form out of the deliberation process itself. To the extent that telematics is a tradeoff for group and one to one interaction, the effects may be profound and costly to the democratic process.

It is possible to exaggerate the extent to which human interaction will be limited by developments in telematics. In fact, electronic town meetings and interactive systems which involve communication among users could conceivably add to the amount of deliberation possible. Even in this case, however, telematics can have indirect but equally important effects on the deliberation process. As information becomes more widely disseminated from centralized sources unbound by geographic or time constraints, the information and opinions which people bring to the marketplace of ideas will be more and more uniform. What was once an exchange relationship could easily become a reinforcement process in which attitudes and opinions developed in seeming independence are corroborated less because of the force of the logic, information and ethic they combine than because they are based on a common pool of fact and opinion disseminated by the telematic networks.

Political participation. It is in the area of actual participation that telematics offers the greatest *potential* for change, partly because of the nature of the technology and partly because to date this is the arc a in which the least has been done. Telematics can impact on the level and type of participation in three ways. First, participation in politics is known to be strongly related to motivational forces such as a sense of civic duty, an interest in politics, and a sense of political efficacy.[21] To the extent that greater exposure to political, social and economic issues, and to the political process more generally can instill such attitudes and values, the level of participation should be increased.

Second, participation requires information if it is to be more than symbolic: citizens need to know what issues are important, what options are available, and where government officials, candidates, and parties stand on them. To the extent that telematics can provide quicker, more detailed, and easier accessed information on these topics, the quality of participation should be improved.

Finally, telematics offers the possibility that the modes of political participation available to citizens can be both expanded to include more "semidirect" forms of involvement[22] and easier, more accessible forms of involvement. Electronic town meetings, such as those experimented with in Columbus, Ohio, allow large numbers of people to listen to political discussion and actually vote on certain issues or express their opinion on them without ever leaving their living room. The potential for telematics to shrink problems of time and space and allow for a return to a more participatory form of democracy seems limitless. It is not hard to imagine the President of the United States addressing the entire nation on some issue of great import and then waiting, momentarily, to see if the nation supports or rejects the president's proposal. It is not hard to imagine the use of such interactive systems at the local, state, and even national level for voting on binding or non-binding referenda, or perhaps to even choose our political leaders. In short, the

technology exists to radically change the way in which people participate, giving them a larger segment of the responsibility of governing themselves.

All of this speculation concerning political participation presupposes that the issues of control, content, and access are settled in ways beneficial to the society as a whole. If information sources do not expand, if the content of information remains culturally and ideologically constrained, and if access is allowed to continue to depend on personal skills and resources, then the picture is less optimistic. Greater participation by citizens who are unprepared to handle that responsibility is an image that has frightened political thinkers throughout history. Participation that is manipulated and influenced by the careful control of information is equally deplorable. And laissez-faire politics of the sort we have engaged in for two centuries would make a mockery of the term democracy, as access to the means of participation became more and more skewed. Again, the future depends critically on the specific ways in which telematics becomes woven into the social and political fabric of our nation.

There are issues concerning telematics and participation that are more subtle than those discussed so far, however. Is participation in group deliberations when none of the group actually comes physically together the same as more traditional discussion and debate? Are the outcomes, the decisions of equal quality? Does the sense of community, of belongingness which is so critical as both a cause and an effect of political participation develop from electronic democracy? These are questions that must be answered as we move at an accelerating pace toward such new forms of politics.

TELEMATICS, POLITICS AND SOCIAL STRUCTURES

The particular ways in which telematics will ultimately interact with politics depends as much on the social structures in which this interaction takes place as on any technical or political development. Central to this interaction is the role of education. The educational process can both affect and be affected by the growth in telematics. The use of computers at the earliest stages of education can increase the individual's competence and skill with such technology while at the same time speed the rate of learning in specific subject areas (consider, for example, the PLATO programs of Control Data). Children raised in an educational environment that includes computers will certainly be more comfortable and skilled in their use outside the classroom. Again, the utility of this development for the political system as a whole depends upon how widespread this training is. Currently there is tremendous diversity in the extent to which computers (and personnel trained to use and teach with them) are available, and this diversity exists from the level of day care and kindergarten straight through college. In some cases computers and computer programs are simply unavailable. In others, the quality of the equipment and/or the training of the staff is sorely inadequate. Such discrepancies, especially when reinforced from the earliest ages, can lead to parallel discrepancies in both general educational development and more specifically in the ability to work with computer-based information in later walks of life.

The level and distribution of income is yet another environmental consideration which will critically shape and be shaped by developments in telematics. Indirectly it will affect the availability of telematics within the educational system, since money for both public and private schools is tied to the availability of funds from either the general population or specific benefactors. In addition, the purchases of home computers, cable, satellite hookups, etc., are all contingent on the disposable income to do so. This again interacts with the educational process, since a student who is able to extend his educational experience into the home is at a distinct

advantage over one who is not, in much the same way that having a piano at home facilitates the learning of that instrument. The extent to which telematics affords the opportunity to provide new "power brokers" in society,[23] who these new power brokers are, and how large a segment of the population they represent depends in part on the degree to which telematics is able to disengage itself from the more traditional class and socioeconomic status distinctions that already exist. If it is unable to do so then telematics could easily represent yet another rather large step toward a society made up of the technologically competent, the technologically superfluous, and the technologically obsolescent.[24]

CONCLUSIONS

In this article we have tried to show the various changes which are taking place in communications technology, focusing on those changes which will directly affect the home information environment. We have then examined the ways in which these changes can impact on mass political attitudes and behaviors, suggesting that how positive a change telematics represents for the system as a whole depends on the control of, content of, and access to such information.

What, then, can be done? Do we simply stand by, as a society, and await the outcome of forces beyond our control? While all major social changes have an element of uncertainty or chance associated with them, it is possible to be more or less prepared for them. It is, of course, beyond the scope of this exploratory piece to try to recommend specific steps to be taken, but we can point to the sectors of society that must be involved in such planning. Business and labor (both within the telematics industry and in the larger community that directly and indirectly uses telematics) must become more aware that it has both a stake in and a responsibility for these developments and the directions they take. Their stake is the need for a technologically sophisticated and adaptable workforce; their responsibility is society's need for technologically sophisticated and adaptable citizens. Whether it is specifically in the development of socially beneficial software and databases, the creation of on the job or at the job education programs, or greater support for the educational system, business and labor must be involved in the process of preparing for our move to a telematic society.

The academic community needs to devote increased attention to basic research in the areas outlined in this paper, specifying with greater precision the linkages among the various components. Such research should take an interdisciplinary approach, drawing on the perspectives and paradigms of history, political science, psychology, and communications. In addition, the academic community must devise new and creative ways of integrating telematics, both as a subject to be taught and as a tool for teaching other subjects, into the traditional curricula, and to do this at all levels of the educational system. Education must involve the full development of the individual's potential as worker, citizen, and human being. A commitment to the integration of telematics into the educational process must go beyond some variant of vocational training to include its use as a more general educational tool and as a tool for the development of an informed and active citizenry. Our educational system must be capable of producing graduates who are comfortable with reading Shakespeare and scattergrams, who are capable of participating as well as programming.

Ultimately it is government which must oversee this transformation, for only government has the potential to consider these issues from the perspective of the public good and the power to implement the details of such a perspective. Government regulations need not mean overly bureaucratic and centralized control of the telematics industry, however. In fact, experience

suggests that such a model is more responsive to the narrow demands of the industry than to the broader concerns of the public interest.[25] Perhaps a more decentralized model based loosely on the citizen boards which help shape and regulate cable television policy in local communities might be more appropriate. In any event, unless citizens' interests are systematically included in the process of determining the direction of telematics, this new technology seems destined to be not a tool for the construction of a more open and participatory democracy, but yet another wedge between the theory and the reality of mass politics in advanced industrial societies.

We would like to end this paper by emphasizing that social changes of lasting import cannot take place when only one aspect of the social structure is involved. For telematics to seriously affect the democratic process, parallel changes must occur in the political economic, social, and educational systems which complement and support this technical development. And yet change must begin somewhere, and telematics is clearly changing the way people are structuring their daily lives. The question then becomes do we attempt to nurture and channel these changes in positive and new ways, or allow them to flow down the well-worn paths of past mistakes?

REFERENCES

1. Anthony Smith, The Wire and the Wavelength—An Historical Study, in *Cable: An Investigation of the Social and Political Implications of Cable Television.* A Report by the Standing Conference on Broadcasting, London, 1974, p. 24.
2. *U.S. News and World Report,* July 25, 1983.
3. Lloyd Cowling, Computers: The Future, in *Telecommunications in the Year 2000: National and International Perspectives* (Ed. Indu Singh), p. 110. Ablex Publishing, Norwood (1983).
4. Talking Terminals and Listening Computers overcome Toy Image, *Infosystems* (Sept. 1980), pp. 52-56.
5. Lloyd Cowling, *op. cit.,* p. 108.
6. Anthony Pastelis and George Stubbs, Fiber-Optic techniques Work Well. *Telecommunications* 15 (Dec. 1981), pp. 16-17.
7. Burton Edelson, Satellite Communications in the Age of Space Shuttle, in *Telecommunications in the Year 2000*: *National and International Perspectives* (Ed. Indu Singh), p. 92. Ablex Publishing, Norwood (1983).
8. Joseph Pelton, *Global Talk,* p. 66, Sijthoff and Noordhoff, The Netherlands (1981).
9. Burton Edelson, *op. cit.,* p. 92.
10. Fred S. Siebert, Theodore Peterson and William Schramm. *Four Theories of the Press.* University of Illinois Press, Urbana, Illinois (1974). (See especially chapters 1 and 2, pp. 9-71.)
11. Karl Marx's *Capital: A Critique of Political Economy* provides the classic explication of this relationship. New York: International Publishers, 1967 (From the English Edition of 1887).
12. See Scott Keeter and Cliff Zukin, *Uniformed Choice: The Citizen in the Presidential Nomination System.* Praeger Publishers, New York (1983).
13. David L. Paletz and Robert M. Entman. *Media Power Politics.* The Free Press, New York (1981). (See especially chapter 1, pp. 3-8, and Part 3, pp. 149-254.) .
14. This argument is made most directly by Daniel Bell in *The Coming of Post-Industrial Society.* Basic Books, New York (1973). See also Ronald Inglehart's *The Silent Revolution.* Princeton University Press (1977). (See especially pp. 77-85.)

15. Edward Jay Epstein. *News From Nowhere,* pp. 87-91. Vintage Books, New York (1973), 87-91.
16. Jeremy Tunstall. *The Media are American,* pp. 20-37. Columbia University Press, New York (1977).
17. Herbert J. Gans. *Deciding What's News,* pp. 91, 126, 180-81 and 266. Vintage Books, New York (1980).
18. Siebert, *op. cit.,* pp. 73-103.
19. Todd Gitlin, *The Whole World is Watching.* The University of California Press, Berkeley (1980). (See especially pp. 9-10 and Part Three, pp. 249-292.)
20. Scott Burns, *The Household Economy.* Beacon Press, Boston (1975).
21. Sidney Verba and Norman H. Nie, *Participation in America.* Harper and Row, New York (1972). (See especially chapters 5, 6, 8, and 9.)
22. Alvin Toffier, *The Third Wave,* pp. 427-431. Bantam Books, Toronto (1980).
23. Bell, *op. cit.*
24. Walter Dean Burham, American Politics in the 1970's: Beyond Party? in *Parties and Elections* in *an Anti-Party Age* (Ed. Jeff Fishel), pp. 333-341. (See especially p. 335.) Indiana University Press, Bloomington (1978).
25. For a theoretical discussion of this phenomenon, and several case studies see Erwin Krasnow and Lawrence D. Longley, *The Politics* of *Broadcast Regulation.* St. Martin Press, New York (1982).

Michael X. Delli Carpini is an American Professor of Political Science at Rutgers University, New Brunswick.

Indu b. Singh is the Director of Marketing and Business Development for Spectrum Planning Inc., Washington, D.C., as well as the Editor-in-Chief of *Telematics and Informatics*