

Chapter 4

Information in Society

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Chapter 4

Information in Society

The Information Society

An information industry analyst recently observed that “every society is an information society.”] That is, all human organizations, no matter how simple, depend for their functioning on an intangible resource called “information. In any society, information serves several purposes. It can be, for example, a commodity of commerce, an indicator of wealth or power, a basis for making decisions, or a source of entertainment.

The more complex a society, the more central information is to its economic activities. The United States seems to be entering what some sociologists refer to as a “postindustrial” period,² characterized by several trends:

- emphasis is on a service economy rather than on manufacturing;
- information is used as a resource, as a factor of production, and as a commodity; and
- scientific discovery and technical innovation drive economic growth.

Whether or not this is a valid model of societal evolution, the above trends are no doubt taking place in the United States. Furthermore, they are combining to create a greater dependence on information processing and technology.

The tasks being undertaken by the large organizations that serve society are growing in complexity. The air traffic control system handles nearly 20 million flights yearly. Every year the financial system clears more than 30 billion checks, the U.S. Postal Service delivers over 100 billion pieces of mail,

and the Internal Revenue Service (IRS) receives more than 140 million tax returns.

The service sector of the economy is growing at a relatively faster rate than the industrial and agricultural sectors (see fig. 6 in ch. 1). Many services such as medicine, law, education, and Government involve the transfer of large amounts of information. Resistance to productivity improvements in this sector, which represents a large part of the economy, has impeded overall productivity growth. Greater application of information technology has been proposed as a chief remedy. For this reason, it is highly likely that in this decade the service sector will increasingly depend on the use of computer-based information systems.

Greater international economic competition coupled with the decreasing availability of basic resources are requiring industry and Government to both improve and speed up their decisionmaking capabilities. Information technology is growing in importance for this purpose. Decisions about design, marketing, financing, and resource allocation all require a more sophisticated approach to the collection and use of information.

Computer and communication technologies, while not the direct causes of societal changes, are facilitating and in some cases accelerating them, thus helping generate the public policy issues confronting Congress. Some scholars see profound effects occurring from the increased dependence on computer technology, and predict that the view of humans as unique thinking beings will change fundamentally.³ Others see significant shifts in the balance of power between individuals and the organizations, private

¹ Anthony G. Oettinger, “Information Resources: Knowledge and Power in the 21st Century,” *Science Magazine*, vol. 209, July 1980, p. 191.

² Daniel Bell, *The Coming of the Post Industrial Society. A Venture in Social Forecasting* (New York: Basic Books, 1973).

³ Bruce Mazlich, “The Fourth Discontinuity,” *Technology and Culture* 8, pp 1-15.

and governmental, that would directly affect our lives.' These highly speculative views raise important questions about the effects an extremely automated society might have on individual freedom. These questions need continued examination.

Some information policy experts take a more pragmatic view, one more useful for assessing specific public policy issues arising from the applications of this technology. Their approach stresses these two points:

1. It is not information technology per se that creates public policy issues, but the particular choices that are made concerning its use.
2. Most policy problems involving automated-data systems are rooted in traditional institutional attitudes and procedures. Information systems must be assessed in the context of that history.

According to this view, technology itself does not restrict society to particular actions, but rather provides a widened range of choices.' Thus, it is not the impacts of a technology that are examined, but the impacts of the particular choices made. The nature of those choices is dependent on the social and legal environment in which they take place. For example, a totalitarian society would build information systems overtly designed to enhance Government control of its citizens. Such systems would be unacceptable in a democratic society.

The necessity of considering the historical context both of the systems and of the policy issues they raise is illustrated by the three case studies in the overall assessment.

1. The National Crime Information Center of the Federal Bureau of Investigation is an automated criminal record system that has been in existence for only 13 years. Yet the patterns of its use, the

types of data stored, and the profound public policy issues it raises are the same as those prevalent over the past 100 years of recordkeeping in the criminal justice community.

2. The Postal Service is nearly as old as this Nation, and the telegraph is almost 150 years old. The distinction between physical and electrical transmission of messages that has existed for a long time without creating serious problems is now being challenged. However, over the years the Postal Service has become an integral part of American society. Decisions about its future role with respect to electronic mail need to take into account all of its historical roles: as a service provider, as an employer, and as an agent for social communication and connection on which many sectors of U.S. society depend.
3. Banking has existed since ancient times. Electronic funds transfer systems are not so much changing the nature of banking as they are helping alter traditional institutional practices in the United States, such as restrictions on multistate banking, distinctions between types of banking institutions, and limitations on types of financial services. The issues of privacy and security, which are examined in some detail in chapters 6 and 7, historically have seriously concerned the banking community, and are thus shaped by its traditional attitudes and practices.

The Nature of Information

The role of information in society is being changed under the influence of new information technology. Some of the changes taking place are:

- Information is becoming a significant economic commodity, but one with certain unique characteristics that distinguish it from conventional commodities of commerce.
- The industry providing information technology and information services

4A. Mowshowitz, *The Conquest of Will* (Reading, Mass.: Addison-Wesley, 1976).

'Daniel Bell, "Communications Technology—For Better or For Worse," *Harvard Business Review*, May-June 1979, p. 20.

has become a major component of the U.S. economy.

- Many more individuals, both as workers and as citizens, need more information and information technology to function effectively.

Thus, over the next two decades information technology will likely change production processes and commercial goods, transportation and working patterns, the nature and content of education, the content and style of entertainment, and the way social values are formed and political decisions made.

There are three basic values of information: commercial, private, and public (see fig. 7 in ch. 1). Information technology is changing the relative importance of these values and throwing them into conflict.⁶

The Commercial Value of Information

Information has been a commodity of commerce for centuries. Books and newspapers, and in this century the broadcasting industry, all sell information. The classic reference book on knowledge as a commodity was written in 1962.⁷ The value of information increases as society becomes more dependent on it. The very high growth rate of the computer-based information industry illustrates this trend (see ch. 14).

Information, particularly in a technological environment, has characteristics that distinguish it from more tangible commodities.

- It is reproducible. Its theft does not deny it to the original owner.

- The cost of its reproduction is usually very low compared with that of its original assembly or creation.
- It can be transported instantly anywhere in the Nation or the world over communication lines.
- Its lifetime, which can be very brief, is thus a principal determinant of its value.
- Its value is not additive. Two or more copies of the same item of information are not necessarily worth much more to the possessor than one.

These characteristics, magnified in some cases by the technology, have created policy problems with respect to computer crime, copyright and patent laws, the flow of data between nations, and property tax laws. The traditional rules and procedures of the U.S. economic and legal systems are oriented toward the commercial exchange of tangible goods and services rather than of information.

The Private Value of Information

In an information society, economic competition is often based on access to special information, such as a formula for a soft drink, an econometric projection, marketing plans, or geological data. Commercially important information is considered by organizations to be proprietary.

Similarly, individuals often consider information about themselves to be private, either because damage can be done by its disclosure or simply because they desire to be left alone. (See ch. 7 on privacy for a more complete discussion.)

The Public Value of Information

American society has always viewed information as having a public value, and has asserted the public interest in a free flow of information. There are many examples:

- the public support of libraries, schools, and museums to produce an informed and literate citizenry;

⁶For a related discussion see Louis H. Mayo, Robert W. Anthony, Henry B. Freedman, et al., *An Exploratory Assessment of Computer-Assisted Makeup and Imaging Systems* (Washington, D. C.: The George Washington University Program of Policy Studies in Science and Technology, January 1980).

⁷F. Machlup, *The Production and Distribution of Knowledge in the United States* (Princeton, N. J.: Princeton University Press, 1962).

- a tradition of academic freedom and a system of open scholarly publication to promote the exchange of ideas and the advance of research;
- first amendment guarantees, which ensure an unfettered discussion of political ideas, freedom of religion, and a free press; and
- freedom of information laws asserting the rights of citizens to know as much as possible about the actions of their Government.

These examples suggest that there is an assumption that American society has a right of access to information of various kinds, and that it is in the public interest to facilitate that access.

This principle has historically brought Government into opposition with private sector interests. Public education competes with private, libraries compete with book-sellers, and so on. In the past, these conflicts have not been serious. As the information society grows, however, and the economic value of information rises, conflicts over its access and use will increase in severity and become more difficult to resolve. Additional problems will be caused by changes in the technologies for the distribution of information, such as the replacement of certain

books by aggregations of articles delivered electronically.

The social interest in guaranteeing equitable access to information may conflict with the need to encourage private sector investment in new information services by letting a profitable market develop. It can also be argued that improvements in the quality of information available to decisionmakers both in the public and private sectors would reduce errors in the allocation of resources, thereby benefiting society as a whole.

Many Federal agencies—the Census Bureau, IRS, the Securities and Exchange Commission, the Environmental Protection Agency, and the Federal Elections Commission, to name just a few—collect large and, in most cases, growing amounts of information, which could be personal or proprietary. The right of the Government to collect the information is established in law, presumably to further legitimate public purposes. However, such collection may strongly conflict with what individuals and organizations believe to be their rights of privacy, and thereby creates an obligation on the Government to protect the information and use it only in carefully prescribed ways.

The Information Economy

Information plays a significant economic role in U.S. society. The number of companies that manufacture and supply computer and communication services is very large and still growing more rapidly than the overall gross national product. The U.S. computer industry, which sold over \$40 billion worth of hardware in 1979, has a projected annual growth rate for the near future of around 20 percent; and the worldwide communication industry, which in 1979 had revenues of over \$60 billion, has a projected annual growth rate of about 8½ percent.

Another measure of the economic importance of these industries is that AT&T and IBM are two of the largest corporations in the world. AT&T ranks first and IBM is among the top five American industrial corporations. (The computer industry is examined in more detail in ch. 14.)

Information services, a new but increasingly important industrial sector, use computer and communication technologies to provide new types of products and services. Some of these are:

- Teletext service, which provides certain types of consumer information (e.g., airline schedules, news reports, shopping guides) over a regular television broadcast signal. This transmission of information does not interfere with the regular video program and can be accessed with a special decoder on a standard television receiver.
- Computerize paging services, which provide elaborate remote messaging services by means of microcomputers in the paging unit itself.
- Specialized information services, which are built into the voice telephone network.

This very young, small, innovative, and rapidly growing industry will be the exploiter of the potentially large consumer markets for information technology services. (Information services are further examined briefly in ch. 14.)

In addition to the above-mentioned sectors of the information economy, there is a much broader sector. It was first studied and characterized in 1976.⁸ In this analysis, the two sectors of the information economy were identified as primary and secondary.

The primary information sector includes those who generate and sell information as well as those who produce information technology, and is much more comprehensive than the computer and communication sectors. Included are typewriter manufacturers, newspaper publishers, producers of films, and Broadway and television shows.

The secondary information sector is comprised of information services and products used by any organization for its own internal purposes. Examples are internal accounting and production, management, and inventory control systems, many of which are already computerized.

⁸Marc Porat, *The Information Economy*, Ph.D. dissertation, Institute for Communication Research, Stanford University, Stanford, California, 1976.

An examination of the trends in the work force reveals the extent to which the economy has shifted. The results of the 1976 analysis shown graphically in figure 6 (see ch. 1) illustrate the transitions from an economy dominated by agriculture, to one dominated by manufacturing, to a service and information economy. It can also be seen that the growth of the information sector did not start with the invention of the computer, but considerably earlier.

Because macroeconomic studies such as these are so broad, they tend to blur the line between industries that use information systems and those few remaining activities that are presently not directly affected by this technology. However, the line separating these two sectors is shifting rapidly and social impacts can flow across it. Thus, for example:

- computer graphics are changing the operating style of the film animation industry;
- traditional print publishers such as Readers Digest and the Knight-Ridder newspapers have invested in new in-house computer/communication-based information services to reach the public;
- the nature of public education may be transformed by new competing information delivery systems; and
- computer-based systems for delivering television programming tailored to each home will change the role of network broadcasting in the United States.

The transformation of much of the information industry that is being brought about by new information systems will change the structure of the industry, the nature of the services provided, and the skills needed by its employees.

As technology reduces the cost as well as the experience and training required for information retrieval, public library services, even in small cities and towns, will increasingly supply more and more up-to-date information from a variety of sources. In many countries, automated card catalogs on ma-

nipulateable filmstrips, and newspapers and periodicals on microfilm and microfiche, are expanding the resources of libraries in schools, universities, and industry. However, this trend may conflict with the public value of information, to the extent libraries move in the direction of charging fees for access to electronic information services. This would run counter to the current free access policies of most public libraries.

Entire editions of newspapers and newsletters are centrally written and electronically duplicated and transmitted—via satellite and microwave—to regional plants where they are printed and disseminated. High-quality transmission of photographs and schematic drawings can accompany the texts of these publications in a matter of minutes after the text is sent.

The emerging and expanding information technologies are reducing the costs and improving the accessibility of many kinds of information. Their impact is also being felt in the traditional hard print industries, which must adapt their conventional ways of doing business to the new technologies or risk displacement by more technologically sophisticated competitors entering the marketplace.

Some economists are beginning to examine the information economy. They are building information into traditional economic theory and modifying economic models to incorporate information as a commodity or factor of production. Although this work is still in its early stages, it will be important in the development of usable economic models for the next quarter of a century.