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Cyberocracy Is Coming

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ERRATA

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266	"McLuhan (1967) was" should read "McLuhan was"
266-7	"Since McLuhan et al. (1967)," should read "Since McLuhan,"
278	"terms....A similar" should read "terms. A similar"
285 (fn. 21)	"Not must Marxist" should read "Not just Marxist"
286	"If a Marxist were" should read "If a new Marx were"
286	"fostering the vise" should read "fostering the rise"
286	"were a new Marxist to" should read "were a new Marx to"
289	"(Bankes et al. 1992" should read "(Conversation with Steve Bankes, 1992"

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291	"Benedixt" should read "Benedict"
291	"Brandt, Stewart. 1988" should read "Brand, Stewart. 1986."
292	"Eisenstein, L." should read "Eisenstein, Elizabeth L."
292	The correct publishing data for the book by Howard Frederick is "Belmont, CA: Wadsworth Publishing Co."
293	The article by Roger Levien is from pp. 205-239 of the work cited.
294	In the citation to Donald Michael, the title "*Some Critical Information*" should read "*Some Critical Implications*"
294	"Michael." should read "Michael, Donald."
295	In the citation to Ronfeldt (1992), "Banks & Builder" should read "Bankes & Builder"
295	The title of the article by Sproull & Kiesler (1991b) is: "Computers, Networks and Work"

Cyberocracy Is Coming

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Abstract *The government world lags behind the business world in feeling the effects of the information technology revolution and related innovations in organization. But government may change radically in the decades ahead. This essay fields a concept—*cyberocracy*—to discuss how the development of, and demand for access to, the future electronic information and communications infrastructures (i.e.,* cyberspace*) may alter the nature of the bureaucracy. Although it is too early to say precisely what a cyberocracy may look like, the outcomes may include new forms of democratic, totalitarian, and hybrid governments. Optimism about the information revolution should be tempered by a constant, anticipatory awareness of its potential dark side.*

Keywords Politics, information, government, cyberspace, cyberocracy, technology, communications, revolution.

Introduction

This is a think piece about how the information and communications technology revolution may affect politics and government in the future. This study does not subscribe to technological determinism, but it is enthusiastic, because its author has been captivated by thoughts like the following: "Perhaps it gets tiresome to read, as we have read for years, that advances in computing are going to change the world. But it's true" (Tennant & Heilmeier 1991); "The world now taking shape is not only new but new in entirely new ways" (Barnet 1990). At the same time, the author's enthusiasm is tempered by a concern that the information revolution may have a dark side.

One idea—that something called *cyberocracy* is coming—motivates this essay.[1] It begins by reviewing the effects that the information revolution is having on business and government. This revolution and its associated technologies seem to be at an early stage of development, and analysts barely have begun to discern its likely political effects.

The essay then focuses on how the modern bureaucratic state may give way to the *cybercratic state* early in the next century. The conclusion recommends the creation of a new field of study around the concept of information and suggests some items for a future research agenda.

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[1]The term cyberocracy dates from a draft that I wrote in 1978.

Cyberocracy: Concept for the 21st Century

People have riddled history with their "isms" and "ocracies." Feudalism, imperialism, capitalism, fascism, socialism, communism, theocracy, aristocracy, democracy, bureaucracy—each historical age has created new ideas and institutional forms.

Most "isms" and "ocracies" of our day have existed for a long time. Socialism and communism, once heralded as the waves of the future, have been around more than a century. Capitalism and liberal democracy have endured much longer. Meanwhile, bureaucracy has spread throughout the public and private sectors of all modern administrative systems.

We thus continue using the vocabulary of the past to interpret the present and speculate abut the future. But technological and other innovations are changing the world so rapidly, and so many more are on the horizon, especially in the areas of information and communications, that we may soon need a new vocabulary of concepts to comprehend the new age we are presumably entering—what is termed the "postindustrial age" by some and the "information age" by others (Bell 1973).[2]

What new "ism" or "ocracy" may arise? The purpose of this paper is to suggest that *cyberocracy* is coming. This term, from the roots "cyber" and "ocracy," signifies rule by way of information. As it develops, information and its control will become a dominant source of power as a natural next step in man's political evolution. In the past, under aristocracy, the high-born ruled; under theocracy, the high priests ruled. In modern times, democracy and bureaucracy have enabled new kinds of people to participate in government. In turn, cyberocracy, by arising from the current revolution in information and communications technologies, may slowly but radically affect who rules, how, and why.

Perhaps the literature does not need another attempt to field another term about the shape of things to come. Awful terms like "compunications," "technetronic society," and "computopia" already have come and gone (Beniger 1986).[3] The term *cyberocracy* may fare no better.

If something like the phenomenon under discussion develops, it may affect the organization of governments and societies, the meaning of authority and democracy, the nature of bureaucracies, the behavior of elites, and even the definition of progress. It may transform how people think about the system and the world in which they live. It may even give rise to new patterns of conflict and cooperation at all levels of society.

Caveats and Clarifications

This paper may seem to promise more than can be delivered. Its aim is to persuade the reader that something called *cyberocracy* is on the horizon, and to provide a general sense of what it may look like and how it may affect politics. But I do not presume to foretell with precision what a fully developed cyberocracy may look like. That may not be clear for decades. The best this essay may do is propose the concept, identify some forms that it may assume and some issues that its development may involve, and indicate some implications for policy analysis.

A few terms used throughout this essay—*information, information technology,* and *information revolution*—deserve clarification. How best to define the term *information*

[2]Bell's writings have influenced much of my thinking in this study.

[3]The terms mentioned here are from writings by Anthony Oettinger, Zbigniew Brzezinski, and Yoneji Masuda, respectively.

remains one of the key problems of the information revolution. There are many definitions out there, but none of them seems satisfactory, hence I will not cite and pick from among them. Yet as a rule, many analysts subscribe to a rising hierarchy with data at the bottom, information in the middle, and knowledge at the top (some would add intelligence or wisdom above that) (Cleveland 1985; Jéquier & Dedijer 1987). In some versions of this hierarchy, data are defined as raw facts, and information is defined as organized data or patterns that arise from the data. Some analysts presume that more of the former will mean more of the latter (e.g., more data will mean more information, and more information more knowledge), but this is not necessarily true. Also, it should not be presumed that the hierarchy is driven from the bottom by data; values and value judgments may intrude at all levels. Depending on the context, I often use the term information to refer collectively to the hierarchy. But at other times, I use the term to mean something more than data, but less than knowledge. It may turn out that knowledge is to the study of information what wealth has been to the study of economics, and power to the study of politics. (It also may turn out that networks are to the study of information what markets have been to the study of economics, and institutions to the study of politics.)

The term *information technology,* also expressed as *information and communications technology* and, in short, as *the new technology,* includes computers, but rarely refers solely or primarily to them. As used here, the term encompasses not only computer hardware and software, but also the communications system, networks, and data banks and other information utilities to which computers may be connected. In some allusions, this technology may be located in an office, but in others, it may be spread web-like around the world. Advances in television, radio, and telephone technologies are also increasingly part of the information technology revolution. These technologies will come into play as the demand grows for new kinds of information-related goods and services. This is illustrated with the following question: Will the morning newspaper be delivered electronically to subscribers by a computer network, an interactive cable television, a wireless radio, or a telephone company?

However, the term *information revolution,* or *information and communications revolution,* is not used in a merely technological sense. This revolution derives partly from the new technologies, but it is not determined by them. Many recent developments in the theory and practice of management reflect the information revolution, but have little to do with technology per se. They owe to conceptual changes in the awareness of the role of information in human behavior, organization, and society. The information revolution is a social, political, economic, cultural, and psychological, as well as technological revolution.

Cyberocracy is the new term here. Terms with "cyber" as the prefix (e.g., cyberspace) are currently in vogue among some visionaries and technologists who are seeking names for new concepts and realities related to the information revolution. The prefix is from a Greek root, *kybernan,* meaning to steer or govern, and a related word, *kybernetes,* meaning pilot, governor, or helmsman.[4] The prefix was introduced by Norbert Wiener in the 1940s in his works creating the field of *cybernetics* (a term related to *cybernétique,* a French word meaning the art of government). Some readers may object to my addition to the lexicon, but I prefer it to alternatives like the "informatization" of

[4]It might be proper to propose the term *cybernocracy* (which I did in a 1978 draft), but "cyber" has become the favored term.

government and the "informated" bureaucracy (Zuboff 1984).[5] In my view, a good case exists for using the "cyber" prefix, because it bridges the concepts of information and governance better than any other available prefix or term. Indeed, *kybernan* is also the root of the word "govern" and its extensions.

Information as Power

The new information and communications technologies are spreading rapidly throughout offices, factories, and homes around the world. The popular and professional literature is filled with news and ideas about the latest computer hardware and software; data banks and expert systems; fiberoptic cables, communications satellites, and emerging global networks for electronic mail, conferencing, and data transmission; privacy, security, and computer crime; electronic cottage industries, automated production lines, and offices of the future; and the vast societal changes that may result.

These developments have affected how people think about power and its use. Agreement is spreading that information should be viewed both as a new source of power and as an agent for transforming one kind of power into another. In the words of two very different observers:

> The crucial point about a postindustrial society is that knowledge and information become the strategic and transforming resources of the society, just as capital and labor have been the strategic and transforming resources of industrial society. (Bell 1979, p. 26; see, also, Smith 1983)

> We are witnessing a historic transformation of the traditional modes of power. Power today is becoming based less on physical and material parameters (territory, military forces) and more on factors linked to the capability of storing, managing, distributing, and creating information. (Debray 1986, p. 18)

In short, we are beginning to live in an information economy and an information society—we are entering an information age (Forester 1980, 1985, 1989). But just how far into it are we?

Strong Effects on Business and Economics

Business leaders have recognized and responded to these trends more quickly than have government leaders. Economic thinking and behavior already are heavily affected by the information revolution.

The production, dissemination, and consumption of information have become major growth activities, especially in the United States, where more than half the jobs may be

[5]Zuboff introduced the term *informated* to make the point that the new technology can assist workers and managers to develop a worker-friendly informated factory, which she distinguishes from an automated factory.

information related (Porat 1977; Naisbitt, 1982).[6] In the advanced nations, jobs in the information sector are said to be growing more rapidly than jobs manufacturing physical goods, whereas manufacturing is becoming less labor-intensive and more knowledge-intensive. Management economist Drucker (1986) estimated that "In all developed countries 'knowledge' workers have already become the center of gravity of the labor force" (p. 780).[7] Meanwhile, investors and "knowledge elites" in the private sector have found that creating new wealth is depending more on information than on other resources.

It used to be said that money is power. Now one hears instead that "Information is power, and economic information is economic power" (Eger 1978, p. 2). Former Citicorp Chairman Walter Wriston reportedly has claimed that information about money is more valuable than money itself.[8]

Thus, information is treated increasingly as a valuable source of competitive advantage, and capital and information are becoming more interchangeable as factors of production. For some business leaders, this means that information is important as a source of capital; for others, that information is succeeding capital as a source of economic and political power. The effects of such rethinking appear throughout the business world.

Conceptual Changes. Concepts of business management are changing partly because of the new technology. The private sector has found that a dispersed business can now be managed directly from a single center or from several locations. Corporate officers and management theorists tout the end of hierarchy and the rise of flat organizations. Top management finds that the new information systems may enable them to run complex operations without relying heavily on middle management. In some cases, the new technology means that a wider span of economic and social control may be exercised from the top; in other cases, the technology may open new channels for lower echelons and outside investors to challenge management decisions. Access to telephone lines and satellite systems for high-speed data transmission has become an important consideration in decisions about where to locate new foreign investments.

Concepts of markets are changing. A marketplace used to mean a geographic area with a boundary that expanded and contracted. But as Bell (1987) noted, the Rotterdam spot market for oil "is no longer in Rotterdam. Where is it? Everywhere. It is a telex-radio-computer *network.*" As work becomes detached from place, and operations from central headquarters, "we see a change of extraordinary historical and sociological importance—*the change in the nature of markets from 'places'* to *'networks'*" (p. 12; italics in original). The entire planet is becoming a real-time market for electronic financial transactions. As the global economy grows, what were once called "multinational corporations" are evolving into "global companies," which regard the entire world as a production platform and marketplace, virtually irrespective of national borders.

[6]Porat found, using 1967 figures, that "total information activity" accounted for between a third and a half of the gross national product (GNP) of the United States, and "information workers" earned more than 50% of labor income in the U.S. workforce. Naisbitt reported that "in 1950, only about 17% of us worked in information jobs. Now more than 60% of us work with information" (p. 1).

[7]Drucker also argues that "If a company, an industry or a country does not in the next quarter century sharply increase manufacturing production and at the same time sharply reduce the blue-collar workforce, it cannot hope to remain competitive—or even to remain 'developed'" (p. 777).

[8]From a television broadcast of "Smithsonian World," KCET (Channel 28, Los Angeles), April 16, 1991.

Concepts of capital are changing. Corporations now buy, sell, store, and transmit information as though it were money (and vice-versa). Capital is viewed as a form of information (and vice-versa). "Capital today exists largely in terms of credit information. Banks no longer ship around large quantities of cash; instead they transmit credit information" (Stonier 1980, p. 306). Electronic transactions and financial news result in immediate, worldwide adjustments in monetary exchange rates without any bullion or currency physically changing hands. Thus, in Wriston's (1986) view, a new "information standard" is replacing the gold standard. In a similar vein, the 1985 collapse of the Home State Savings Bank in Ohio led to a comment that "the world's financial markets are intertwined as never before. When money is literally nothing but pulsed laser beams travelling along fiber-optic pathways, a sizeable ripple in any part of the world will be felt almost simultaneously in every other" (Morris 1985, p. 3).

Wriston, who has been praised for building Citibank into "the one institution that understands that finance no longer has to do with money but with information" (Drucker 1985, p. 7), says that new terms and concepts are needed.

> [M]ost of the terms we use in standard economic analysis were invented in the industrial age, and while many are still relevant, some no longer measure what they once did, because the base has changed. . . . If we think about our economy, another word we use is "capital." Economists of many schools tend to agree that capital is stored-up labor which has been expressed in dollars. A good case can now be made that knowledge and information are becoming the new capital in today's world. . . . A strong argument can be made that information capital is as important, or even more critical, to the future growth of the American economy than money. Despite this perception, this intellectual capital does not show up in the numbers economists customarily look at or quote about capital information. (Wriston 1986, pp. 120, 125-126)

Meanwhile, traditional concepts of labor and work also are being challenged; the new technology is transforming the nature of work and relationships between workers and managers. According to Harvard Business School Professor Zuboff (1984):

> The contemporary language of work is inadequate to express these new realities. We remain, in the final years of the twentieth century, prisoners of a vocabulary in which mangers require employees; superiors have subordinates; jobs are designed to be specific, detailed, narrow, and task-related; and organizations have levels that in turn make possible chains of command and spans of control. . . . However, the images associated with physical labor can no longer guide our conception of work. (pp. 394–395)

In her view, "work organization requires a new division of learning to support a new division of labor," because, in the final analysis, "the informated organization is a learning institution" (pp. 394–395). The image she offered for labor–management relations is one of concentric rings rather than hierarchal pyramids.

Computer-Productivity Paradox. Despite these changes in theory and practice, the new technology is far from fulfilling its promises for business. Instead of a paperless "office of the future," only about 1% of business information is currently kept in electronic

form. Moreover, the new technology has so far had few positive effects on efficiency and productivity, and a "computer-productivity paradox" is widespread. As MIT economist Robert Solow noted, "We see computers everywhere but in the productivity statistics" (Boroughs et al. 1990, pp. 46–48). This does not mean that the technology cannot fulfill its promise. The problem is not so much the technology as the fact that organizations are still learning how to absorb and use it.

For the most part, the technology is being inserted into existing organizational forms—computers are being thrown at workers and managers—as a tool to improve the speed and efficiency of routinized parts of the production process. But analysts are finding that many organizations may need some redesigning to take advantage of the technology and its capacity to integrate the production process. A few firms have figured this out. For example, Frito-Lay Inc., and Raychem Corporation stand out for their use of the new technologies to enhance productivity. But for each story of successful redesign and adaptation, there are more stories of failure. Many problems reportedly reflect the absence of networking among the (often mismatched) computer systems that a company has, a result being that even if individual offices are well equipped and have computer-competent staff, they may lack electronic access to vital data in another office or the company's mainframe (Boroughs et al. 1990, p. 48).

Perhaps a productivity paradox should be expected in the early phases of a revolutionary technology; the existence of the paradox may be evidence that the information revolution is in an early phase. Stanford economic historian Paul David reportedly found that the introduction of electric motors led to a similar lag in productivity in the early 1900s until factories shifted entirely from steam to electricity, redesigned their layouts, and got fully wired in the 1920s (Boroughs et al. 1990).[9] David and others concerned about the current productivity paradox feel it may be resolved in the 1990s, particularly if a shift occurs from emphasizing the computer as a tool for processing data to using it more as a tool for acquiring and sharing information across vast networks (Tennant & Heilmeier 1991; Johnson 1991).

As part of the transition, the current U.S. recession may continue (even worsen), or a global recession/depression may occur if either of two propositions is valid: (1) that a revolutionary new technology is likely to induce, or help induce, a major recession/depression in the course of its adoption; and/or (2) that a major recession/depression is required for a revolutionary technology to take hold. The histories of the telephone and telegraph in the late 1800s, and of electricity and electric motors in the early 1900s, lend credence to both propositions, as does the current U.S. recession.[10]

Lagging Effects on Government and Politics

The governments of all the postindustrial nations are acquiring the new technologies, seeking competitive advantages from them, and addressing the issues they raise. The governments of England, France, Japan, and the United States all have produced major studies of various policy implications of the information and communication revolution since the 1970s. France is pursuing the "informatization" of society. Japan has an aggressive plan to rewire the country with fiberoptic cables and connect businesses,

[9]Forester (1989) also addressed what he termed *the productivity puzzle.*

[10]Although Buroughs et al. (1990) vaguely referred to this possibility, I am more indebted to postings by Elin W. Smith in computer-mediated conference discussions on the Whole Earth 'Lectronic Link (WELL), Sausalito, Calif., during 1991.

homes, and institutions to them by the year 2015. Meanwhile, the U.S. government, notably with Congressional approval of a controversial bill sponsored by Senator Albert Gore, is beginning to determine to what extent, when, and how to connect the United States with networks of fiberoptic cables and high-performance computers.

The new technology has given rise to a new generation of policy issues. Foremost among them have been privacy and security issues. Sweden was the first nation to enact a privacy law, in 1973, after discovering that data on Swedish citizens was available in 2,000 data banks stored outside the country. A year later, the United States passed its first Privacy Act to protect individual rights that could be jeopardized by the use of the new technologies. Since then, numerous other countries have adopted laws to protect privacy.

The technology also has obliged government to focus on a new set of international telecommunication issues. The growth of transborder data flows and international trade in information services, the rising demand for access to communications networks and crowded radio-spectrum frequencies, and the prospect of direct broadcast satellites have all raised complex commercial and regulatory issues and touched sensitive nerves about national sovereignty and independence. International institutions and agreements, such as the International Telecommunications Union (ITU), the Organization of Economic Cooperation and Development (OECD), and the General Agreement on Tariffs and Trade (GATT), all have been modified to deal with "a world economy that is more and more driven by flows of information" (Feketekuty & Aronson 1984, p. 63).

Thus governments are responding to the challenges that the new technologies pose for the defense of individual and national rights. But, in a more general sense, the government world has been slower than the business world at coming to grips with the information revolution.

Recognition of Information's Power. Numerous corporate leaders have spoken and written about the information revolution. Although a vast speculative literature exists about the political effects of the information revolution, only a few government leaders, notably France's François Mitterrand and former U.S. Secretary of State George Shultz, have shown keen interest in the significance of the new technology.

Shultz quickly realized in the 1980s that it represented a new source of power. In his view, its diffusion was making the world smaller and more interdependent, but also more turbulent. It was altering the technological bases of national, regional, and global economies. It was inducing political changes that would challenge traditional concepts of national sovereignty and affect not only the role of government in society, but also the international balance of power (Shultz 1985a, 1985b, 1986). He foresaw that the outcome would be to the advantage of the open, democratic societies of the West.

> The more they [communists] try to stifle these technologies, the more they are likely to fall behind in this movement from the industrial to the information age; but the more they permit these new technologies, the more they risk their monopoly of control of information and communication. (Shultz 1986, p. 28)

Thus, recognition is spreading in governments around the world that the new technologies may profoundly alter the nature of political power, sovereignty, and governance.

- The distribution of *power* and the prospects for cooperation and conflict are increasingly seen as a function of the differing abilities of governments and other political actors to utilize the new technologies. A new distinction is emerging between the information "haves" and "have-nots." Some actors may become global information powers, but others, notably in the Third World, fear "electronic colonization" and "information imperialism."
- Information flows based on the spread of the new technology are undermining traditional concepts of territorial *sovereignty* (Wriston 1988/1989; Webster 1984; Ware 1981). Information in electronic form, unlike most goods and services, is difficult to control; financial data flows, electronic mail between computers and fax machines, and television broadcasts from remote trouble spots do not halt at border check points. Clinging to closed, autarchic notions of sovereignty is less and less a viable option for ultranationalistic governments.
- A key expectation about *governance* is that the new technology benefits society over the state, and thereby strengthens the prospects for democracy. The revolutionary upheavals of 1989, especially in Eastern Europe, have provided evidence for this, and raised optimism that open societies are superior and will triumph over closed ones. But in the United States and other leading democracies, the new technology also may lie behind trends that could undermine the democratic process (e.g., the growth of single-issue politics, media sound-bites, targeted mailings, and public surveillance).
- In addition, the new technology has raised expectations that top leaders and their staff eventually will have access to better information, from any part and level of government, virtually on demand. But meanwhile, especially in U.S. foreign policy, the modernization of an office's communications systems has sometimes enabled it to expand its operational horizons in ways that stimulate bureaucratic rivalries.

In short, the basis exists in the government world for conceptual and structural shifts that are as profound as in the business world. Yet, by comparison, the government world appears to be changing much more slowly and uncertainly. With few exceptions, policymakers and analysts are just beginning to discern how government and politics may ultimately be affected by the information revolution (Jéquier & Dedijer 1987).

Slow Progress in the U.S. Government. Applying the new technology to government has been a stressful task for the U.S. government since the 1970s. In 1984, Grace, who had just headed a presidential commission on waste and inefficiency in the federal government, observed that:

> Over three quarters of the federal government's white-collar work force is involved in the processing of information—from mailing Social Security payments to processing tax returns. . . . The federal government is the single largest user of data processing systems in the world. (p. 1B)

But his commission was appalled by the obsolescence, incompatibility, and duplication of computerized information systems scattered about the federal branch, by the rapid

turnover of systems personnel, and by the "woefully inadequate" quality of the information available to federal managers (Grace 1987).

Federal offices and agencies had a terrible time in the 1980s trying to modernize their information systems and computerize their administrative activities.[11] The list included the Internal Revenue Service, the Social Security Administration, the Census Bureau, the Immigration and Naturalization Service, the Patent Office, and offices in the Army and the Navy. According to a General Accounting Office official testifying to Congress in 1989, "The government spends about $20 billion each year on information technology and management, but I would be hard-pressed to identify a single . . . systems development project that could be used as a model (Purnell 1989).

Efforts to install advanced information systems in the White House did not fare well either. By the mid-1970s, when President Jimmy Carter took office, the White House systems were much less sophisticated than the business world's, and had been installed in a haphazard, fragmented, and uncoordinated manner. The emphasis was, and remained, on improving the efficiency of routine office tasks more than on informing the decision makers and improving their efficiency. Some analysts saw that the new technology could provide tools to develop an institutional memory and support crisis management. However, an effort to develop an integrated decision-support system for the Carter White House, and a subsequent effort under President Ronald Reagan, both ran afoul of internal power politics and staff rivalries and were halted (Hinckley 1986).

Yet a case may still be made that the improvements that have occurred in the White House communications systems since the 1960s have had a significant effect on the ability of the president and the White House and National Security Council (NSC) staff to take an increasingly operational and independent approach to the conduct of foreign policy.

> The situation room and its communications systems thus helped Presidents to seize control of the foreign-policy system. It helped the NSC staff to serve the President as he must be served, even if it offered also unfair advantages in the bureaucratic competition. But established initially to bring Kennedy and his staff more fully into the policy game, it would be employed by subsequent Presidential aides—especially Kissinger and Brzezinski—to keep out State and Defense, sometimes even their Secretaries. The new communication networks allowed both Presidents and the White House staffers to get more deeply into the daily business of diplomacy, sometimes acting without the knowledge of the officials actually charged with those responsibilities. The machines have allowed the growth of the operational Presidency. (Destler, Gelb, & Lake 1984, p. 247)

Congress did not advance more effectively than the executive branch in this period.

> As an organization, Congress adopted computerized information services in a slow, halting, and fragmented manner. . . . The key to understanding Congress's move into the computer age lies not in discovering the nature of

[11]This came to Congressional attention because of reporting requirements of the Paperwork Reduction Act of 1980, which required the Office of Management and Budget (OMB) to review information technology systems proposed by government agencies, and was overseen by the OMB's Office of Information and Regulatory Affairs.

> modern information systems, but rather in delving into the nature of Congress as an organization. (Frantzich 1982a, p. 91; see, also Frantzich 1982b)

The House and the Senate installed separate networks to provide access to electronic mail, to computer-based issue briefs from the Congressional Research Service, and to the SCORPIO system of data bases. This system which grew out of computerizing the Library of Congress's card catalog, included files on the substance and status of recent bills, on contents of the Congressional Record, and on references to policy-relevant articles in the periodical literature (Heginbotham 1987). The new systems also could be used to track voting records and compile data on congressional districts.

As in other parts of the government, the new technology affected the distribution of knowledge and power on Capitol Hill. It seemed to have a democratizing effect. For example, it enabled members to challenge the traditional "resident information" in the minds, staff, and files of committee chairs. But the Hill's new information and communications systems also seemed to reinforce incumbency, because members could use these systems, especially their data bases, to help get reelected.

The information systems of the executive and legislative branches, already fragmented within each branch, were kept entirely separate from each other. However, whereas executive branch officials could sometimes gain access to the Congressional data bases, its representatives could rarely get their hands on data bases and simulation models used in the executive branch. Thus, in various ways, "The introduction of the computer threatened to upset the comfortable pattern of intrabranch and interbranch power holding" (Frantzich 1982a, p. 234).

This picture improved during the 1980s, but not much. Although it is difficult to ascertain the status of new applications in the government, it appears that many departments and agencies now have electronic mail and are putting some basic records in electronic data bases. But most of these networks and data bases are rudimentary, are not interconnected, and may be guarded jealously.

The new technology mostly has been applied in ways that conform to established bureaucratic practices. The U.S. government appears to remain in a phase of trying to install the technology, to make it improve efficiency, and to decide what else to do with it. Will it change how officials obtain information, monitor policies, identify options, and make decisions? Will the reluctance be overcome for different departments and agencies to interconnect their networks and provide access to each others' data bases? Will the result be a more open and democratic process? Such questions are far from answered.

A Revolution Barely Begun

In sum, the information revolution is well underway, but it is also in its infancy. The beginnings of its maturation may be 10 years away. The technology remains in an incipient stage of development, compared with what is on the drawing boards and in the minds of the visionaries. The best and worst are yet to come in terms of the technology's effects on society, and especially on its politics.

A new technology usually has to prove itself first in terms of efficiency. Advanced information and communications systems, properly applied, are improving the efficiency and cost-effectiveness of many activities. But improved efficiency is not the only, or even the best, possible effect. The new technology also is having a transforming effect, because it disrupts old ways of thinking and doing things, provides capabilities to

do things differently, and suggests that some things may be done better if done differently:

> The consequences of new technology can be usefully thought of as first-level, or efficiency, effects and second-level, or social system, effects. The history of previous technologies demonstrates that early in the life of a new technology, people are likely to emphasize the efficiency effects and underestimate or overlook potential social system effects. Advances in networking technologies now make it possible to think of people, as well as databases and processors, as resources on a network. Many organizations today are installing electronic networks for first-level efficiency reasons. Executives now beginning to deploy electronic mail and other network applications can realize efficiency gains such as reduced elapsed time for transactions. If we look beyond efficiency at behavioral and organizational changes, we'll see where the second-level leverage is likely to be. These technologies can change how people spend their time and what and who they know and care about. The full range of payoffs, and the dilemmas, will come from how the technologies affect how people can think and work together—the second-level effects. (Sproull & Kiesler 1991a, pp. 15-16; see, also, Sproull & Kiesler, 1991b)

In some areas, information technology is beginning to emerge from the efficiency-proving stage. We thus may begin to see increasing evidence of a lesson from the history of an earlier revolutionary technology, the printing press. According to its greatest historian, Eisenstein (1968), it "created conditions that favored, first, new combinations of old ideas and, then, the creation of entirely new systems of thought" (p. 8). Drucker has said that a radical technology may not displace established technologies unless the new one proves itself ten times more cost-effective (Gilder 1989). Afterward, the structural changes implied by the new technology are much more likely to occur. Indeed, a realization that institutional redesigns are needed to take full advantage of a new technology may be an important sign of maturation.

Thus, extrapolating from the current effects of the new technology may not be a good guide to its future effects. As the technology lives up to its potential, new elites, institutions, and ideologies may arise.

Beyond Bureaucracy: Cyberocracy

Throughout history, information has been essential to government, and different types of governments may be distinguished by the ways in which they acquire, possess, transmit, and control information. Yet information per se rarely has been considered a key organizing principle in theory or practice (Innis 1950; Converse 1985; Deutch 1963). Cyberocracy implies that information and its control will be elevated as a key principle.

The term needs to be defined. A precise definition is not possible at present, but, in a general sense, cyberocracy may manifest itself in either or both of two ways:

- narrowly, as a form of organization that supplants traditional forms of bureaucracy and technocracy; or
- broadly, as a form of government that may redefine relations between state and society, and between the public sector and the private sector.

This section briefly elaborates on the first way. The second is discussed in "Toward the Cybercratic State." In between, some infrastructural factors are discussed that may affect the outcome.

Although the shape of a full-fledged cyberocracy remains obscure, it should spell major changes in the nature and conduct of government. It should not mean that a nation's intelligence services, think-tanks, media, or other sources of informational power dominate government, although the information revolution has increased their visibility and importance. The major impact probably will be felt in the organization and behavior of the modern bureaucratic state (Toffler 1970).

Bureaucracies enable governments to generate, process, distribute, and store information. Even the Egyptian, Roman, and other ancient empires were administered, in part, by bureaucracies. Yet the terms *bureaucracy, bureaucratic,* and *bureaucrat* are not ancient; they data from the 1830s and 1840s. The growth of formal bureaucracy is a phenomenon of the 19th and 20th centuries, and the modern bureaucratic state is one of humankind's recent accomplishments. For organizations in both the public and private sectors, the bureaucracy represents an important, modern technology of control (Beniger 1986).

To some extent, a cyberocracy would be a bureaucracy changed by computers. This new form presumes the diffusion of advanced information and communications systems throughout a nation's government (and its public and private sectors, generally). It also implies the rise of elites who rely on those systems and work to use them to their fullest capabilities.

But it would be a mistake to define *cyberocracy* as a computerized bureaucracy, or *cybercrat* as a bureaucrat with a computer. The new technology opens the doors to new capabilities and possibilities; it implies that things may be done differently. This difference may stem less from the computer someone may have than from the access it may provide to networks and data bases outside one's office, and potentially across all branches and levels of government, in the private as well as the public sector, and internationally as well as domestically.

Although bureaucracies are organized along thematic lines, big budgets and staffs generally are considered more important than information as bases of bureaucratic power. Moreover, the hierarchical structuring of bureaucracies into offices, departments, and lines of authority may confound the flow of information that may be needed to deal with complex issues in today's increasingly interconnected world. Development of a cybercratic state may mean that "big information" becomes a more important source of power and authority than a budget.

Cyberocracy must surpass bureaucracy and its 20th-century iteration, *technocracy*[12] if new techniques of acquiring and using information are to take hold. Bureaucracy depends on going through channels and keeping information in bounds. In contrast, cyberocracy may place a premium on gaining information from any source—public or private. Technocracy emphasizes "hard" quantitative and econometric skills, such as programming and budgeting methodologies. In contrast, a cyberocracy may bring a new emphasis on "soft" symbolic, cultural, and psychological dimensions of policymaking and public opinion. Bureaucrats command offices and channels. Technocrats command scientific expertise and analytical skills. Cybercrats may not only command all that their predecessors commanded, but also may redraw the boundaries of appropriate, authorized behavior.

[12]The term "technocracy" was coined in 1919 and popularized in the mid-1930s (Bell 1967).

Cyberocracy may mean that the traditional notions of bureaucratic boundaries are broken, and that the public and private sectors become increasingly permeable to each other. The new technology makes possible a degree of networking and bypassing that would play havoc with the traditions of a hierarchal bureaucracy, but that may become hallmarks of future organizational processes.

One key to being a cybercrat may be the ability to tap multiple sources of information in electronic form, available inside and outside the official system, from both public and private sectors, in ways that bypass or break the conventional boundaries of bureaucracy. Another key may be the ability to readily communicate and consult, individually or in teams, with selected individuals inside and outside of government who may be able to contribute to a policymaking process, although those individuals may be far removed from one's immediate office area. Policy consultation and coordination may become more extensive than ever, but may unfold in ways that defy traditional bureaucratic conceptions. At stake, then, is not only access to information, but also control of how information is used to influence policymaking and to direct behavior.

A new information and communications infrastructure will be required for such a system.

Mind-Bending New Infrastructure

Technical Requirements

Cyberocracy will require handy systems for selectively acquiring and representing complex information about how a particular political, economic, social, or other system may be performing, and for assessing policy options about how to affect the performance of a system. It should be possible to call up and use within minutes or hours the kinds of information that may now take days or longer to assemble.

Thus, it is still too soon for cyberocracy, because it has technical requirements that are not yet met. But they are under development and may be available in little more than 10 years. Better computer hardware and software are needed, as well as much better communications networks and data banks.

Computer Hardware and Software. The technology is still at a stage where we are very conscious of it; it is not yet "transparent" to us (Smith 1986). Desk-top, lap-top, and palm-top computers must be made much more powerful and convenient than today's models (Norman 1989). Even the desk-top varieties should probably have flat-console screens. Storage capacity should be massive by today's standards. Software for working with mixed media must be fully realized, so that text, sound, and graphics may be easily mixed and transmitted together. What works on one machine should be workable on another. According to John Walker (1992), the visionary president of Autodesk, Inc.:

> What is happening today is that all of the barriers, hardware and software, that once distinguished personal computers from engineering workstations are being erased. . . . As the current technological transition matures, we will enter an era in which the easily-drawn distinctions among "PCs", "workstations", and even "mainframes" begin to disappear. There will be, instead, a continuum of computing capability and cost that ranges from pocket pen-based portables to parallel supercomputers, all of which can be

> accessed by users with a common user interface, and which run a wide variety of industry standard applications.

Technologists at Xerox's Palo Alto Research Center (PARC) foresee adding active "badges," "pads," and display-size "boards" to the list of technologies for creating "ubiquitous computing" that is seamless and invisible (Weiser 1991).

Also, new techniques are needed for "envisioning information" (Tufte 1983, 1990; Friedhof 1989). This will not only enhance data representation and analysis, but also result in human-computer interfaces that are smarter, friendlier, and more realistic and informative than at present. For example, an Information Visualizer that was under experimental development at Xerox PARC offered real-time, three-dimensional, interactive animation in color (Clarkson 1991). An objective of such efforts is to provide visually easy, but richly detailed ways of finding, representing, and scanning information that might otherwise be located in a volume hundreds of pages thick or an array of filing cabinets. Some designers aim to eventually develop ways to watch data "flow" over time, as might be the case with a model of an organization, international financial flows, or a physical, chemical, or biological process. According to Walker (1992), the challenge is

> to build, inside a computer, models of things that exist in the real world. Whether you call it computer aided drafting, or solid modeling, or computational chemistry, or desktop video, or virtual reality, this concept is at the heart of the technological adventure of the second half of the Twentieth Century and will form the centerpiece of the industrial revolution of the Twenty-First.

Many of these capabilities may be available in a few years, because the power of microprocessor is expected to continue doubling every 2 years, as it has done since the early 1980s. By the end of the 1990s, it should be possible to make desk-top computers that are more powerful than today's supercomputers.

Communications Networks and Conferencing Systems. The United States and other advanced societies are on the cusp of a shift in significance—from what may be done with a computer in a single office or organization, to what may be done as a result of connecting a computer to communications networks, conferencing systems, data bases, and modeling and simulation systems elsewhere within and far beyond the boundaries of that office or organization. Vast computer communication networks and "internets" are spreading rapidly around the United States and the rest of the world. The best networks provide for electronic mail, news-related discussions, group conferencing, and remote log-ins to and file transfers from distant sites. These capabilities must spread to other networks, and many of these networks should be expanded and interconnected so that a user may communicate anything in electronic form (text, audio, video) with almost anybody, anywhere, anytime. Things are moving well in this direction—a "worldnet" is beginning to exist—and, except for the "anybody" part, may be attainable not long after the turn of the century (Quarterman 1990a; Denning 1989; Johnson 1991).[13]

[13]"All of the networks and conferencing systems that are interconnected for mail transfer form a worldwide metanetwork, the *Matrix*, which is the subject of this book" (Quarterman 1990, p. 125).

It will take at least another decade to construct the full range of expected public and private, local and worldwide infrastructures, and to interconnect them where politically possible. Progress is coming from the spread of fiberoptic cables and satellite systems that can carry broadband-width, multimedia transmissions. Fiberoptic cables have been laid under the Atlantic and Pacific oceans, linking North America, Europe, and Asia. Cables also have been laid by telephone companies across the landmass of the United States and Canada, and will be laid in Mexico. Lines are beginning to run into office buildings in the United States; and connections to some homes, for broadcast media as well as network communication purposes, are expected within little more than 10 years. Japan has a far more aggressive program than the United States for thoroughly rewiring its country with fiberoptic cables.

The fiberoptic "highways" and "railroads" laid to date are not likely to become obsolete soon. Some commercial fibers now spanning the United States can carry transmissions at a rate of 1.7 gigabits (billion bits) per second per fiber, which is equivalent to 25,000 voice channels per fiber. Increasing their capacity will not depend on laying higher-quality fibers, but on improving the laser transmitters and photodetector receivers. The existing "fiber's intrinsic information-carrying capacity is almost 1000 away from where we are now" (Lucky 1991, p. 348).[14]

A key objective for many visionaries is to upgrade and expand the most important network linking research centers and universities in the United States—the NSFNET/INTERNET (the successor to the ARPAnet). This is the most important computer network in the United States. Including its spread to sites abroad, it is also the most important in the world—some foreigners have even begun arguing that it is a world rather than a U.S. network. The future of the INTERNET is thus crucial to the future of the information revolution. The issues include the upgrading of the INTERNET's technological infrastructure, its extension beyond the high-prestige sites that it currently serves to other schools and communities in the United States, and its adaptation to commercial usage.

The resolution of these issues is underway. Last year, Congress approved the High-Performance Computing Act of 1991, a bill sponsored by Senator Albert Gore that aims to upgrade the network's lines this decade with fiberoptics to a capacity of up to 3 gigabits per second, more than 60 times their current best carrying capacity and 50,000 times the ARPAnet's original capacity (Karraker 1991). The act also will improve the usage of the network by creating on it the National Research and Education Network (NREN). This year, Senator Gore has introduced a follow-on bill, the Information Infrastructure and Technology Act of 1992, to ensure that the technology developed under last year's act is applied widely in the areas of K–12 education, libraries, health care, and industry, particularly manufacturing.

The INTERNET is intended to serve public, noncommercial purposes, but it is under increasing pressure to allow purely commercial traffic. Thus, Advanced Network & Services (ANS), a joint venture since 1990 of the IBM, MCI Communications, and Merit Network corporations that has a term contract to maintain the NSFNET, has been installing new lines in some areas and providing expanded services and new connections to it for commercial purposes through a privately owned subsidiary, ANS CO+RE Systems, Inc., which was created in 1991. ANS CO+RE and the Commercial Internet Exchange (CIX), a rival association of seven networks that carry commercial traffic,

[14]Other analysts put the current carrying capacity much lower (e.g., 100 million bits per second).

agreed to work toward permanent interconnectivity as a step toward creating what is being called the "Commercial Internet."

Satellite communications capabilities also are being dramatically upgraded and expanded. For example, during the Gulf War, the major news media relied on suitcase-size portable satellite telephone systems from Mobile Telesystems Inc. (MTI), which use the IMARSAT network (Antoniak 1991). Moreover, parts of the U.S. military were so short of telecommunications equipment that they resorted to commercial suppliers (Grier 1992). This decade, Motorola aims to install a system—Iridium—that will use 77 small, low-orbiting satellites to enable subscribers to communicate to and from anywhere on the planet on portable cellular telephones. Also, the Soviet Union had planned to install a packet radio system for worldwide communications called Gonetz (Messenger) that would use 30-36 satellites.[15]

The ultimate goal is the construction of an end-to-end Integrated Services Digital Network (ISDN), once the governments, industries, and other bodies involved agree on worldwide standards and protocols. Such an agreement may occur this decade, or soon afterward, bringing a quantum jump in electronic mailing, file transferring, and conferencing capabilities. ISDN will enable users to switch at will between voice telephone and data transmission; to transmit text, audio, and video; and to engage in multimedia conferencing over long distances, all without having to use a modem. Today, it would take days to transmit an electronic copy of the text of the *Encylopedia Britannica* from a library to a home (assuming a transmittable copy existed). Tomorrow, with a fiberoptic ISDN, it only will take seconds or a few minutes, graphics and related audio included (Williams 1991; see, also, Barlow 1992).[16]

Although the computer has received enormous attention, because of its potential to transform social relations and empower individuals, the new communications networks are expected to have equally profound effects in the future:

> Networking has the power to allow everyone to participate in a worldwide marketplace—will we be able to ensure that everyone has equal access to it? Networking makes it feasible for people in organizations to share information freely and frequently—will we be able to release ourselves from "chain of command" organizational structures to take advantage of this capability? Networking will give people access to vast libraries of historical and up-to-the-minute written, visual, and oral information—will we be able to develop tools to allow people to chart their own courses of learning and discovery through such information? Networking has the potential to connect all the world in one global electronic civilization—will we be able to sustain a diversity of cultures? (Johnson 1991, p. 168)

Data Banks and Information Utilities. Tomorrow's policymakers and analysts will need quick access to data banks, the likes of which are but a gleam in the eye today. The number, variety, and sophistication of on-line data bases is rapidly increasing. Because of expense and other matters, only a few people, mostly research and reference librarians,

[15]I do not know what has happened with this plan since the breakup of the Soviet Union.

[16]Most ISDN initiatives involve waiting for fiberoptic cables, but Mitch Kapor and John Barlow of the Electronic Frontier Foundation propose using new compression techniques across the current copper-wire cables to create a "Personal ISDN" system to benefit large masses of the population in the near future.

enjoy direct access. Moreover, much of what is available is quite current. Few materials more than 10 years old have been put in electronic form. Techniques for searching through these data bases remain rudimentary, normally depending on selected key words—the user often ends up with far more, or far less, than he or she really wants.[17]

A cyberocracy will require that entire libraries of print materials (e.g., books, periodicals, reports, memoranda, survey data, time-series data, etc.) be readily available in electronic form. This will be necessary for historical as well as current materials, in order to broaden the available temporal horizons. It will be necessary not only for the materials that may be associated with particular offices, but also for materials that may be needed from public and private sources beyond the office confines, in order to broaden the available spatial horizons.

Some companies have begun to market CD-ROMs (compact discs, read-only memories) that contain encyclopedic amounts of literature. But a more interesting and promising effort, led by the Thinking Machines Corporation in association with the Dow Jones, Apple Computer, and KPMG Peat Marwick corporations, seeks to develop a nationwide data network based on Wide Area Information Services (WAIS) that permit a user to view diverse information utilities as a single coherent system. It will enable computer users to access multiple libraries simultaneously, including the Library of Congress, and conduct searches and retrieve entire texts. It also may enable individuals to create personalized electronic newspapers. This use of WAIS has been under development and testing on the INTERNET. Widespread public access will be possible if the INTERNET is improved and expanded along the lines of NREN, including new links to schools and communities that currently are not connected (Markoff 1991).

Although the focus today is on the data base, this may not be the case in the future. Visionary technologists foresee the possibility of "expert systems," "intelligent agents," and "knowbots" that can peruse vast data banks and "information utilities" according to the specified needs of the user. They also see the possibility of "mirror worlds" and "reality windows" that may be used to show what is happening (Gerlernter 1991). The technology may still be used to access facts, but pioneer computer technologist Kay (1991) went further:

> The retrieval systems of the future are not going to retrieve facts but points of view. The weakness of databases is that they let you retrieve facts, while the strength of our culture over the past several hundred years has been our ability to take on multiple points of view. That's what simulations allow you to do. Databases will be replaced by active simulations that no longer contain embalmed slices of a company at different points of time but active simulations of the company. (p. 207)

One way to accomplish this is expected in the form of new computer architectures based on neural networks, which will "combine concepts of parallel architecture with those of artificial intelligence and machine learning" and which can be programmed to simulate "judgment" according to the user's criteria (Gazis 1991, p. 69).

Standards and Protocols. Today's computer chips, operating systems, software inter-

[17]Examples of widely used data bases, especially for searching through periodical literature, include Dialogue Information Service's DIALOG system and Mead Data Central's NEXIS system.

faces, communications networks, and data bases come in so many designs that technical issues about "connectivity" and "interoperability" need to be resolved before universal communications can be achieved. International standards and protocols must be set, and facilities must spread, so that users may connect whatever hardware and data banks they prefer to all important communications networks and data banks, not only at the office or home, but almost anywhere in the world that they work (e.g., airports, hotels, libraries, and other people's offices).

Many international efforts are underway to deal with these issues. For example, the International Standards Organization's Open Systems Interconnection (ISO-OSI) standard has been adopted by 100 computer, communications, and software vendors concerned about interoperability. Other steps have been taken by organizations like the Open Software Foundation, which was created by seven computer manufacturers, and by an umbrella group, X/Open Company Ltd., which includes U.S. and European manufacturers, customers, and international standards organizations. A key stake is whether, and whose version of, the Unix operating system may ultimately prevail as a world standard.

In the early 1990s, new chip designs for reduced-instruction-set computing (RISC) led to one of the latest rounds of efforts to decide common standards. The Advanced Computing Environment (ACE) consortium represented the key effort. It formed in 1991 with 21 companies led by the Compaq Computer Corporation and expanded to include dozens of other companies. But ACE did not include Sun Microsystems Inc. or the Hewlett-Packard Company, leading producers of RISC-based work stations. Nor did it include the leading chip manufacturer, Intel, which had RISC designs of its own. Meanwhile, two other companies not in ACE, IBM and Apple Computer Inc., proceeded to sign a letter of intent to cooperate with each other to develop their own RISC-based designs. In mid-1992, after a year of shifting fortunes, ACE's plans were foundering, its leading member, Compaq, left it, and the quest for standards was in flux again.

These efforts to promote open systems and interfirm cooperation clearly mask intense rivalries for market advantages. "Standards bodies and industrial alliances are the continuation of competition by other means," says one commentator, paraphrasing Karl von Clausewitz (Verity 1991, p. 76).

Meanwhile, the advent of CD-ROM discs and their attractiveness for storing and retrieving data used by the U.S. government, especially its intelligence agencies and military forces, is raising another set of interoperability issues. A consultant summarizes the challenge as "the ability to purchase any CD-ROM title and be able to access it on any CD-ROM drive, using any microcomputer system, operating under any operating system, using any retrieval interface" (Shapiro 1991). Many U.S. government agencies are reportedly banding together to put pressure on industry to come up with a common standard.

In short, much remains to be accomplished in the areas of connectivity and interoperability before something like ISDN can become a reality. But again, sometime late this decade remains a reasonable estimate. The implications verge on the philosophical:

> Machines everywhere will be bridged together to form a pool of intelligence and power. In the end, of course, it matters only that the power that emerges works to the benefit of mankind. If experience is any guide, more communication is better. The more things are open, the more we are interconnected, the better off we are. This is the promise of future communications. (Lucky 1991, p. 366)

Advent of Cyberspace

As the new technologies—the hardware and software, communications networks, and information utilities—become interconnected, they may form a globe-circling *cyberspace.* This term, which is from science fiction in the 1980s, still lacks a clear definition and may not survive debate. But it is taking root as a preferred term for envisioning the electronic stocks and flows of information, the providers and users of that information, and the technologies linking them as a new realm or system that has a functioning identity as significant as an economic or political system. The term generally refers to the whole world, but it also may be used to refer to a corporation, university, government, nation, region, or some other spatially limited environment (Gibson 1984).[18]

Major New Domain of Power and Property. Today, the term refers mainly to the computerized communications networks, conferencing systems, and related data bases that are being developed, expanded, and, in some cases, interconnected rapidly in the United States and around the world. These include:

- private networks for financial data transmission among banks and other financial and credit institutions;
- private networks that serve global and multinational companies, like Apple's AppleLink, IBM's VNET, the Xerox Internet, and the networks of companies like General Electric and Dupont;
- private networks used by the media to prepare their broadcasts and publications, such as the BASYS system used by the Cable News Network (CNN);
- public data networks that are accessible for a fee, such as Sprintnet (formerly Telnet, owned by U.S. Sprint), TYMNET (owned by McDonnell Douglas), and, to some extent, the Moscow Teleport (which bridges between users and networks in the United States and the former Soviet Union);
- cooperative networks—the favorites of most visionaries—that link universities and research centers, like the INTERNET, BITNET, UUCP, and USENET (the latter houses hundreds of "newsgroups" for information-sharing and discussion about diverse interests and activities);
- subscription networks that create "virtual communities" and provide access to data bases, electronic mail, and conferencing systems for their members, like Prodigy Services, which is a joint venture of IBM and Sears, Roebuck & Company; the Whole Earth 'Lectronic Link (WELL), a marvellous gathering place that emerged from progressive movements in Northern California; and the Institute for Global Communications (IGC), which overlaps with the Association for Progressive Communications (APC), is the home base of activist networks like PeaceNet and

[18]The term's unusual influence extends to professional works like Quarterman (1990) and Benedikt (1991), and to conferences like "Civilizing Cyberspace: Minding the Matrix," sponsored by Computer Professionals for Social Responsibility, at the Carnegie Endowment for International Peace, Washington, DC, June 26–27, 1991. A newsletter *Virtual Reality Report* (Meckler Corp.) keeps track of definitions of *cyberspace* and a related term, *virtual reality.* Other terms that get used include *noösphere, infosphere,* and *technosphere.*

EcoNet, and enables Amnesty International's Urgent Action Project to issue e-mail alerts to its supporters;

- networks that governments maintain for their purposes, ranging from the U.S. State Department's increasingly modern systems to local government systems like the Public Electronic Network (PEN) in Santa Monica, California, which enables citizens to establish special interest groups, and the "City Hall On-line" system forthcoming in Colorado Springs, Colorado;
- community-based networks, like the Cleveland Freenet, that provide electronic mail, topical conferencing, and data bases to serve local needs independently of the local government, and that may provide access to the INTERNET and other community-based networks.

Some definitions of cyberspace also include other infrastructures for electronic information and communications, such as the telephone system, radio, television, and cable broadcast systems, satellite communications systems, private security systems, truck location and dispatch systems, and so on.

The key definitions envision cyberspace as not only a new kind of *information infrastructure,* but also as a *virtual reality.* The latter is another new term in search of definition, but it basically means that a user may be able to access cyberspace through hardware and software that render the impression of being in a three-dimensional environment containing three-dimensional representations of the people, places, objects, and data in which the user is interested and with which he or she may proceed to interact (Rheingold 1991).

Today, this new realm is in a nascent phase of construction. Much of what exists is partitioned and compartmentalized—from home to home, office to office, organization to organization, and nation to nation. Nonetheless, out of sight of much public attention, cyberspace may already be the fastest-growing, new domain of power and property in the world. Just the networks mentioned above—and there are many others—embrace hundreds of thousands of computer nodes, millions of users, and billions of dollars worth of activities. Developing and integrating this new realm nationally and globally may become one of the great undertakings of the turn of the century.

> Once several national information infrastructures are in place, countries will tie them together, much as national power grids, airline routes and telephone circuits have been linked in the past. The result will be a global information infrastructure that will help the people of the world buy and sell information and information services and share knowledge and creative energy—we hope to the benefit of all. (Dertouzos 1991, p. 69)

Issues and Analogies for the Future. Cyberspace means different things to different people, but for many the political, economic, and other stakes already seem enormous. Recent debates are fraught with questions about who will have access, who will benefit, and who will control it. To what extent should it be developed as a public utility, as a strategic resource, and/or as an educational service? Should its development be left to the government or to private enterprise? To what extent should it be open to public access or treated as private property? To what extent should the freedoms expressed in the First Amendment apply?

These debates hark back to issues identified a decade ago in a classic study by

Pool (1983). U.S. law, he pointed out, has evolved separately in each of three domains of communications: print media, common carriers, and broadcasting. Print media have been governed by the First Amendment. Common carriers, which include the telephone, the telegraph, the postal system, and some computer networks, have been governed by principles of "universal service and fair access by the public to the facilities of the carrier," on equal terms without discrimination. But the domain of broadcasting, which includes radio, television, and cable, has resulted in a highly regulated regime. Here, frequencies are allocated, broadcasters are selected, and licenses are issued by government agencies. Although fairness is an objective, "the principles of common carriage and of the First Amendment have been applied to broadcasting in only atrophied form. For broadcasting, a politically managed system has been invented (Pool, 1983, p. 2).

Pool (1983) foresaw that the advent of electronic communications implied both the creation of a new domain and a convergence of all the domains into "one grand system" (p. 28). The concern he raised—it resounds in today's debates about the effects of the new technologies and the development of cyberspace—is that the historical trend toward political regulation will continue; the traditions of free speech enshrined in the First Amendment may be subverted in the future information society.

> In that future society the norms that govern information and communications will be even more crucial than in the past. . . . The onus is on us to determine whether free societies in the twenty-first century will conduct electronic communication under the conditions of freedom established for the domain of print through centuries of struggle, or whether that great achievement will become lost in a confusion about the new technologies. (Pool 1983, p. 10)

The outcome Pool (1983) hoped for included universal interconnectivity, basic rights for public access, and clear standards for easy use.

Related efforts to define and debate the issues posed by the prospect of a new infrastructure often turn to analogies, metaphors, and models from past U.S. experience. One that merits attention is that of the "commons." For the most part, "highway" and "railroad" analogies have framed the debate about proposals to rewire the United States with fiberoptic cables and undertake NREN and other large-scale projects. Each analogy has different connotations. Proponents of the highway analogy generally favor government-led development of the communications and information infrastructure as a public asset and national resource, whereas proponents of the railroad analogy want it developed as a private enterprise by firms such as IBM, MCI, and their joint venture, ANS. The highway model is reportedly the norm in Japan, Europe, and other parts of the world, and U.S. critics of private enterprise worry that application of the railroad (or a toll-road) model may lead to monopoly controls, limited and costly access, and the exclusion of many people (Karraker 1991). But a case also can be made that privatization in the context of antitrust law may provide better results than government bureaucratization of the development process.

Although most discussions view cyberspace as something that does not exist, and hence must be constructed—the case with the preceding analogies—still another analogy views it as a frontier that virtually exists and beckons for exploration, colonization, and development.

> The colonization and settlement of North America by Europeans provides a useful model for thinking about the growth of cyberspace. Like sixteenth century Europeans, we too have found a New World (new to us, anyway). As cyberspace develops, we believe that the notions of colonization and settlement will prove more useful in describing and analyzing what is happening than the notions of design and creation. (Morningstar & Farmer, 1991, pp. 110–111)

In this view, different "cyberspace colonies" will be (indeed, they already are being) carved out by many different kinds of actors, many of them initially misfits and adventurers from ordinary society. As the colonies grow, they may be expected to develop different forms of government, citizenship, and property rights. They also may be expected to improve their (electronic) resource bases and transportation systems, compete for immigrants and settlers, and expand their boundaries toward each other. As this occurs, the colonies increasingly will enter into trade relations and diplomatic negotiations with each other. Conflict and crime may increase as the colonies face issues of whether to oppose each other or to interconnect. In the end, if all goes well according to the originators of this analogy, traditional American principles of decentralization, pluralism, and tolerance may provide the bases for the integration of a national, and perhaps global, cyberspace (Morningstar & Farmer 1991).

This may sound fanciful, but it provides another, illuminating way of reiterating a significant point: Cyberspace is an important new domain of power and property. Its development may affect not only individuals and organizations, but also relations between state and society, and between their public and private sectors. Cyberspace and cyberocracy are coming into existence at the same time, and each will affect the development of the other.

Restructured Perceptions of Social Space and Time

As the information revolution alters people's consciousness of the world around them, their perceptions of space and time are affected. These may seem like subjects for metaphysics and the physical sciences, not the social sciences. Indeed, the physical sciences rest on hard-fought concepts of space, time, and momentum. Although few social scientists use such terms, a persuasive case may be made that "every political theory that has aimed at a measure of comprehensiveness has adopted some implicit or explicit proposition about 'time,' 'space,' 'reality,' or 'energy'" (Wolin 1960, pp. 15–16). Wolin's (1960) statement continues as follows:

> Although most of these are the traditional categories of meta-physicians, the political theorist does not state his propositions or formulate his concepts in the same manner as a metaphysician. The concern of the theorist has not been with space and time as categories referring to the world of natural phenomena, but to the world of political phenomena; that is to the world of political nature. If he cared to be precise and explicit in these matters, he would write of "political" space, "political" time, and so forth. Admittedly, few if any writers have employed this form of terminology. Rather, the political theorist has used synonyms; instead of political space he may have written about the city, the state, or the nation; instead of time, he may have

> referred to history or tradition; instead of energy, he may have spoken about power. (pp. 15–16)

A curious, important effect of the information revolution is that people are thinking anew about their perceptions of social time and space and their role in shaping consciousness and behavior (Bell 1977; Pool 1990; Rifkin 1989). McLuhan (1967) was one of the first analysts to raise this a quarter century ago:

> Electric circuitry has overthrown the regime of "time" and "space" and pours upon us instantly and continuously concerns of all other men. It has reconstituted dialogue on a global scale. Its message is Total Change, ending psychic, social, economic, and political parochialism. . . . Ours is a brand-new world of allatonceness. "Time" has ceased, "space" has vanished. We now live in a *global* village . . . a simultaneous happening. (McLuhan, Fiore, & Agel 1967, pp. 16, 63).

This impressive, enthusiastic view has resounded in subsequent discussions about the effects of the information revolution. Yet it begs for examination. The nature of the change is more complex and ambivalent than McLuhan et al. (1967) say. The truth that they illuminate ignores other truths and possibilities.

It is believed widely that the new technology is making the world smaller. Now people may easily communicate with, form relationships in, and acquire knowledge from distant places. But a case also may be made that this means the world is bigger, because the technology expands people's horizons, makes them more aware of distant places, and enables them to see that what happens far away may have more bearing on their lives than they previously realized. From a global (i.e., macro) perspective, the world may be smaller, but from an individual (i.e., micro) perspective, it may just as easily seem bigger.

It also is observed widely that the technology lies behind the undoing of many established barriers, borders, and boundaries. Thus, financial data transmissions now ignore national borders; the democratic upheavals in Eastern Europe lead to the fall of the Berlin Wall; and geographically scattered scientists, activists, ethnic diaspora, and other groups form "epistemic communities," "electronic tribes," and "virtual communities" on computer networks. But a case also may be made that the technology enables new barriers and boundaries to be defined and erected. For example, single-issue groups and religious factions use computerized mailing lists to campaign against their opponents, draw sharp dividing lines, and polarize the public. Wealthy elites use cellular telephones, fax machines, and computers to live in increasing splendor away from the rest of humanity. Government and corporate leaders erect virtual walls of technology to protect secrets and defend against terrorist attacks—whereas terrorists aim to turn public opinion against such leaders by scaring them into isolation. Some individuals and groups may use the new technology to narrow their sources of information to pet topics, removing themselves from exposure to broad media that have shaped national culture and consensus for decades.

Thus, the new technology is having complex, ambiguous, and ambivalent effects on people's spatial orientations. Many traditional social, economic, and political barriers are coming down because of it. But in other cases, the traditional barriers may be reinforced, and new ones may be erected.

The information revolution also is changing people's time horizons. Since McLuhan

et al. (1967), many analysts have argued that the new technology is enabling people to conquer time. For example, financial transactions clear almost instantaneously around the world now. People send faxes and electronic mail anywhere in minutes. CNN and other television networks broadcast in real time the sights and sounds of SCUD missiles over Israel. Government officials move with apparent composure from one immediate crisis to the next.

But a case also may be made that people's time horizons are being distorted because of the new technology. In many ways, it has been used to overload people with information about current developments, narrow their focus, and pressure them to act quickly. Too many things seem to be happening instantaneously and simultaneously. Too many people seem captivated by an intensified awareness of the immediate present and its crises, a sense of detachment from the past, and an anticipation of an accelerating rush into the future. Many seem to be abandoning a sense of history and tradition. Whereas for some activities, like financial transactions, the world has become a single fluid time zone, in other respects people are increasingly sensitive about the gaps in temporal progress and its pace in different parts of the world.

In other words, many people are not conquering time, not even the present moment—they are being conquered by it. Although some think they are saving time, others feel they are being deprived of it. Although some think they are increasingly able to grasp the future, others feel they are losing their grip on it. Partly because of technology, information (not to mention disinformation) is flowing faster than many people feel they can absorb, sort, make decisions, and obtain additional information that may be needed to make the right decision and control the outcome.

The maturation of the technology and its use may address many of these points. Some practitioners and visionaries recognize the need to develop computerized methods that will enable users to control the flood of information about the present, illuminate what is most important, introduce historical perspective, and simulate alternative futures. The result may be to stretch the time perspective, something quite different from the "allatonceness" that McLuhan et al. (1967) acclaimed. In saying this, I am going against the grain of other forecasts (e.g., Rifkin, 1989) that computerization will continue to obliterate people's sense of the past.

If one accepts the spatial and temporal shifts that McLuhan et al. (1967) lauded, a united, even happy, "global village" is still not the only possible implication. Like McLuhan et al., Bell (1977) has commented that technology is resulting in "the eclipse of distance and the foreshortening of time, almost to the fusion of the two" (pp. 26–27; see, also, Bell 1967). But in his view, instability is a likely implication. Societies, the United States in particular, are undergoing a "loss of insulating space" as conditions and events in one place are quickly, demandingly communicated to other places. Political systems are becoming more "permeable" than ever to destabilizing events, and people are more able to respond directly and immediately. In some societies—Bell (1977) was worried about the United States—this may raise the likelihood of contagious mass reactions and mobilizations, and make the rulers strengthen centralized controls to keep that from occurring. Although time and space perceptions are not explicitly mentioned, Lowi (1972, 1975) identifies many of the same implications as Bell. In other words, the information revolution is an important factor behind both the integration and the disintegration that may be seen occurring all around the world today.

The new technology is having, and will continue to have, important, but complex, ambiguous, and ambivalent effects on people's perceptions of space and time. These perceptions form an important bridge between people's values and their behavior. This is

relevant to the analysis at hand, because the development of cyberspace implies some reconstruction of political space and time.

Toward the Cybercratic State

"Beyond Bureaucracy: Cyberocracy" discussed cyberocracy as a descendant of bureaucracy that may break the boundaries of that traditional form of administration and management. The technical, infrastructural, and epistemological considerations discussed in "Mind-Bending New Infrastructure" show that the stakes and issues are broader than the redesign of individual offices or office areas to benefit from the new technology.

Almost by definition, cyberocracy will mean that a government has an official cyberspace, with varying degrees of interconnection among its parts. Cyberocracy might be defined as a form of organization that has a well-developed cyberspace, conducts many key activities there, and is structured as though its cyberspace were an essential factor for the organization's presence, power, and productivity. Technology may appear to be the driving consideration, but how these new forms of organization and infrastructure are developed will depend as much on sociopolitical and other considerations.

In this future environment, government personnel may keep most office work in electronic form, have electronic records that extend back decades in time, and use computerized models to visualize and assess trends and policy options. They may be on one or more networks for electronic mail, news feeds, conferencing, and document preparation with other officials, as well as for access to external information utilities and networks that belong to the government or its contractors and to which access is authorized.

A network may be confined to an office area, extend throughout a department or agency, or span different parts of the government. There may be many networks for different purposes and participants, and these may be interconnected to varying degrees through gateways of controlled access. The extent to which a cybercrat has access to networks that reach beyond his or her office into other parts of the government may be an important issue. Another may be the extent to which he or she has access from the office to public and private networks, conferencing systems, and data bases that are outside the government, maybe in a foreign country.

Cyberocracy may raise issues about relations not only between people and offices in particular areas, but also between different office areas, agencies, and departments of the government; between the public and private sectors in general; and between state and society. It may prove to be no mere variation on bureaucracy or technocracy; the technology implies more than improved efficiency for old institutional designs. Cyberocracy may radically change, in ways we do not perceive, how states and societies interact, how governments are structured, and how offices and people within those governments deal with each other, outside organizations, and individual citizens.

A key issue for theory and practice may be the pros and cons of interconnection. Technology provides a capability for interconnecting individuals, organizations, and sectors on an unprecedented scale. As already noted, the technology alone will not determine how it gets used or what the outcomes are; that will depend on broad cultural, political, and other conditions. In some areas, and for some states and societies, extensive interconnection may be desirable. Elsewhere, that may be not be the case.

The first cyberocracies may appear as overlays on established bureaucratic forms of organization and behavior, just as the new postindustrial aspects of society overlay the still necessary industrial and agricultural aspects. Yet such an overlay may well begin to

alter the structure and functioning of a system as a whole. Just as we now speak of the information society as an aspect of postindustrial society, we may someday speak of cyberocracy as an aspect of the "postbureaucratic" state (Toffler 1990, p. 166).

Nations where the political and cultural commitment to bureaucratic forms is relatively low and freedom of information high may have the easiest time evolving a cybercratic state. Nations where the state is highly bureaucratized and bureaucratic behavior is ingrained culturally and politically may have difficulty developing such a state, although the new technologies may be amply used for political control.

There will be no single type of cyberocracy. Some variations may occur, because different departments and agencies within a government perform different tasks and have different requirements. For example, the kind of cyberspace that the U.S. State Department may want may be quite unlike what the Internal Revenue Service may want. Furthermore, national variations may appear, because of differing cultural and other conditions. Thus, Japan and the United States will probably develop very different types. This may take time to become clear.

More Questions than Answers

Since the 1960s, the information revolution has given rise to a host of recurrent questions that reduce to a string of polarities and contradictions: What will this revolution favor more: Open or closed systems? Decentralization or centralization? Big or small government? Federal, state, or local government? The public or the private sector? Inclusionary or exclusionary communities? Individuals or institutions? State or society? Privacy, or security and surveillance? Freedom or authority? Democracy or new forms of totalitarianism?

The literature offers exhortations and evidence in all directions, but no definitive answers. Most of what has been thought about such questions appeared in writings in the 1970s. With few exceptions, recent writings provide little additional clarification or insight (Zuboff 1984). New research would help, especially if it were conducted carefully in the knowledge that we may be in a confusing transitional phase. Indeed, some of today's trendier points (e.g., the information revolution empowers individuals, favors open societies, and portends a worldwide triumph for democracy) may not hold up as times change.

The best answer may ultimately be "all of the above," depending on the situation and the society affected by the new technology. Open as well as closed types of states may continue to arise. Centralized and decentralized institutions may flourish in the same state. Complex, hybrid patterns may occur. For example, decision-making capabilities in some governments may become more centralized and more decentralized at the same time.

In any case, these are good questions, and they are relevant to a discussion of cyberocracy. The following subsections consider some prevalent notions in the literature about how government may be affected by the information revolution. These involve three themes:

- the rise of new elites;
- the restructuring or organizations; and
- relations between public and private sectors.

The next section then examines whether the information revolution may favor democracy or totalitarianism.

This preliminary study can do no more than selectively examine some general, potential implications of these themes for cyberocracy. Some readers may feel that other

important themes are neglected (e.g., the implications for relations between different branches and levels of government, between the government and the citizenry, and between the governments of different countries). But in my literature survey, I have found less written about these themes than about the three treated here. If the concept of cyberocracy merits continued discussion, other themes may be addressed in future work.

Rise of New Elites

For decades, analysts have expected the information revolution to create new elites (Bell 1977; Lowi 1972, 1975; Michael 1972; Drucker 1989), and a new stratification between the "information-rich" (or "haves") and the "information-poor" (or "have-nots"). Awkward terms like *knowledge elites* and *knowledge workers* have gained currency to label the new strata that live off the expanding information sectors.

A principal contributor to thinking about the new knowledge elites, Bell (1980), concluded that:

> The fear that a knowledge elite could become the technocratic rulers of the society is quite far-fetched and expresses more an ideological thrust by radical groups against the growing influence of technical personnel in decision making. Nor is it likely, at least in the foreseeable future, that the knowledge elites will become a "cohesive class" with common class interests, on the model of the bourgeoisie rising out of the ruins of feudalism to become the dominant class in industrial society. The knowledge class is too large and diffuse. . . . What is more likely to happen . . . is that the different situses in which the knowledge elites are located will become the units of corporate action. . . . The competition for money and influence will be between these various situses. (p. 543)

His points are sound, but do not lay the matter to rest, for he defined knowledge elites in primarily technical terms. Other analysts who take a less technical approach to the new elite continue to detect insidious possibilities.

One of the latest warnings comes from Harvard political economist Reich (1991a) who added the equally awkward term *symbol analysts* to depict a growing gap between a new elite and a new mass.

> Of course, wealthier Americans have been withdrawing into their own neighborhoods and clubs for generations. But the new secession is more dramatic because the highest earners now inhabit a different economy from other Americans. The new elite is linked by jet, modem, fax, satellite and fiber-optic cable to the great commercial and recreational sectors of the world, but it is not particularly connected to the rest of the nation. That is because the work this group does is becoming less tied to the activities of other Americans. Most of their jobs consist of analyzing and manipulating symbols—words, numbers or visual images. Among the most prominent of these "symbol analysts" are management consultants, lawyers, software and design engineers, research scientists, corporate executives, financial advisers, strategic planners, advertising executives, television and movie producers, and other workers whose jobs titles include terms like "strategy,"

> "planning," "consultant," "policy," "resources," or "engineer." (p. 42; see, also, Reich 1991b)

Reich saw a gap growing in many cities between these symbol analysts and the broad mass of local service workers whose jobs depend on the symbol analysts. For him, "The stark political challenge in the decades ahead will be to reaffirm that, even though America is no longer a separate and distinct economy [from the rest of the world], it is still a society whose members have abiding obligations to one another" (Reich 1991a, p. 45; see, also, Zuboff 1984).

Reich's (1991a, 1991b) points are serious, but the implication that the new infrastructure benefits mainly the rich and powerful provides a partial picture. For example, elites in political and professional organizations that previously have lacked influence may use the new technology to help form coalitions with geographically distant, like-minded elites elsewhere, including in foreign countries. Builder (1991) foresees the formation of "transnational factions" and "transnational communities" of scientists who may help press for peace. The formation of "epistemic communities" of scientists and activists located in different countries has become a subject of analysis in the scholarly journal *International Organization.* Some of the heaviest users of the new communications networks and technologies are progressive, center-left, and socialist activists, through entities like the Association for Progressive Communications. Cyberspace is going to be occupied by all kinds of people, with all kinds of ideologies and agendas, from almost all areas of society.

It is also a mistake—one that Reich does not make—to expect that computer whizzes who act like a priesthood and lack social consciousness will end up running the new infrastructures of society and government. This view lingers, because of some early analyses of computers and their implications. The development of cyberspace will generate new elites, in consonance with other trends in society. The defining attributes of these elites may include a knowledge of, and a dedication to, the use of information and communications technologies. But these technologies are ever easier to use. As the skill requirements decline and the number of skilled people increases, the social, political, and other attributes of the new elites may become increasingly diverse.

Today's knowledge elites are not necessarily tomorrow's cybercrats. Some knowledge elites, especially in universities and research centers, may have nothing to do with cyberspace or cyberocracy. Some cybercrats who have technical or other knowledge and skill also may be knowledge elites. But cybercrats also may appear who have no interest in knowledge per se, although they are skilled at using computers, data bases, models, and networks.

Individually, there will probably be as many different types of cybercrats as there are bureaucrats, technocrats, and other types of officials. What may distinguish the new generation of elites is that they will tend to define issues and problems in informational terms, and to look for answers and solutions through their access to cyberspace and their knowledge of how to use it to affect behavior. The new elites may include propagandists and manipulators, as well as people of high public integrity and democratic consciousness.

Organizational Restructuring

According to many accounts from the business world, the information revolution is causing the flattening of organizations, the collapse of hierarchies, increased decentral-

ization, and reductions in the number of middle-level managers. Technology and management innovations are said to be undermining traditional hierarchal and recent matrix forms of organization. Success in the new business environment is said to increasingly depend on organizing project-oriented "teams" and "clusters" of individuals from different parts of a hierarchy who function semiautonomously until a project is completed. Although some work and management units operate more autonomously than ever, other units span more boundaries than ever (e.g., the case of strategic planning). One new notion is that organizations should be redesigned around networks instead of hierarchies, and that these networks should be kept in flux. Another notion is that well-managed networks of small companies may increasingly outperform big centralized companies.[19]

Such views have prominent champions, notably Drucker (1988, 1989) and Toffler (1970, 1990), and important shifts are occurring in management theory and practice (Applegate, Cash, & Mills 1988; Bell 1967; Lowi 1972, 1984). But it is easy for enthusiasts to overstate them and claim that more is changing than may be the case. Complex organizations depend on some kind of hierarchy. Hierarchy does not end because work teams include people from different levels and branches. The structure may be more open, the process more fluid, and the conventions redefined; but a hierarchy still exists, whether one is looking at management in the United States, Japan, or another country entering a postindustrial, postbureaucratic phase. The fact that the world is going through a very turbulent and, in many ways, revolutionary period of change means that many kinds of hierarchies are being disrupted and overturned; but this may be a transitory phase, until the information revolution and a new world order result in a new set of hierarchal relationships.

Decentralization is another important trend for many states and societies. The evolution of technology has matched the trend, because the initial emphasis on centralized data-processing and networking through mainframe computers, often run by managers who acted like a priesthood, has given way to the current emphasis on distributed data-processing and networking through small computers linked by local area networks. But decentralization is not the only possibility or solution in all cases.

As management scientist Huber (1990) pointed out, asking whether the new technology may increase or decrease centralization is too general a question, and perhaps the wrong one. In some cases, the new information technologies may enable an organization to become even more centralized, or decentralized, than it is. Huber's (1990) hypotheses also suggested that the computer-assisted communications and decision-support technologies may lead to the reverse: greater decentralization for highly centralized organizations and greater centralization for decentralized ones. In addition, operations researchers have shown how organizational decision support systems (ODSSs) may enable decentralized organizations to rest on strong, centralized bases of information (Walker 1991).

The question of whether decentralization or recentralization will prevail becomes even more complex if one asks how the new technology and related management innovations may enable organizations to become more centralized and more decentralized at

[19]My familiarity with these themes benefited from computer-mediated discussions in "EnviroBioInfoWholeEarth Organizational Structures," Topic 468, the Information Conference, on the WELL, Sausalito, Calif., during July–August 1991. Postings by Mitsuharu Hadeishi and Steven Rosell were particularly useful to me. Writings by Tom Peters were referred to during the discussion. Also, numerous articles in the *Harvard Business Review* over the past 5–10 years address these themes.

the same time. Indeed, many analysts have noted that the real question is how to have both. The answer may lie partly in a concept identified by Yale computer scientist Gelernter (1991). Although the new technology fosters decentralization, it may also provide greater "topsight"—a central understanding of the big picture that enhances the management of complexity.

> If you're a software designer and you can't master and subdue monumental complexity, you're dead: your machines don't work. They run for a while and then sputter to a halt, or they never run at all. Hence, "managing complexity" must be your goal. Or, we can describe exactly the same goal in a more positive light. We can call it the *pursuit of topsight.* Topsight—an understanding of the big picture is an essential goal of every software builder. It's also the most precious intellectual commodity known to man. (Gerlernter 1991, p. 52)

Although many treatments of organizational redesign laud decentralization, it alone is not a decisive issue—the pairing of decentralization with topsight may be what offers the real gains.

Furthermore, the demise of middle management may be a suspect notion. Many companies have reported reductions; in some, this stems from installing computer networks to track information that used to employ numerous clerks and middle managers. But this reduction may be a transitory trend. Former AT&T lab director Penzias (1990) suggested that middle managers may be needed more than ever, particularly to maintain links between different working groups in large organizations: "As I see it, these growing needs for the services that middle managers provide are the key driving forces behind the dramatic changes taking place in the employee mix of information technology companies" (p. 191).

As cyberocracy develops, will governments become flatter, less hierarchal, and more decentralized with different kinds of middle-level officials and offices? Some may, but many may not. Governments may not have the organizational flexibility and options that corporations have.

In the U.S. government, interagency working groups and task forces have been a common phenomenon for over a decade. This has not meant less hierarchy and middle management, but it has meant a more networked form of organization. At the apex, the White House and the National Security Council are stronger operationally as a result of their growing information and communications capabilities. In some instances, officials there have designed and implemented some policies and operations without apprising other parts of the government. But the latter are catching up and catching on; more, not less, coordination and consultation should be expected in the future. The notion of enhancing decentralization and improving flexibility and performance through clustering small business companies around a central company has a governmental counterpart in the privatization of public services and procurement, although this has not proceeded far yet.

In other words, the postbureaucratic state may end up configured quite differently from the traditional bureaucratic state. If so, future studies of political rivalries and struggles in a government redesigned for the information age will read quite differently from contemporary studies of bureaucratic politics.

Public and Private Sector Relations

The development of the new infrastructure should raise issues about relations between the public and the private sectors. One issue is access by officials to public and private communications networks, conferencing systems, and data banks located outside government circles. For now, this is barely an issue. In some instances, a limited capacity exists (e.g., to get copies of media reports, or to enable an official to communicate with an international agency), but few officials are interested. Eventually, however, officials at all levels may want access to external networks to help answer questions or exchange views. For a cyberocracy, such access would seem desirable (albeit for some countries and governments more than others). Should an official be able to connect to any service he or she needs in the public or private sector? Or should diverse, separate networks and utilities be built to accommodate official needs, including for privacy and security? Such questions, rarely asked today, are bound to grow in importance.

A second, more general, issue is the effect on definitions of, and relations between, the public and private sectors. The boundaries are blurring between the two sectors. At the same time, new fusions are resulting from efforts to create public–private partnerships to address many policy problems. According to political scientist Lowi (1972), writing presciently 20 years ago about the potential political impact of the information revolution, "the blurring and weakening of the public–private dichotomy could be the most important political development in the coming decades" (p. 148). A related question—it gets asked particularly by librarians—is whether social imperatives or proprietary interests should govern how information gets organized, stored, and distributed (Schiller 1981).

For many observers, a major phenomenon of our times is the trend toward the privatization and deregulation of economic activities around the world. In many countries, the public sector has seemed to diminish in scope if not strength. Although this trend has received heavy attention, there are indications of an obverse parallel trend: Many political activities that were once considered private (or could be conducted as though they were private) are increasingly public (and publicized). For example, an election or case of corruption that might have been treated as a private affair in some country years ago may now be turned by the media into a worldwide event. Computer networks installed by local communities and governments, like Santa Monica's PEN, may enable previously isolated individuals to make contact and organize a caucus or political action group that nobody expected. Records of electronic mail messages in the U.S. government, and of police computer and radio discussions in major cities, may be released to the press in connection with sensitive legal proceedings.

In these respects, both the private and public sectors are being opened up, expanded, and redefined. The more this proceeds, the more the lines between them are blurred, and the two are fused. The information revolution lies behind much of this. The blurring of public–private boundaries, and of the boundaries between domestic and foreign policy, also has been pointed out often in the literature on transnational interdependence since the 1970s. That literature recognizes the information revolution as one of the factors explaining the growth of global interdependence. In addition, the advent of cyberspace is leading to the creation of new areas of private and public activity. Here, too, distinctions between public and private and between commercial and noncommercial are blurring. For example, the research-oriented NSFNET/INTERNET is not supposed to carry commercial communications. However, some commercial actors have long had access to it (evidently for activities deemed noncommercial), and a Commercial

Internet is being fused to it. A few years ago, questions were not answered easily about whether subscription systems like the WELL (where the question was often discussed) should be allowed access to the INTERNET; but a few months ago, the WELL joined it.

Where will this lead? Will it mean that traditional distinctions between public and private become relics of the industrial age? At a minimum, people may need to think less in terms of turning to government or the private sector to solve a problem, and more in terms of building cooperative partnerships across public and private boundaries and across all levels of government. This seems to be both an implication of the information revolution and a task that cannot be achieved without its tools, given the degree of consultation and coordination that may be required.

Beyond that, political scientist Benjamin (1980) suggested that the public–private distinction may be outmoded. He also suggested that the development of postindustrial societies will raise the importance of "collective goods" and services that stand between but are different from public and private goods and services, traditionally conceived. In this view, institutional redesigns will be needed in the United States and elsewhere to deal with the changing nature of goods and services that people demand (Benjamin 1980, 1989). Bell (1987) once pointed out that "the nation–state is becoming too small for the big problems of life, and too big for the small problems of life. . . . In short, there is a mismatch of scale" (p. 14). But Benjamin and others argued that scale is not the key issue; the whole relationship between what is public and what is private, and thus between state and society, may be headed for redefinition, domestically and internationally. Bell (1980) might well agree, for he too has argued that information and knowledge are tantamount to collective goods.

The implications for cyberocracy are unclear and speculative. They may mean a continuation of "big government," but they also may mean greater interconnection, consultation, and collaboration between the public and private sectors, if not the creation of a whole new sector that is separate from, but also mediates between, those two traditional sectors. This new sector may turn out to be crucial for cyberocracy to work. Meanwhile, it is difficult to see how smaller government will be the result, because vast data collection, storage, analysis, manipulation, and dissemination capabilities may be required. Perhaps governments will need fewer middle managers and clerks in the future. Perhaps many data collection and storage activities can be turned over to agencies outside government boundaries. But personnel with new skills also will be required. It may be increasingly difficult to tell where the boundaries of government stop.

From Hierarchies to Networks

A theme emerges from these considerations: The information revolution appears to be making "networks" relatively more important, and interesting, than "hierarchies" as a form of organization. This may mean that transaction-cost analysis—the approach to organizational economics that germinates with Ronald Coase and culminates in the writings of Oliver Williamson—should be modified, so that the concept of networks is added to its traditional emphasis on the concepts of markets and hierarchies. This may have profound implications for the cybercratic state, both for how it is organized internally and for the kinds of external actors to which it must respond.

The information revolution, in both its technological and nontechnological aspects, sets in motion forces that make life difficult for traditional, hierarchal institutions. These forces disrupt and erode hierarchies, diffuse and redistribute power, redraw boundaries, broaden spatial and temporal horizons, and compel closed systems to open. This creates

troubles, especially for large, bureaucratic, aging institutions, but the institutional form per se is not obsolete. It remains essential, and the responsive, capable institutions will adapt their structures and processes to the information age. Many will evolve from traditional hierarchal to new, flexible, network-like models of organization (Malone & Rockart 1991; Sproull & Keisler 1991b; Bikson et al. 1991).

Meanwhile, the network phenomenon is not only modifying an old form—that of large hierarchal institutions—but also giving rise to a new form. The very forces that cause troubles for old institutions (e.g., the erosion of hierarchy) favor the rise of multiorganizational networks of small organizations. Indeed, the information revolution is strengthening the importance of all forms of networks—social networks, communications networks, and so on. The network form is very different from the hierarchal form. Although institutions (large ones in particular) are traditionally built around hierarchies and aim to act on their own, multiorganizational networks consist of (often small) organizations or parts of institutions that have linked together to act jointly. The new technology favors the growth of such networks by making it possible for dispersed actors to consult, coordinate, and operate together across greater distances, for longer periods of time, and on the basis of more and better information than ever before.

One implication, then, is that many government institutions may evolve to become "networked organizations." A second implication is that "organizational networks" may develop in between many of those institutions, their parts or their agencies, including across national borders.

There is a third implication, as well. The rise of multiorganizational networks is an important trend, but less in the government than in the business world. It seems most important in the realm of civil society. Growing numbers and varieties of nongovernment organizations (NGOs—some of them also called private voluntary organizations, PVOs) are forming network-like coalitions, in many instances to strengthen their efforts to influence the behavior of governments and businesses. The examples include new networks among special interest, public interest, pressure, lobbying, and/or advocacy groups. Some of the best examples may be found among activist movements on the left and center–left that revolve around human-rights, peace, environmental, consumer, labor, immigration, racial, and gender-based issues. These movements, especially those that use PeaceNet and other communications services, increasingly blend the organizational, social, and physical dimensions of the network concept.

A third implication, then, is that the network phenomenon may intensify interactions between state institutions and the organizations that deem to represent civil society. This may raise the requirements for the actors in a cybercratic state to have access to information and communications infrastructures that lie outside official structures, at the interface between state and society.

Concluding Comment: Revaluing Values

Not long ago, people worried that the information revolution and the relentless advance of technology and technocracy might mean that their lives would be run by heartless computers, and that government would be reduced to a "Hell of Administrative Boredom" (Lowi 1972). This surely will not be the case. The information revolution has led, and continues leading, to intense questions about values and new debates about choices and conflicts among them. Indeed, the new technology is unsettling, in part because it permits unprecedented exchanges of values, information, and propaganda, within and between nations (Webster 1984).

Cyberocracy ultimately concerns the nature of governance. Because of this, the concept leads directly to questions about freedom, privacy, and security of information. The concept cannot be developed without raising broader value-laden questions about the nature of authority, freedom, equality, and democracy in the information age (or whatever one prefers to name the future). Whether and how to interconnect different parts of the government (not to mention state and society, generally) and, at the same time, safeguard their autonomy cannot be answered without making value judgments (Brand 1986).

In a sound cautionary statement, Michael (1983), a professor of planning and public policy at the University of Michigan and a senior analyst of information revolution issues, has summarized this challenge:

> To my mind, more information and more information technology pose for all levels and types of institutions the greatest challenge facing civilization—short of avoiding nuclear holocaust. The depth and extent of the challenge is evidenced by a summary of consequences that accompany an information-rich world: [It] 1) changes and redistributes the loci of power and action; 2) changes the operational and, eventually, the symbolic meanings of "sovereignty," interdependence and authority; 3) changes the relevant understanding of social process from disconnected, linear, cause/effect relationships to multiply interconnected, circular relationships of cause-effect-cause-effect-cause . . . ; 4) forces priority valuing of issues that have been secondary to the focus of governments or corporate responsibility: the planetary environment, future generations, biological impacts; 5) undermines the conventional definition of leadership competence; 6) requires a portion of citizenry that can think and value accordingly. (p. 41)

Democratic and Totalitarian Possibilities

Will cyberocracy favor democratic or authoritarian and totalitarian tendencies? At present, the information revolution seems to strengthen democratic forces around the world. But totalitarian cyberocracy also remains a possibility.

A Single-Edged Sword Favoring Democracy?

Many analysts have been optimistic that the information revolution should strengthen democratic tendencies. This optimism generally has three bases. First, it is argued that the new technology—all types and sizes, including computer hardware and software, radio and television receivers, cellular telephones, fax machines, cassette and video tapes, networks, etc.—is spreading into more and more hands around the world. Thus, no regime will be able to isolate itself or its country from the information revolution, nor will any regime be able to centrally control the technology or the people who use it. The "Big Brother" system of George Orwell's *1984* will not be possible. Most readers forget that Big Brother was not all-seeing. Only about 10% of the people were monitored at any time.

Second, as a result of improved access to information resources, the presumably smaller, weaker actors should be able to compete on more equal terms with bigger, stronger actors. Power should accrue more to individuals than to institutions.

> The universal availability of electronic libraries, with their power to organize and select information, means that individuals can compete with organizations and organizations can compete with the state on more equal terms. . . . A similar argument holds good for the developing countries seeking to compete economically and politically with the developed nations, and with the multinational companies. . . . (Ducker 1985, p. 167)

> The power of entrepreneurs using distributed information technology grows far faster than the power of large institutions attempting to bring information technology to heel. Rather than pushing decisions up through the hierarchy, the power of microelectronics pulls them remorselessly down to the individual. (Gilder 1989, p. 346)

Second, the "open" societies of the world seem better suited than the "closed" societies to take advantage of the new technologies and to respond to the challenges they pose to established concepts of national sovereignty and governance. Moreover, information and communications flows appear to be a powerful instrument for compelling closed societies to open. Thus, U.S. Secretary of State George Shultz (1985a), writing before the revolutions of 1989 proved the point in Eastern Europe, believed that:

> The free flow of information is inherently compatible with our political system and values. The communist states, in contrast, fear this information revolution perhaps more than they fear Western military strength. . . . Totalitarian societies face a dilemma: either they try to stifle these technologies and thereby fall farther behind in the new industrial revolution, or else they permit these technologies and see their totalitarian control inevitably eroded. . . . The revolution in global communications thus forces all nations to reconsider traditional ways of thinking about national sovereignty. (p. 716)

If the Soviet regime risked adopting the new technologies, Shultz (1985a) and others (Stonier 1983) predicted (correctly) that its leaders would have to liberalize the Soviet economic and political systems.

Recent events in Eastern Europe, the former Soviet Union, China, and, to a lesser extent, Latin America have provided exciting evidence for the democratizing effects of the information revolution. As long as the aim in the West is the demise of communist and other traditional hard-line authoritarian systems, policymakers in the United States and Europe are well advised to expect that the diffusion of the new technologies will speed the collapse of closed societies and favor the spread of open ones (Builder & Bankes 1990; Wilhelm 1990).

However, the fact that the new technology can help sweep aside old types of closed regimes does not necessarily mean that it will also make democratic societies more democratic, or totalitarian ones impossible. The technology may have different implications for postindustrial societies than it has had for industrial and less-developed societies.

A Double-Edged Sword with a Dark Side?

A longer view of history provides little assurance that the new technology favors democracy. Centuries ago, the coinage of money and the invention of the printing press enabled liberal democracy to emerge:

> With the arrival of the printing press, the dikes holding back the flow of information broke. The great increase in the circulation of knowledge stimulated the generation of additional knowledge in an explosion that echoes to this day. By democratizing access to recorded information, the printing press set in motion the spread of literacy and education, literature and the arts, science and technology, and commerce and industry that led to the industrial revolution and the creation of democratic governments serving at the will of an informed populace. (Levien 1991, p. 210)

The printing press was a key technology enabling the Renaissance, the Protestant Reformation, the end of feudalism, the rise of modern science and capitalism, and the colonial expansion of the European empires to the New World and Asia (Eisenstein 1968, 1979; Innis 1950).

Yet, the printing press and later technologies (e.g., the telephone and radio) did not prevent new and ever worse forms of autocracy from arising. Early on, these technologies contributed to the demise of the old monarchies and the broadening of popular participation in politics. But later, these same technologies were turned into tools of propaganda, surveillance, and subjugation that enabled dictators to seize power and develop totalitarian regimes. The fascist regimes of the 1930s and 1940s and the communist regimes of later decades are the prime examples.

In other words, we should not dismiss the possibility that the new technology may serve antidemocratic purposes in the future. This does not mean that technology is value-free, neutral, or apolitical. What technology does is widen the range of possibilities within a particular context. As Bell (1979) pointed out:

> The new revolution in communications makes possible both an intense degree of centralization of power, if the society decides to use it in that way, and large decentralization because of the multiplicity, diversity, and cheapness of the modes of communication. (p. 36)

The effects depend on the context. The new technology, like the old, may induce some cultural and political change, but it also may enable a given system to further refine the political structures that are most acceptable to its culture, which may not be democratic in the Western sense. The revolutionary change from the Shah to the Ayotollah Khomeini in Iran is an example where too much information of a modernizing nature may have helped induce a reaction and a return to a traditional Islamic preference to exclude outside information. Yet, it also should be noted that, in his quest for power, Khomeini took advantage of the information revolution by using smuggled cassette tapes to spread his message among the Iranian people.

French social critic Ellul (1990) extended the argument by insisting that technology, far from being neutral, is fundamentally "ambivalent." It is bound to generate harmful effects that are inseparable from its beneficial effects:

> This is why all the dissertations on autonomy (individual and institutional), decentralization, personalization, the growth of liberty, the opening up to small groups, and democratization thanks to new technologies—and these dissertations have multiplied infinitely over the past few years—are absolutely futile and inconsistent. For they ignore the feature which is intrinsic to the very being of technique: its irrepressible ambivalence. (Ellul 1990, p. 76)

Research on how the new technology may affect local government in the United States supports the view of "communications and information technologies as malleable political resources that are most often designed and used in ways that follow and reinforce the existing structure of power." Depending on the situation, especially what kinds of leaders are in power, the new technology is "capable of facilitating change or stability" (Dutton 1988; see, also, Kraemer & Dutton 1979; Laudon 1974; Dutton 1982; Kraemer 1991). Its inherent ambivalence makes it malleable.

In short, the existence of democracy does not assure that the new technology will strengthen democratic tendencies and be used as a force for good rather than evil. The new technology may be a double-edged sword even in a democracy.

A classic, but ignored, set of studies sponsored by The Conference Board provided ample, grim warnings of this possibility in 1972. Although recognizing that the new technology might help empower the individual, the authors—notably Crecine & Brunner (1972), Lowi (1972), and Michael (1972)—variously emphasized that the results could instead include: increased susceptibility of the individual to outside manipulation, a rise in the number and diversity of ad-hoc interest groups and social movements, increased fragmentation and fractionalization of society and politics, greater stratification and centralization of society around information resources, and greater efforts by some policymakers to control access to information and use it to manipulate the public.

Evidence for these concerns has appeared in the conduct of party politics in the United States. Despite initial hopes that "electronic democracy" and "teledemocracy" would increase popular participation and government responsiveness, mainstream analysts have continued to worry that the new technology may be used to undermine democratic practices. Observations to this effect were made in the early 1980s by political scientist Neustadt (1985):

> A wave of new technology will transform campaigning, political organizing, news coverage, lobbying, and voting. Some of these changes may make campaigning less costly and bring decision-making closer to the people. But the greatest impact may be to fragment our politics, narrowing people's perspectives, shifting more power into special interest groups, and weakening the glue that holds our system together. (p. 561)

With the development of "narrowcasting networks" tailored to small audiences, "many people may end up knowing less." Worried that power has been shifting from the political parties to narrow interest groups for decades, Neustadt (1985) raised the now widespread concern that "the new technologies will further dilute the fragile glue of the parties and of public identification with broad ideas" (pp. 564, 567). Such concerns are being renewed with Ross Perot's calls for creating an "electronic town hall."

For other analysts, the key concern is the effect on government administration. The potential dark side is captured in studies warning about the emergence of a "computer

state" (Burnham 1983), a "dossier society" (Laudon 1986), and a "surveillance society" that may limit personal liberty in the United States (see, also, Bell 1979). These studies show that the new technology may facilitate the monitoring and surveillance of people on the job and elsewhere, the amassing and merging of enormous statistical data banks for profiling individuals and their activities, and the restriction of access to "strategic" and "secret" information. After all, the U.S. government has more data on its citizens than any totalitarian government has on its citizens.[20]

The enactment of sound privacy and security laws should prevent abuse. But these authors suggest that there may be a natural tendency for powerful, enterprising actors to use the new technology in ways that may limit, if not jeopardize, individual freedom and knowledge. According to Burnham (1983), cheap computing power makes it easy to amass "transactional information" on individuals (e.g., records of phone calls, credit payments, medical and criminal histories) in huge data bases, and transmit them anywhere. Instead of empowering the individual over the institution, these data bases and networks favor "the growing power of large public and private institutions in relation to the individual." The result is likely to be the abuse of individual rights, and "a gradual drift toward authoritarianism" that is subtle because of "a lack of obvious villains" in our democratic system (pp. 9, 234). The problem to guard against is not only the "abuse" of "personal information" by public sector agencies, but also its "use" by the private sector for marketing, investigative, and other purposes (Ware 1991).

Today's concerns revolve mainly around data-base capabilities. But in the future, ubiquitous computing may raise additional concerns. Weiser (1991) of Xerox PARC warned of the possibility that:

> Hundreds of computers in every room, all capable of sensing people near them and linked by high-speed networks, have the potential to make totalitarianism up to now seem like sheerest anarchy. Just as a workstation on a local-area network can be programmed to intercept messages meant for others, a single rogue tab in a room could potentially record everything that happened there. . . . [Yet a] well-implemented version of ubiquitous computing could even afford better privacy protection than exists today. (p. 104)

More ominous visions by less moderate thinkers raise specters of "technological terrorism" (Ellul 1990) and "friendly fascism" (Gross 1980) being imposed with velvet gloves. Ellul's (1990) point was subtle. In his view, the entire, optimistic, uncritical, "discourse" about the new technology, and the pervasive insistence that people must become acclimated to it, represent a form of "terrorism which completes the fascination of people in the West and which places them in a situation of . . . irreversible dependence and therefore subjugation" (pp. 384–385). In his analysis, a new "aristocracy" is leading people to believe that a computerized society is inevitable, and that they have no choice but to succumb to it:

> The ineluctable outcome is dictatorship and terrorism. I am not saying that the governments that choose this as the flow of history will reproduce Soviet terrorism. Not at all! But they will certainly engage in an ideological terrorism. (Ellul 1990, pp. 386–387)

[20]Heard on television program "Smithsonian World," KCET (Channel 28, Los Angeles), April 16, 1991.

The irony for Ellul (1990) was that people are being led to think the technology will enhance their freedom, when, in his view, it is bound to limit their freedom.

Unlike the other critics represented here, Gross (1980) did not focus on information technology. But its potential uses for surveillance and control undergird many concerns he raised:

> [T]he means of control over this great mass [of technology] has been developed to such a degree that centralized systems can keep tabs on incredible amounts of information over long sequences of widely dispersed and decentralized activities. (Gross 1980, p. 51)

Gross's (1980) work reflected standard socialist concerns that big government and big business in the advanced capitalist countries collude to the detriment of society. Nonetheless, his concept of "friendly fascism" contributes to this study by suggesting that the information revolution may, in time and in some places, give rise to political systems and practices that purport to be democratic but are not.

Totalitarianism Far from Finished?

Americans regard democracy (especially our own) as the highest achievement of centuries of political evolution. Moreover, many also believe that evolution favors democracy as its leading edge and strongest contender. Both beliefs may well be valid.

Nonetheless, the long history of humanity's political progress—from tribes and city-states, through theocracies, monarchies, and empires, to the creation of modern nation-states and republics, with their modern bureaucracies and political parties—has not yet given rise to either democracy or totalitarianism as a final political outcome. Democratic, authoritarian, and totalitarian tendencies have occurred and vied for preeminence at every stage. Thus, some monarchies provided people more individual freedom and protection under the law then did others. In recent decades, the United States and the Soviet Union coexisted as the democratic and totalitarian archetypes of the modern bureaucratic state and party system.

Moreover, across the centuries of political evolution, with each passing stage, the span between democratic, autocratic, and totalitarian possibilities has grown wider. There was less difference between the milder and harsher monarchies of the Middle Ages than between the capitalist and communist systems of recent years.

The development of cyberocracy may fit with this historical trend. Cyberocracy, far from favoring democracy or totalitarianism, may make possible still more advanced, more opposite, and farther apart forms of both. In the United States and other countries where democracy has deep roots, the information revolution may render up new instruments and opportunities for ordinary citizens to exercise their freedoms, improve their ways of life, make political choices, and protect their personal interests. But elsewhere, the tools of cyberocracy may give a state apparatus and its rulers powerful new means of control over their citizenry, with an official ideology determining what information is allowed.

Perhaps the leading edge of history does favor liberal democracy. Yet, behind that edge, regimes that are antidemocratic, authoritarian, and totalitarian have kept cropping up, especially where a charismatic leader is able to generate public consensus in favor of tyranny. The conditions under which such regimes arise often include irrevocable desires to catch up to a more advanced and powerful country, to spread one's own influence

abroad, to resist if not defeat an external enemy, to counter a threat to internal control, to have a regime that imposes order and simplifies what people should think and do following a period of disarray and information overload, and simply to remain in power. Such conditions still exist in many places today. The inequality of socioeconomic conditions around the world; the vigor of many national, religious, ethnic, and other rivalries; the interest of many regimes in exploiting technology to exert their power at home and abroad; and the vulnerability of many peoples to charismatic leaders all continue to make it likely that, in more than a few places, perhaps especially in the Third World, ruling elites and their security forces will use the new information technologies for antidemocratic purposes.

For example, events in China since the demonstrations in Tiananmen Square confirm that exposure to the information technology revolution is politically risky for a totalitarian regime. But these events also show that such a regime can learn to exploit the technology (Ronfeldt 1990). Meanwhile, an ostensibly democratic country, Singapore, is making the most determined effort in the world at the informatization of all parts of society (Gurbaxani et al. 1990). But as this develops, the specter of undemocratic controls is rising.

There is no assurance that the information revolution will favor glasnost and democracy in the long run. The cold war may be over, and liberalism may be carrying the day in many places, but totalitarianism may be far from finished. The advent of cyberocracy may help us realize how fruitful democracy can be in countries like the United States. Yet it also may mean that we have yet to see how thorough totalitarianism can be. Far from favoring democracy or totalitarianism, cyberocracy may facilitate more advanced forms of both. It seems as likely to foster further divergence as convergence, and divergence has been as much the historical rule as convergence.

In the past, the divergence principle was most evident between countries. In the future, another possibility is that the principle may increasingly apply within countries. The information revolution may enable hybrid systems to take forms that do not fit standard distinctions between democracy and totalitarianism. In these systems, part of the populace may be empowered to act more democratically than ever, but other parts may be subjected to new techniques of surveillance and control.

Comment on Political Philosophy and Social Structure

The information revolution also may lead to new political (and economic) philosophies and ideologies. The creation of computers, robots, artificial intelligence, and now artificial life (Levy, 1992) has led many thinkers to ponder the philosophical, ethical, and psychological implications for one's place in the universe; the concept of the self; the distinction between man and machine; and the nature of the mind, intelligence, and life itself.

> We have seen the computer begin as a mere instrument for generating ballistic tables and grow to a force that now pervades almost every aspect of modern society. In an important sense, it has already transcended its status as a mere tool to be applied to specific tasks. It has become a symbol, indeed a source, of questions that were in earlier times asked only by theologians and philosophers but which have now, in part because of the role computers and computations play in the world, attained immediacy and urgency. (Weizenbaum 1980, p. 438)

Writings in these philosophical areas have raised questions of freedom and power (e.g., whether man will be the master or the slave of the new technology, and whether it will liberate or isolate man as a social being). But many such writings seem theoretically abstract and lack clear import for political and economic philosophy. In general, scientists, philosophers, and social theorists do not seem to know yet what to make of the information revolution, although some recognize it may have profound implications (Forester, 1980, 1985, 1989).

The political content of many philosophical discussions still reflects terms of debate inherited from the industrial era and the rise of the nation-state. It may be argued that the information revolution will affect the philosophical bases of society, among other concerns. But the terms are usually adaptive. Information is viewed as a factor that may cause adjustments and modifications in prevailing forms of philosophy and ideology, but not an entirely new system of thinking about politics and society.

In addition, there is a substantial literature that focuses on the effects of the new technology and the information factor on capital and labor. Although many analyses recognize that the technology may foster economic and social change, there has been a tendency to view it as just another capital-intensive, labor-saving technology in a long line of such technologies (Simon, 1980). Thus, procapitalist writers herald the potential benefits for economic efficiency, productivity, profit, and competition, whereas their critics emphasize potential costs, such as job displacement; unemployment; and the exploitation, dehumanization, and alienation of the worker (Block & Hirschhorn 1979; Solomonides & Levidow 1985). In the 1970s and 1980s, before the tide rose against socialism, this literature provided arguments over whether capitalism or socialism was more likely to be strengthened by the new technology, and which of the two systems would be more capable of maximizing the benefits for people and society.

However, if the information revolution proves as powerful as its key theorists and enthusiasts expect, it is bound to change the nature of the philosophical concepts to which we are accustomed. Today's political labels (capitalism, socialism, liberalism, totalitarianism, democracy, and autocracy) may prove inadequate.

How this may occur and what may result are unknown. But I offer a speculation that uses some of the language of Marxism.

Cyberocracy may spell the obsolescence and transformation of standard Marxist theses. Karl Marx may have been a visionary with a sense of history; but he was still a man of his time, the mid-19th century, when industrialization was just taking off. Thus he made "capital" the key factor in his vision, and Marxism made it a central theoretical concern of intellectuals worldwide as industrialization gained momentum in the late 20th century.

Yet, although claiming to abolish capital as a basis of power, the Marxist-Leninist governments of the 20th century built huge states based on the centralization and manipulation of information.

> [S]tate monopoly on information is a very central part of the blueprint for governance in these states, not just in wartime or under duress, but as a routine matter. Indeed, if one takes what are usually called the stable governments of the world, strict state control of public information is a more sharply distinctive characteristic setting apart Marxist-Leninist governments than anything else commonly coded, such as economic distributions. In practice, if not in theory, this information control is simply the defining signature of such states. (Converse 1985, p. 8)

A central ideology, an enormous bureaucracy, a single party, government-controlled propaganda and news media, powerful and pervasive security services, privileges for high-level bureaucrats, the suppression of intellectual dissent, no real freedom of information and expression for common citizens, the jamming of foreign broadcasts, restrictions on travel and communications abroad, restrictions on the availability and use of information and communications technologies—what more could a totalitarian information controller want to work with?[21]

Communist regimes were slow to join the information revolution. In the 1950s and 1960s, the old guard of the Soviet regime, led by Joseph Stalin, objected to the emerging cybernetic theories about information's importance, and upheld Marxist-Leninist precepts about the importance of labor. However, ideas from East European socialists resulted in a major debate about the role of advanced science and technology in social and economic development. As the debate continued in the 1970s and 1980s, a new generation of Soviet bureaucrats and technocrats became convinced that computerized information processing was crucial for the development and security of the state.[22] This led the regime to install thousands of automated management systems for economic, administrative, and military purposes, and to train thousands of people in their use. Importing new technology from the West was rationalized on the grounds that the socialist systems would prove better at using it.

Two dilemmas persisted into the 1980s. One was the difficulty of reconciling cybernetic thinking, as developed in the decentralized West, with Marxist-Leninism. This may be illustrated by an old Soviet review of a Soviet book about using computers to identify a Pareto-optimal consensus in a conflict situation. The reviewer criticized the author for closing his eyes

> to the potential danger of using cybernetics and mathematics as tools of economic research if mathematical-economics models are detached from Marxist-Leninist methodology. . . . There is no place in his "study" for Marxist methodology, which is replaced by the methodology of cybernetics. (Anonymous 1978)

The other dilemma concerned the spread of personal computers, which began to occur under a concept known as the "collective use of personal computers." Access remained tightly controlled. For a system where few people had telephones, private ownership of mimeograph machines was not allowed, and typewriters had to be registered with the authorities, the personal computer posed a risk to the centralized control of information and the security of government data banks. However, partly because of military concerns to develop a computer-literate population, education and training pro-

[21]Not must Marxist-Leninist regimes, but all totalitarian regimes, rightist and leftist, show similar patterns of information control. The examples include François "Papa Doc" Duvalier's regime in Haiti and Fidel Castro's regime in Cuba. A related aspect was the attempt in the 1970s and 1980s by some Communist and Third World nations to establish through UNESCO a "new world information order." Its protagonists proposed international standards and a licensing system for journalists that would have subordinated news agencies to government dictates. They also proposed to have UNESCO finance improvements in the communications facilities of liberation movements.

[22]Although I lack data, a similar concern to make use of the new information technologies may explain why Cuba had an Institute for Cybernetic Socialism in the 1980s.

grams began as a national priority (on a table-top model called the Agat, or Agatha, modeled after the Apple II).

In short, successive Soviet regimes followed Marxist-Leninist precepts to claim that they had abolished capital accumulation as the basis of political power and social structure. But, in the process, they substituted another basis that Marx did not foresee and that may represent the antithesis of his initial ideals: the accumulation and control of information.[23]

If a Marxist were to reappear in the late 20th century, is it not doubtful that he or she would again focus on "capital"? Would the focus instead be on "information"? In the postindustrial age, information may succeed capital as a central theoretical concept for political and social philosophy. This is suggested by some of the major writings cited in this study (Bell 1967; Drucker 1985, 1986; Toffler 1990; Wriston 1988/1989). More to the point, international communication theorist Frederick (1993) said that "If Karl Marx were alive today, he would not write *Das Kapital,* but 'Die Information.'" If true, it may bring a twist to the old Marxist dialect.

According to Marxism, the capitalist accumulation of "surplus labor" and labor's exploitation by "monopoly capital" account for a society's structure and its ills and inclinations. That structure is composed of socioeconomic "classes" that are defined by the "relation to the means of production of capital."

But the postindustrial age may instead raise a new concern about "surplus information" or "monopoly information" that is concentrated, guarded, and exploited for privileged economic and political purposes. Moreover, a society may become structured into new kinds of classes—dare I say, "cyber strata" and "cybernets"—depending on one's relation to the means of production of information. There may be lower, middle, and upper classes of information haves and have-nots. Special cybernets may develop inside organizations, as illustrated, for example, by who participates in which work teams and who may be included or excluded from access to a particular network or data bank.[24] Some nets may cut across organizational and jurisdictional boundaries, fostering the vise of "transnational political factions" (Builder 1990) and virtual communities.

Marxist theorizing placed the capitalist system, its wealthy elites and corporations, in center-stage, especially for societies where the private sector was powerful, labor struggles were repressed, and the public sector was small and weak. But the information age and the growth of cyberocracy may bring bureaucratic (and postbureaucratic) administrative systems to center-stage as the new villains, especially where the state and related public sectors may try to dominate society and become the main repository and dispenser of information shielded from public accessibility. State bureaucracies seem as likely as private corporations to hoard "surplus" information.

Thus, were a new Marxist to appear today, he or she might well be disturbed by statist systems based on the monopoly control of information. The United States and other market-oriented systems bore the brunt of anticapitalist criticism. But, in the future, leftist, rightist, and other kinds of systems based on large, secretive, authoritarian bureaucracies (or cyberocracies) may be the appropriate target for information-centered criticism.

[23]Marxism-Leninism was not the only reason. Culture and tradition have disposed Russian rulers since long before the Russian Revolution to seal their nation against foreign influence and impose strong press and other informational controls over the local population.

[24]My point about cybernets may be related to Bell's point about situses of knowledge elites. Cybernets may be interconnected situses.

The fact that socialism and communism have proved unfit as routes to freedom, equality, and prosperity does not let the private sector off the hook. According to some accounts, the major threats to privacy now come less from government agencies than from corporations that are compiling vast amounts of demographic, credit, and other types of personal data that may be used for marketing, investigative, public relations, and other purposes (Ware 1991).

Coda

The information revolution has resulted in hundreds of studies about the new technologies and their current and potential effects. Many studies reiterate similar speculative points (this study is no exception). But, as critic Marien (1985) noted:

> Unfortunately, no effort has been made to collect all of these forecasts, assessments, speculations, and warnings to determine what is known and not known, identify areas of agreement and disagreement, and establish the range of proven policies that might be pursued. Ironically, in the midst of an inchoate revolution in communication technology, this relatively simple act of communication between researchers and responsible policy-makers has not occurred. . . . The fragmentation of perspectives increasingly found in the wider society is reflected in the subject of communications itself, which is studied by the professions of journalism, education, and information science (formerly library science), and such cross-disciplinary areas as computer science, management science, behavioral science, language and area studies, and future studies. Adding to this intellectual tumult, researchers in the social sciences often specialize in the economics, politics, and sociology of information and communications. Occasional government studies attempt to provide some overview, but little or no effort has been made by governments, foundations, research institutes, or leading universities to try systematically to overcome the rampant bureaucratization of knowledge in general and thinking about communications in particular. (pp. 651, 657–658)

Marien (1985) also claimed that the lack of communication among researchers and policymakers is "largely due to our obsolete industrial era colleges and universities, which encourage attention to small and 'manageable' questions, technical questions that result in 'hard' answers, and questions that conform to the configurations of the established disciplines and professions" (p. 657).

It remains true that the new views about "information" do not fit well into the standard academic disciplines and research fields. Marien's (1985) call for greater coherence indicated that it may be time for a new academic discipline or field to emerge, as earlier times resulted in the fields of economics and political science.

Cyberologists, Arise

Of the many studies of information and communications issues, few offer grand conceptual and theoretical possibilities. A key reference point for many computer and information scientists, the information theory developed by Claude Shannon (Gilder 1989), focused on distinguishing signals from noise and transmitting them efficiently from one place to another. But it is a technical theory and has little import outside scientific and

engineering circles. The works of McLuhan, a key reference point for many social scientists, illuminate the importance of the new communications media for society. But his works, too, have limited theoretical reach.

Instead, the analyst in search of the bases for a possible new discipline is advised to turn to thinkers who bridge the hard and soft sciences, like Wiener (1948, 1950), the father of cybernetics, who called for a new discipline in the 1950s. Since the 1970s, extensive intellectual ferment has occurred around the idea that all organized systems, including living organisms as well as societies, depend at their core on how information is generated, transmitted, processed, and controlled. This is leading to an "information-processing view of human organization and society" that means, according to social scientist Beniger (1990),

> the proper subject matter of the social and behavioral sciences, if they are to complement studies of the flows of matter (input-output economics) and energy (ecology), ought to be information: its generation, storage, processing, and communication to effect control. (p. 38)

Following these leads, I suggest another term, *cyberology,* to describe the possible field of study. Its content should extend beyond what are currently treated as information science and management, and encompass aspects of sociology, political science, economics, psychology, and anthropology. As Beniger (1990) indicated, such a field should draw on systems theory, game theory, and decision theory. It could include artificial intelligence and the new field of artificial life.

The subject matter may seem diverse in today's terms, because it may span topics that analysts do not normally group together. Yet this diversity may embody as much coherence as any other academic discipline or field of research. University and research centers might be well advised to develop research capabilities in this respect. Policy-makers in Washington and elsewhere at home and abroad will have an increasing need for analyses that sort out and assess the issues raised by the spread and use of the new technologies.

Next Steps

The author remains uncertain about how the concept of cyberocracy should be defined, and what should be its scope. Should it refer to an organizational successor to bureaucracy? To a new form of government, mostly affecting the executive branch? To a new relationship between state and society? To the proprietors and regulators of cyberspace? All these possibilities have been discussed or hinted at in this paper, although it has concentrated on the first two.

At the same time, the author has become increasingly certain that new research is needed about the effects of the information revolution on government and politics, and that the concept of cyberocracy should be fielded for discussion despite its imprecision. What follows is a sketch of some items for future research that, if pursued, would help further develop this concept and anticipate its implications (see, also, Bankes & Builder 1992).

Methodology for Assessing Information and Communications Infrastructures. There are well-developed methodologies for analyzing political and economic systems. Moreover, an analyst who knows a lot about a nation's economic system probably knows something about its political system too; and vice-versa. In contrast, methodologies are lacking for

analyzing information and communications infrastructures and systems, except in limited technical and managerial senses.

A methodology needs to be developed for assessing institutions, elites, governments, and international relations from a cyberological viewpoint. Such a methodology could help the analyst better understand a nation's economic and political systems and what makes them function (or not function) together. It could help identify what information and communications infrastructures may be needed to support, for example, policies to liberalize an economy or political system, improve public education, foster regional integration, and/or build networks for global cooperation. A methodology also might serve to identify vulnerabilities that a country may need to correct or that may be exploited in an adversary.

Although I currently have little idea how to design a methodology, a starting point might be to borrow from the architecture of computer networks and identify different "layers" that must be present for an infrastructure to function properly (Bankes et al. 1992; see, also, Jéquier & Dedijer 1987).

Trends in Government Technology Absorption and Organizational Change. As noted previously, this study has not sought to ascertain the status or the adoption of the new technologies by the United States and other governments. How well are various U.S. offices, departments, and agencies doing at installing and using computerized systems? How are these systems, especially their networks and data bases, affecting the policymaking process within offices and across them? What visions, challenges, and concerns are driving (or slowing) the development of the nascent cyberspace(s) in government? No reports systematically address such questions; answers must be sought piecemeal from diverse sources, and few answers are readily available.

It would be useful to clarify the trends and issues not only for the U.S. government, but also for other major governments, including those in Canada, Japan, and one or two European countries. Data and analysis are so lacking in this area that it is unclear which governments may be doing better than others, why, and whether this has any effect on their relative capacities for policymaking and implementation at home and abroad.

Intragovernmental, Intergovernmental, and Transnational Relations. The governments that succeed in using the information revolution and its associated technologies to develop advanced information and communications infrastructures may leap ahead of other governments in their capacity to deal with current issues, assert their presence, build cooperative networks and partnerships, and cope with competition and conflict at home and abroad. But where is it most important to succeed: Inside the government, to improve internal policymaking processes? Between governments, to build new patterns of consultation and coordination? Or should the focus be on building new infrastructures that bridge between state and society, and between different states and societies?

Some governments may do better in some respects than in others. For example, even if the U.S. government were to lag behind the Japanese at using the information revolution and its technology to improve internal policymaking processes, the United States may do better than Japan at using it to build cooperative relations with its neighbors and partners. It would be useful to clarify these points, because they may have implications for the comparative advantages of governments vis-à-vis each other.

Support for Regional Integration: North America. As the world enters a new era, success at regional integration may become essential for major powers to continue playing strong

roles on the global stage. Progress with regional integration will raise the requirements for the coordination of neighbors' domestic policies and for the establishment of new institutional mechanisms that cut across traditional notions of national borders and sovereignty.

It would be useful to identify whether and how the creation of advanced information and communications infrastructures may affect the prospects for regional integration efforts in Europe, North America, and around Japan. In another study, the author has recommended that this be done for the United States, Canada, and Mexico, one objective being to create conferencing networks and databases that will facilitate elite dialogue on issues of mutual concern across all three countries (Ronfeldt 1992).

Global Interconnection: Networks Versus Nations. We are moving out of an era of global interdependence and into an era of global interconnection. The attention-getting trend today is the rise of global markets (e.g., for goods, ideas). Yet the spread of transnational and global networks (not only communications, but also social and organizational networks) among corporations, governments, advocacy groups and other nongovernment organizations, international and multilateral agencies, transnational elites, and so on, may have equally profound effects on the nature of the new order.

As these organizational networks are built, cutting across public and private sectors and national borders and interests, influential new sub- and supranational actors may increasingly compete for influence with national actors. As political and economic interests grow in protecting and expanding networks, the networks themselves may increasingly take precedence over nation–states as the driving factor in domestic and foreign affairs. The government that gains the lead in building and shaping these organizational networks may gain enormous comparative advantage to influence the direction the world goes in economically, politically, and socially.

The information revolution is a key factor behind the rise of these global (and regional) networks of organizations and elites. Research seems advisable to identify the relationships between the information revolution and the rise of organizational networks, because this may have significant implications for the domestic and foreign policies of the United States and other countries.

New Sources and Forms of Conflict. This study has avoided conflict issues. Although the information revolution may enhance the prospects for peaceful, democratic progress and prosperity under some conditions, it also may enhance the prospects for conflict under other conditions. Moreover, the need to respond to these new forms of conflict may strengthen the trend toward cyberocracy, although not necessarily its democratic possibilities.

Research may be needed on questions such as the following: How will the information revolution alter the sources and forms of conflict? What will be their "information content" (conceptually and technically)? To what extent, and in what ways, may "more and better information" help lead to their resolution? What may be the implications for strategies and tactics for responding to internal and external conflicts? Will information subversion, blockades, and assaults be feasible? Will it be possible to exploit information and communication networks to damage an adversary's economic or political system without attacking it in a conventional sense? What may be the implications for military doctrine, organization, and strategy (Arquilla & Ronfeldt 1992)? What should countries and governments, not to mention nonstate actors, be preparing for?

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