

**Part I**

**Changing Communication  
Infrastructure,  
Goals, and Policymaking**

## **Chapter 2**

# **Conceptual Framework for Analyzing Communication Issues**

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# Conceptual Framework for Analyzing Communication Issues

## INTRODUCTION

New technologies create new potential and new opportunities that change our notions and expectations about what is possible and what is not. In fact, we have often looked to the development of new technologies to resolve thorny societal problems that have no obvious or tractable solutions. However, past efforts to correctly anticipate the use and impact of new technologies all too often have fallen short of the mark.

In the realm of communication alone, for example, the potential of the telephone was not widely appreciated, although Alexander Graham Bell, himself, had an uncanny prescience about its future use.<sup>1</sup> Nor did radio technology appear very promising—viewed primarily as a mode for point-to-point communication, microwave technology was rejected as being too difficult to focus and control.<sup>2</sup> More recently, the computer's role in society has far exceeded the expectations of its early creators and developers.<sup>3</sup>

The gap between expectations and actual experience with new technologies can be explained, in part, by our limited understanding of the relationship between technology and society. Attempts to depict this relationship have typically been unidimensional, focusing either on technology as a driving force or on a particular set of social forces that has determined the evolution of technology. However, experience has proven such conceptualizations to be far too simplistic. Lacking an adequate understanding of technological development we, as a society,

have been unaware of the realm of choices available. Thus, we have often been unable to channel technological development in the most positive directions.

Today, we are witnessing profound changes in communication systems worldwide brought about, in part, by the development and advancement of a wide variety of information and communication technologies. Together, these new technologies have significant potential to enhance communication and improve social, economic, and political circumstances in a number of different ways. If, as a society, we are to maximize this potential and have a greater choice about how these new technologies evolve, we will need to improve our analytical basis for assessing their development.

To this end, this chapter will provide an analytic framework for assessing the new communication and information technologies and the alternative roles that the Federal Government might play in their development and use. It will lay out a conceptual model of the relationship between technology and society that takes into account technological developments, social forces, and the values and roles of individuals and groups who have authority to make decisions about technology. The model will be used to define the scope of the OTA assessment and organize the report. By identifying the critical points at which choices about technology might be made, the model suggests the key questions that need to be raised about new communication technologies.

<sup>1</sup>From the beginning, Bell foresaw a network of private telephones that would be available to everyone, rich and poor alike. But most others—perhaps because it appeared so soon in the wake of the telegraph—found the telephone unworthy of comment. Totally underestimating the telephone's future, William Orton, President of Western Union Telegraph Co., for example, declined the opportunity to buy its patent rights, purportedly saying: "What use could this company make of an electrical toy?" Sidney H. Aronson, "Bell's Electrical Toy: What's the Use? The Sociology of Early Telephone Usage," Ithiel de Sola Pool (ed.), *The Social Impact of the Telephone* (Cambridge, MA: The MIT Press, 1977), p. 16.

<sup>2</sup>David Sarnoff, of NBC, took particular exception to this point of view. In a letter to Edward J. Nally, General Manager of the Marconi Co., he proposed taking advantage of the leaky aspects of this technology to develop a "radio music box." Gleason L. Archer, LL.D., *History of Radio to 1926* (New York, NY: The American Historical Society, Inc., 1938), p. 112.

<sup>3</sup>As Paul Ceruzzi has pointed out: "[Computer programmers] had no glimmering of how thoroughly the computer would permeate modern life. [They] saw a market restricted to a few scientific, military, or large-scale business applications. For them, a computer was akin to a wind tunnel; a vital and necessary piece of apparatus, but one whose expense and size limited it to a few installations." Paul Ceruzzi, "An Unforeseen Revolution: Computers and Expectations, 1935-1985," Joseph J. Corn (ed.), *Imagining Tomorrow: History, Technology, and the American Future* (Cambridge, MA: The MIT Press, 1986), p. 189.

## DEFINING KEY TERMS

To develop an analytic framework to examine the potential impacts of new technologies on communication systems, and to identify the potential ways that the Federal Government might respond to these advances, it is necessary to define the concepts, such as technology and communication, that are used throughout this report. Such terms are the building blocks of conceptual analysis. How they are defined will determine not only the scope of this study, but also the terms of the debate about, and the range of options for dealing with, new and emerging communication issues.

### *The Nature of Technology*

Technology can be defined in many ways, both broad and narrow. Some older definitions, for example, limit its meaning to specific tools or machines. Other theorists define technology more broadly as know-how—"a system of knowledge intended to have a practical bearing."<sup>4</sup> Beyond this, a definition of technology can also include the human processes and relationships required to bring a scientific idea to life.

People choose their definition of technology to suit the questions they are asking and the problems they must solve. Scientists and engineers, for example, may have less need to consider human factors; thus, their definitions concentrate on machines and physical structures such as roads, airports, and nuclear reactors.<sup>5</sup> However, a purely mechanical definition of technology would be inadequate for a study analyzing how technology might affect communication and communication systems. In this report, we have defined communication and communication systems as processes in which individuals and groups come together to

formulate, exchange, retrieve, and interpret information.<sup>7</sup> Understanding how technologies might affect these activities requires a definition of technology that is broad enough to include the intersection of physical objects and people. As Todd LaPorte has said: "One must look at 'who is technology' as well as 'what is technology'."<sup>8</sup>

This report, therefore, defines technology broadly, incorporating the relationships and transactions of those involved in communication processes. To maintain this view, while allowing for independent analysis of machines, tools, and techniques, the technology will be considered an interdependent (but not necessarily tightly connected) conglomeration<sup>9</sup> that, to borrow from Langdon Winner's categories, comprises:

- **apparatus:** the physical devices of technical performance, such as tools, instruments, machines, etc.;
- **technique:** the technical activities, such as skills, methods, procedures, and routines that people engage into accomplish tasks; and
- **social arrangements:** the relationships that are established and the transactions that place allowing people to carry out technical processes and to give physical form to their ideas.<sup>10</sup>

Looking specifically at apparatuses, for example, this report will consider how new technical applications might affect the formulation, exchange, and interpretation of information. Focusing on technique, the study will examine issues such as the kind of technical training and level of socioeconomic resources that would be required to successfully implement a new technical apparatus. And, in examining social arrangements, it will raise a number of institutional questions about who needs to cooperate with whom, and in accordance with what

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<sup>4</sup>Jay Weinstein, *Sociology/Technology Foundations of Post-Academic Science* (New Brunswick, NJ: Transaction Books, 1982), p. xi. See also J.K. Fiebleman, "Pure Science, Applied Science, Technology Engineering: An Attempt at Definitions," *Technology and Culture*, Fall 1971, pp. 305-317; and Charles Susskind, *Understanding Technology* (Baltimore, MD: The Johns Hopkins University Press, 1973), p. 1.

<sup>5</sup>For a discussion of technology viewed as "a form of social organization," see Todd R LaPorte, "Technology as Social Organization," Institute of Governmental Studies, Working Paper, 4-384-1, University of California, Berkeley, n.d.

<sup>6</sup>Ibid.

<sup>7</sup>See following section for detailed definition of communication.

<sup>8</sup>LaPorte, op. cit., footnote 5, p. 8.

<sup>9</sup>The notion of a loosely constructed conglomeration has been used here to convey the idea that technology is never a finished product, but is always evolving in relationship to social forces. In this sense, then, one might think of technology as a process. For a comparison of the characterization of technology in these two senses, see Jennifer Daryl Slack, "Historical Review of the Concept of Communication Needs With Respect to Technology," OTA contractor report, November 1987.

<sup>10</sup>Langdon Winner, *Autonomous Technology: Technics Out of Control as a Theme in Political Thought* (Cambridge, MA: MIT Press, 1977), pp. 11-13.

rules and regulations, if new technological apparatuses are to be effectively deployed. The impacts of new technology on communication and on society vary according to each of these aspects of technology, and they need to be considered both separately and in their entirety.

### ***The Definition of Communication and Other Related Terms***

**The** word “communicate” comes from the Latin root “**communis**,” signifying communion or the idea of a shared understanding of, or participation in, an idea or event. In this original sense, the word communication was used as a noun of action that meant “to make common to many (or the subject thus made common).”<sup>11</sup> Toward the end of the 17th century, the notion of imparting, conveying, or exchanging information and materials was incorporated into the concept.<sup>12</sup> Although modern dictionaries tend to adhere to the latter definition,<sup>13</sup> both connotations continue to survive in everyday speech. Their dual usage can, at times, be a source of confusion in discussions about communication. \*4

Academics and researchers have generally defined communication in accordance with the sender/receiver model developed by Shannon and Weaver in their work on information theory.<sup>15</sup> As depicted in figure 2-1, this model characterizes communication as a systemic process, the main components of which include: sender, message, transmission,

noise, channel, reception, and receiver. Although originally developed to account for technical aspects of information transfer, this model has had a much more general appeal and has been used to examine many forms of communication.<sup>16</sup>

Notwithstanding its past popularity and its record of versatility, the sender/receiver model is not particularly well-suited to many of the tasks required for this study, which seeks to address the entire range of policy issues raised by new communication technologies. Policy issues generally entail points of conflict, and this model is not designed to draw attention to them.<sup>17</sup> The rather passive notions of “message,” “sender,” and “receiver,” for example, draw attention to the problems of effective communication and downplay any problems involved in, or issues about, who gets to formulate, send, and access information, on what bases, and with what objectives and effects. Nor does this model provide a basis for raising questions and issues about communication goals. Effectiveness and efficiency are simply presumed to be the most appropriate measures for evaluating communication processes.

The sender/receiver model is also much too orderly to adequately describe many of today’s mediated communication processes. It assumes that communication takes place as a consistent, linear sequence of events—an assumption that is not supportable in today’s technology-mediated infor-

<sup>11</sup>Daniel J. Czitrom, *Media and the American Mind* (Chapel Hill, NC: The University of North Carolina Press, 1982), p. 10. It was clearly this definition that the philosopher, John Dewey, had in mind when he wrote in *Democracy and Education*: “Society not only continues to exist **by** transmission, **by** communication, but it may **fairly** be said to exist **in** transmission, **in** communication. There is more than a verbal tie between the words common, community, and communication. Men live in a community in virtue of the **things** they have in common; and communication is the way in which they come to possess things in common.” John Dewey, *Democracy and Education* (New York, NY: Macmillan Co., 1915), as cited in Czitrom, *supra*, p. 108.

<sup>12</sup>The use of the term **t** designate the physical means of communication evolved during the period of rapid development of railroads, **canals, and roads**. For a discussion, see Raymond Williams, *Keywords: A Vocabulary of Culture and Society* (New York, NY: Oxford University Press, 1976), pp. 62-63.

<sup>13</sup>*Webster’s New Collegiate Dictionary*, for example, defines communication as “an act or instance of transmitting,” and **as** “a process by **which** information is exchanged between individuals through a common system of symbols, signs, or behavior.”

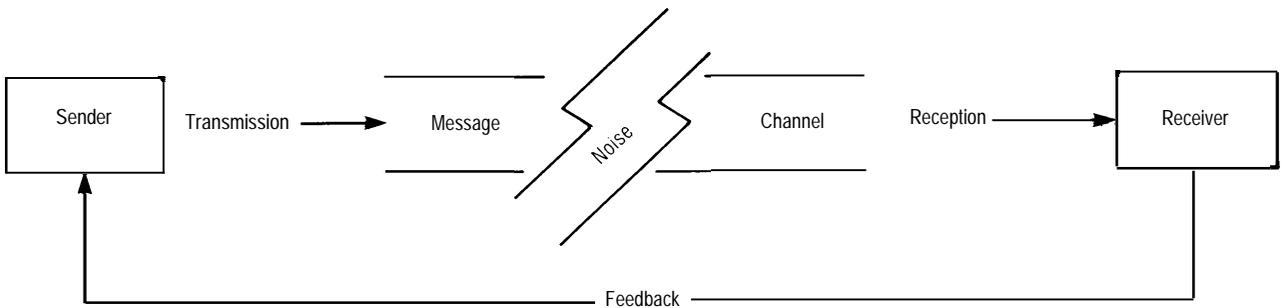
<sup>14</sup>Czitrom, *op. cit.*, footnote 11, p. 10.

<sup>15</sup>Claude Shannon and Warren Weaver, *The Mathematical Theory of Communication* (Urbana, IL: University of Illinois Press, 1949), P. 5. The sender/receiver model has **recently** fallen on hard times as many communication researchers have become interested in elements of communication that are downplayed by the model, such as context, formal constraints of media, and cultural norms. For a discussion of other models of communication and a comparison of their strengths and weaknesses, see C. David Mortensen, *Communication The Study of Human Interaction* (New York, NY: McGraw Hill Book Co., 1974), ch. 2, pp. 29-65.

<sup>16</sup>Political scientists, for example, have employed this conceptualization to study propaganda and its effects. It has also been used in mass media studies to describe the one-way flow of information to mass audiences, and feedback in the form of buying **decisions** and comments to broadcasters. Sociologists have integrated it into their structural/functional models to examine the efficiency or effectiveness of organizational communication. The sender/receiver model has even been used in conjunction with humanistic models of interpersonal communication to explain problems in understanding as “breakdowns.”

<sup>17</sup>Joseph F. Coates, “What is a Public Policy Issue?” (Washington, DC, n.d.), P. 29. As **described**: “A public policy issue may be defined as a fundamental enduring conflict among or between objectives, goals, customs, plans, activities or stakeholders, which is not likely to be resolved completely in favor of any polar position in that conflict.”

Figure 2-1-Shannon/Weaver Model of Communication



SOURCE: Office of Technology Assessment, based on Claude Shannon and Warren Weaver, *The Mathematical Theory of Communication* (Urbana, IL: University of Illinois Press, 1949), p. 5.

mation environment.<sup>18</sup> With a computerized bulletin board, for example, how does one identify and distinguish between who is the sender and who is the receiver? And, similarly, who is considered the sender when the receiver can now access information on demand?

To focus on potential areas of conflict, this study requires a model that highlights interrelationships and interdependencies among people and institutions. And, to bring the new technologies into play, it needs a multi-directional way of thinking about the process of communication. To meet these two requirements, **this study will define communication as the process by which messages are formulated, exchanged, and interpreted.** These activities are considered to be related to one another in a process, insofar as they are all required for an act of communication to take place. But the process is not necessarily linear, nor does it entail a predictable sequence of events. In fact, there are numerous ways in which these activities can be brought together, as can be seen in figure 2-2.<sup>19</sup>

Defining communication broadly in this fashion, it is clear that, just as it is becoming increasingly difficult to view communication technologies as being separate from information technologies, the process of communicating can no longer be viewed as a mere transmission process, separate from the

information that is being communicated. Thus, the analysis of new technologies will look at developments in information retrieval, processing, and storage, as well as information transmission and exchange. Similarly, the analysis of communication providers and the relationships among them will focus not only on the providers of communication channels and pathways, but also on the creators and users of information content.

Communication processes do not occur in a vacuum; rather, they are facilitated and sustained by an underlying network of individuals and institutions that provides the means and mechanisms for formulating, exchanging, and interpreting information, and for establishing the necessary linkages between these activities. In pre-industrial societies, such networks might entail a number of institutional structures such as kinship groups or caste systems; in advanced industrial societies, they are generally constructed around a complex set of technologies, assuming the broad definition of technology given above.<sup>20</sup> In this report, this entire network of apparatuses, knowledge resources, and institutional arrangements that support communications will be referred to as the **communication infrastructure**.

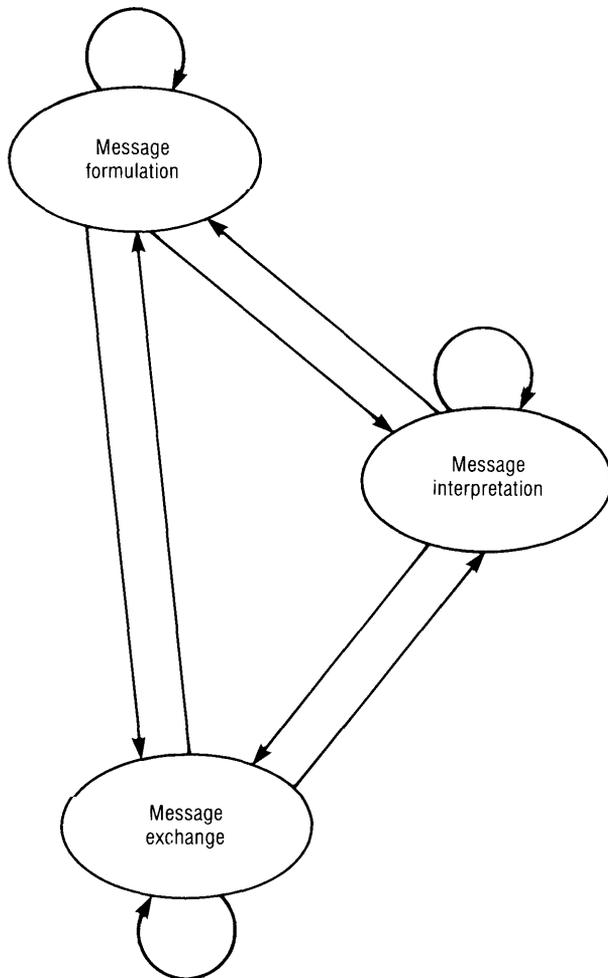
When such communication processes, technologies, and organizational and institutional relationships become established over time, they give rise to

<sup>18</sup>Nor does the linear model apply to interpersonal communications. It ignores the reciprocal aspects of communication and the fact that lists very much active participants. For the first interactive model that takes the reciprocal nature of communication into account, see Wilbur L. *The Process and Effects of Mass Communication* (Urbana, IL: University of Illinois Press, 1954).

<sup>19</sup>When the sequence of a communication process becomes established as a recognizable and predictable pattern of events, it takes on the aspect of what can be called a communication system. By "system" we mean, at the most basic level, a cyclical pattern of interlocking behavior based on expectations about what is taking place.

<sup>20</sup>This is not to say that social networks do not play a significant role in advanced industrial societies in facilitating the formulation, exchange, and interpretation of information. In trying to understand the impact of new communication technologies on society, one important research concern is the extent to which technologies replace these social networks, and with what effect.

Figure 2-2-Communication Process



SOURCE: Office of Technology Assessment, 1990.

an accepted set of values, functions, behavioral norms and practices, and rules about how communication decisions should be made. Considered in their entirety, these institutional and organizational relationships, the infrastructure that sustains them, and

the norms that regulate and reinforce their behavior will be referred to as the **communication regime**.<sup>21</sup>

**The** communication regime is both nested in and sustains the larger social system of which it is apart, for communication is the basis for all human interaction and one of the means for establishing and organizing society. Communication is the process by which all social activity is conducted; without it, a society could not survive. It is the means by which group norms are established, expectations are voiced, individual roles are assigned, change is enacted, social control is maintained, and activities are coordinated.<sup>22</sup>

Communication also allows the individual to function in society. Only through interaction with others do individuals acquire the tools of language and the shared sense of reality they need to establish intimate relations and to cooperate to achieve common goals.<sup>23</sup> Through acts of communication, people define themselves—their sense of uniqueness as well as their self concepts—and negotiate and sustain a position and place in the world.<sup>24</sup>

Supporting all forms of human activity, communication runs like a thread entwined throughout the course of history. As Lucian W. Pye has described it:

Communications is the web of human society. The structure of a communication system with its more or less well-defined channels is in a sense the skeleton of the social body which envelops it. The content of communications is of course the very substance of human intercourse. The flow of communications determines the direction and the pace of dynamic social development. Hence it is possible to analyze all social processes in terms of the structure, content, and flow of communications.<sup>25</sup>

How the communication regime is ordered, therefore, is likely to have a significant impact on society, just as changes in society are likely to have a

<sup>21</sup>The term "regime" is borrowed from the field of international politics, where: "Regimes can be defined as sets of implicit or explicit principles, norms, rules and decision-making procedures around which actors' expectations converge in a given area of international relations. Principles are beliefs of fact, causation, and rectitude. Norms are standards of behavior defined in terms of rights and obligations. Rules are specific prescriptions or proscriptions for action. Decision-making procedures are prevailing practices for making and implementing collective choice." Stephen D. Krasner, (ed.), "Structural Causes and Regime Consequences: Regimes as Intervening Variables," *International Regimes* (Ithaca, NY: Cornell University Press, 1983), p. 2.

<sup>22</sup>Martin Lawrence LeFleur, *Theories of Communication* (New York, NY: David McKay CO. Inc., 1970). See also Lucian W. Pye (ed.), *Communications and Political Development* (Princeton, NJ: University Press, 1963), p. 4.

<sup>23</sup>Donald P. Cushman and Dudley D. Cahn, Jr., *Communication in Interpersonal Relationships* (Albany, NY: State University of New York Press, 1985). See also Donal Carbaugh, "Communication Systems: Exploring the Role of Information Technologies," OTA contractor report, December 1986.

<sup>24</sup>*Ibid.*

<sup>25</sup>Pye (ed.), *op. cit.*, footnote 22, p. 4.

considerable effect on the nature of the communication regime. Thus, in order to identify and understand the policy issues raised by new communication technologies, it is first necessary to construct a clearer picture of the relationships between technology, the communication infrastructure, and society.

## A CONCEPTUAL FRAMEWORK FOR ANALYZING POLICY ISSUES ENGENDERED BY NEW COMMUNICATION TECHNOLOGIES

Theoretical models are abstractions or simplifications of the real world as viewed from a particular vantage point. By defining critical relationships, such models serve as maps to guide researchers through extraneous materials to relevant questions and interesting insights. It will be useful, therefore, to begin the investigation of how new technologies might affect the realm of communication and society by conceptualizing how new technologies interact with society, and how choices about these technologies are made.

### Existing Conceptualizations

There is ample literature that seeks to explicate the causal relationships between technology and society.<sup>26</sup> Some thinkers on the subject posit that the role of technology is supreme, dictating social and economic relationships. In his work, *The Technological Society*,<sup>27</sup> Jacques Ellul, for example, argues

that the shape society takes is but a mere reflection of technique. In similar fashion, Harold Innis concludes, in *The Bias of Communication*,<sup>28</sup> that it is the modes of communication that determine the structure of society, a theme later developed by Marshall McLuhan in *The Medium is the Massage*.<sup>29</sup>

The opposite proposition—that social systems structure technological developments—can be found in the tradition of Lewis Mumford. For example, in *Technics and Civilization*, Mumford contends that the invention of the clock was almost inevitable because the rigid schedule of monastic life required it.<sup>30</sup> More recently, this perspective resounds in the works of those who represent the “critical school” of communication.<sup>31</sup>

Acknowledging situations in support of both propositions, many scholars and researchers are now developing models about technology and society that are based on the interdependence and interaction of the two.<sup>32</sup> It is on this interactive model of technology and society, which is historically more realistic, that this and subsequent chapters will be based.<sup>33</sup>

### A Model to Guide the Present Analysis

The analytic framework that will be used in this assessment is depicted in figure 2-3. The key elements of this model are:

- the existing communication regime;
- the interactions between technological advances and social forces;

<sup>26</sup>The study of technology and society has a long history going back two centuries to the works of Adam Smith, Henri Saint-Simon, and Karl Marx. In fact, it was the growing interest in technological developments that gave rise to the field of sociology. Interest has intensified in recent years as both scholars and policymakers have sought to anticipate and ameliorate the unintended consequences of the deployment of technology. Once again, these interests have given rise to a new field of study, that of technology assessment. For three very different accounts of the history of ideas about technology, see Weinstein, op. cit., footnote 4; Winner, op. cit., footnote 10; and Jennifer Daryl Slack, *Communication Technologies and Society: Conceptions of Causality and the Politics of Technological Intervention* (Norwood, NJ: Ablex Publishing Corp., 1984).

<sup>27</sup>Jacques Ellul, *The Technological Society* (New York, NY: Knopf, 1964).

<sup>28</sup>Harold Innis, *The Bias of Communication*, 1951 (Toronto: University of Toronto Press, Reprint, 1971).

<sup>29</sup>Marshall McLuhan, *The Medium is the Massage* (New York, NY: Random House, 1967).

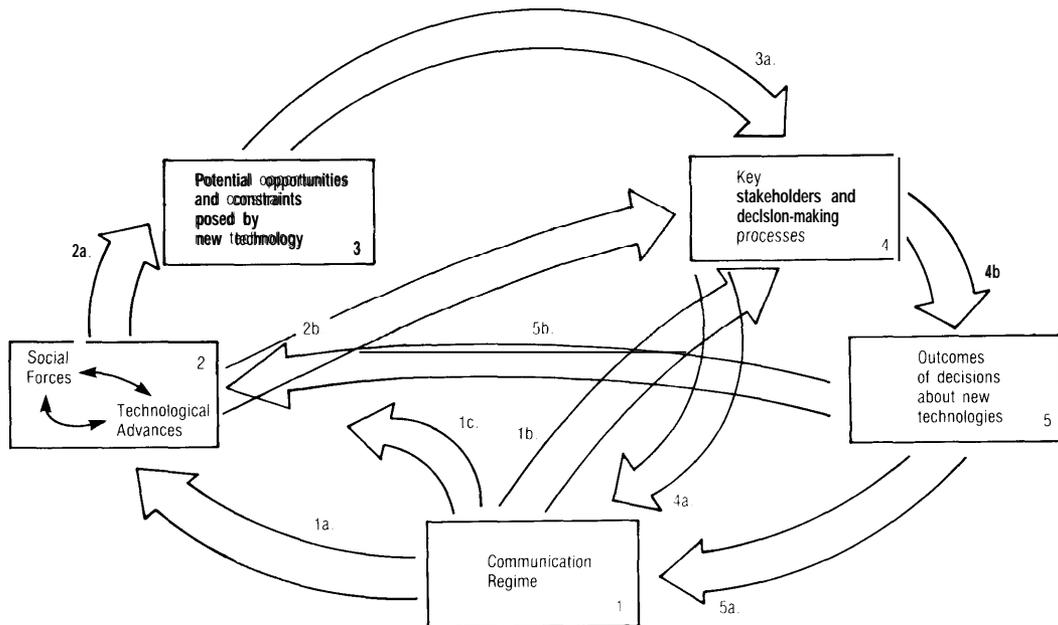
<sup>30</sup>Lewis Mumford, *Technics and Civilization* (New York, NY: Harcourt Brace & Co., 1915).

<sup>31</sup>&., for example, Richard Collins et al. (eds.), *Media, Culture and Society, A Critical Reader* (London: SAGE Publications, 1986); see also, Michael Gurevitch et al. (eds.), *Culture, Society and the Media* (London: Methuen, 1982).

<sup>32</sup>See Slack, *Communications Technologies*, op. cit., footnote 26, p. 7, for a discussion of these approaches. It should be noted that these models differ with respect to the degree and timing of how society and technology influence one another. According to one school of thought, technology is essentially neutral before it has been developed. And it is only as technologies are exploited and molded in accordance with particular social, economic, and political conditions that it takes on a determining force of its own. For this view, see Clifford Christians, “Home Video Systems, A Revolution?” *Journal of Broadcasting*, vol. 17, Spring 1973, pp. 223-234. Others think of technologies as being biased in favor of particular outcomes at the moment of their conception because they are envisioned and designed with certain purposes and practices already in mind. For this perspective, see Raymond Williams, *Television Technology and Cultural Form* (New York, NY: Schocken Books, 1973).

<sup>33</sup>Two OTA workshops, “Characterizing the U.S. Communication System” (Jan. 9, 1987) and “Tracking Technology: A Workshop To Identify the Ingredients of Change” (Dec. 15, 1986), were important sources of information and insight for this conceptualization.

Figure 2-3-interactive Model of Communication and Society



SOURCE: Office of Technology Assessment, 1990.

- Potential opportunities and constraints generated by new technologies;
- the key stakeholders and decisionmaking processes; and
- the outcomes of decisions about new technologies.

To follow this model, begin by focusing on the existing communication regime and trace the interactions and interrelationships between these elements (from 1 through 5 and back to the starting point). The arrows in figure 2-3 depict what are considered to be the most critical relationships.

### Existing Communication Regime

As defined above, the communication regime consists of the:

- a. norms, values, goals, and roles that sustain and maintain communication within a given realm;
- b. communication infrastructure that supports and facilitates communication processes; and

- c. decisionmaking processes and the rules and regulations that govern how the communication regime is managed and regulated.

As demonstrated in figure 2-3, the communication regime is not a closed system; it is influenced both by decisions that are made about the regime itself [4a] and by decisions that are made about new communication technologies [5a]. Moreover, the communication regime will also affect the larger society, of which it is a part. Because communication is essential to all social activities, how the communication regime operates will affect all social, economic, political, and cultural activities [1a], as well as the values and positions of key decision-makers [1b]. Activities within the communication regime will also affect the level and direction of technological development [1c].

### Interaction of Social Forces and Technological Advances

Technological advances involving communication are the product of decisions made about

technological opportunities [5b] and the activities that take place within, and the outputs of, the communication regime [1c]. These technological advances are constrained in their effects on society, however. They are tempered by social forces (e.g., as economic and demographic trends) and major historical events (e.g., such as war or a depression) that may give rise to needs and conditions that can either foster or inhibit certain technological applications. The particular form or application of a new technology will also be shaped by the play of social forces and the conditions under which it is brought into use.<sup>34</sup> If the social and technological infrastructure is inadequate to exploit the benefits of new advances, some technologies may never be applied at all.<sup>35</sup>

Together, technological advances and social forces interact to create new ways of carrying out economic, political, cultural, and social activities, as well as new opportunities and constraints [2a]. The interaction of technological advances and social forces also creates new communication needs and desires, and changes stakeholder perceptions of their interests [2b].

### Potential Opportunities and Constraints Engendered by New Technologies

In figure 2-3, social forces and technological advances are viewed as converging to create new possibilities that, depending on how and by whom they are experienced, might be viewed as either potential opportunities or potential constraints. An opportunity in one realm of life, for example, maybe a constraint in another—just as something that benefits one person may create a problem for another.

Technological advances might give rise to new economic opportunities for some people, for example, by creating new markets for old products,

making possible new products, reducing production costs, or allowing newcomers to enter old markets. However, these same advances might establish new economic constraints for some producers if they increase the rate of obsolescence of some of their products, increase the number of their competitors, and/or reduce their market shares. Similarly, new political opportunities might be generated if technological applications reduce the costs for individuals and groups to participate in political processes, or increase their access to decisionmakers or to potential allies and supporters. But to those in the political process who may be circumvented by new technological applications, these developments will be perceived as a new constraint. The emergence of such opportunities provokes some stakeholders to reassess their needs, values, interests, resources, and traditional alliances, and to adjust. Other stakeholders may remain unaware of the significance of the changes, or be unable or unwilling to alter their behavior. Depending on their responses, the relative position and status of stakeholders are likely to change [3a].

### Key Stakeholders and Decisionmaking Processes

Whether or not new technological possibilities are developed, and how these opportunities and constraints are distributed among individuals and groups throughout society, will be determined by the decisions that are made about them in the context of existing institutional structures, laws, and practices [4a]. And such decisions will, in turn, depend on who the key decisionmakers are; how they perceive their needs and interests and goals and objectives in the light of new technologies; and the power and authority that they have to determine events.<sup>36</sup> Decisions about technology will be made consciously or inadvertently. They will be made in a

<sup>34</sup>For a description of how social forces have affected the design and development of communication technologies, see LeFleur, *op. cit.*, footnote 22. As he points out, these forces often override the idealistic aspirations and hopes that are attached to technological change. The development of the penny press is one example. Many social reformers hoped that it could be used to re-establish a broad moral and political consensus across the United States after the turmoil caused by the Civil War. Social and economic conditions worked against them, however. The penny press emerged not only in a period of cultural upheaval and transition, but also in a period of intense competition for advertisers and readers. Instead of trying to improve the cultural and moral standards of people, newspaper publishers felt compelled to adopt any sensationalist device so long as it would bring in additional readers. Czitrom, *op. cit.*, footnote 11, pp. 92-93.

<sup>35</sup>Such was the case in ancient Alexandria, for example. Although inventors had the theoretical knowledge necessary to create primitive versions of a steam engine and a wheeled cart, these ideas lay dormant and only became practicable in application centuries later in conjunction with the industrial revolution. Winner, *op. cit.*, footnote 10, pp. 73-74. More recently, this problem has become evident in a number of developing countries where government leaders have been disappointed by the failure of a high technology to take hold and catapult their nations into a new, modern era. W.W. Rostow, *The Stages of Economic Growth* (Cambridge, England: University Press, 1971).

<sup>36</sup>Decisionmakers have generally found such opportunities quite threatening. For an historical account of the conservative role that communication stakeholders played with respect to new technological developments, see Brian Winston, *Misunderstanding Media* (Cambridge, MA: Harvard University Press, 1986), pp. 15-34.

variety of arenas—the scientific/technical community; the marketplace; and the social/organizational, political, and cultural arenas. However, in any particular instance the outcomes of such decisions will be determined by, and reflect the preferences of, those who, within the relevant context, have the authority and/or the resources to structure the choices of others.

### **Outcomes of Decisions About New Technological Opportunities**

As decisions about new communication technologies are made, it will become clear which opportunities and constraints will materialize, and who will win and who will lose as a result.<sup>37</sup> These decisions, moreover, will affect all elements of the model, setting the entire complex of interrelated changes into motion once again.

Clearly, this framework is a simplification of the complex set of factors and interactions that come into play when new technologies confront society. However, by identifying critical relationships, it suggests the key questions to be examined and issues to be raised in identifying and analyzing future roles that the Federal Government might play with respect to new information and communication technologies. In this fashion, the framework provides the underlying rationale for the scope and structure of this report. As described below, the organization and the subjects of the chapters reflect the flow and logic of this model.

## **ORGANIZATION OF THE REPORT**

To assist Congress in determining appropriate communication goals for an age of information and advanced communication, this report is divided into three parts. Part I (incorporating boxes 1 and 2 in the model) examines the U.S. communication regime and how it is being altered in response to technological advances and changing social forces. It includes chapter 2; chapter 3, which discusses the norms,

policy goals, and rules that govern relationships in the communication infrastructure; and chapter 4, which examines how technological changes are affecting the interdependencies among producers, distributors, and users of communication facilities.

Part 11 (encompassing box 3 in the model) examines the potential opportunities and constraints posed by new technologies in four realms of life. Chapter 5 looks at how new communication technologies can be employed to create comparative advantage in the business arena, and the issues and policy implications to which these new possibilities give rise. Chapter 6 focuses on the role of new technologies in the political arena, and its impact on democratic processes. Chapter 7 examines what effect new technologies might have in allowing for broader participation in the shaping and development of culture, and what public policy steps might be required for such possibilities to be realized. And chapter 8 considers whether and how new communication technologies might be used to facilitate or detract from individual efforts to achieve personal autonomy and self-realization.

Part III (covering boxes 4 and 5 in the model) analyzes the crosscutting communication policy issues engendered by technological change, and identifies and evaluates alternative policy strategies and options for their resolution. Chapter 9 focuses on issues involving equitable access to communication opportunities. Chapter 10 looks at issues concerning the security and survivability of the communication infrastructure. Chapter 11 examines the problems and issues entailed in achieving interoperable communication systems. Chapter 12 considers the requirements and policy alternatives for modernizing the Nation's communication infrastructure. And chapter 13 analyzes the jurisdictional issues that are likely to arise in formulating and implementing a national communication policy.

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<sup>37</sup>For a characterization of how these decisions are made in communication policy, see Vincent Mosco, *Pushbutton Fantasies* (Norwood, NJ: Ablex Publishing, 1982), figure 2-2, p. 26.