


Information Resources Policy

*Arenas,
Players,
and Stakes*

A large, bold, white number '1' is positioned on the left side of a black rectangular area. To the right of the black area is a vertical band with a grainy, textured appearance, and further right is a white background.

*Annual Report 1976-1977
Volume One*

*Program on Information
Resources Policy*

 *Harvard University*

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**INFORMATION RESOURCES POLICY AND
THE HARVARD PROGRAM**

Information resources policy is about the rapidly changing world of postal services, communications (computers and communications) facilities and services, the media, databanks, electronic fund transfer systems, business and governmental intelligence organizations and other information resources on which we all depend as we do on energy and materials.

The vanishing of boundaries among traditional information resources confronts us with the issues that the Program on Information Resources Policy addresses; its aim is to lay out the policy game clearly so that all the players will have the same high-quality, objective background information. Volume I of this, our fifth annual report, details what we mean by information resources, what issues we see and how we work.

Looking at the middle-term, two to ten years ahead, the Program serves as a neutral forum to describe the arenas of conflict, the significant players, the stakes of the game and the forces in action. We mark the trends, discuss the possible strategies and lay out for all players the policy options and their likely consequences.

For independence and quality, we seek diverse and competing affiliates as sources of our funds, we build in review of our plans and projects by players

and other experts, and we make all our findings public by such means as testimony, seminars and publications. Our affiliates provide not only financial support but also reviews of our strategy and information about themselves and their arenas. Accomplishments to date and where we are going are spelled out in Volume II.

**INFORMATION RESOURCES POLICY:
ARENAS, PLAYERS AND STAKES
ANNUAL REPORT
VOLUME 1**

Available on request is Volume 2 of the annual report for 1976-77, *Information Resources Policy: Program Projects*, describing the Program's research, teaching and dissemination activities.

**PROGRAM ON INFORMATION RESOURCES
POLICY**

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**THE INFORMATION SECTOR
TODAY ACCOUNTS FOR MORE
THAN 20% OF THE U.S. GNP . . .**

Figure 1.
THE INFORMATION INDUSTRIES

	Approximate Gross Revenue (in billions of dollars)						
	1970	1971	1972	1973	1974	1975	1976
Broadcast television	2.8	2.8	3.2	3.5	3.8	4.1	NA
Cable television	0.3	0.3	0.4	0.5	0.6	0.7	0.9*
Broadcast radio	1.1	1.3	1.4	1.5	1.6	1.7	NA
Telephone	18.2	20.0	22.6	25.5	28.3	31.3	35.6
Telegraph	0.4	0.4	0.4	0.5	0.5	0.5	0.5
Specialized common carriers	0.0	0.0	0.0	0.0	0.0	0.0	0.1*
Satellite carriers	0.1	0.1	0.1	0.1	0.1	0.1	0.2
Mobile radio systems	2.0	2.2	2.4	2.6	2.9	3.2	NA
Motion pictures	3.8	3.8	2.9	3.8	5.5	NA	NA
Organized sports, theaters, etc.	4.4	NA	NA	NA	NA	NA	NA
Computer software suppliers	1.5	1.7	2.0	2.5	3.0	3.6	4.3
Computer service suppliers	6.3	6.7	7.9	8.3	9.0	10.0	11.2
Postal service	0.7+	0.8+	1.0+	1.2+	1.3+	1.6+	1.7+
Private information delivery services	7.0	7.4	8.3	8.9	9.6	10.0*	11.2*
Newspapers, wire services	3.2	3.2	3.5	3.9	4.1	4.2*	4.6*
Periodicals (including newsletters)	0.9	1.1	1.1	1.5	1.7	NA	NA
Business consulting services	7.9	7.6	8.0	8.6	9.7	NA	NA
Advertising	32.4	37.7	41.3	43.4	47.0	50.6	NA
Marketing and sales	40.6	47.4	55.3	61.0	64.0	NA	NA
Brokerage industries	3.4	3.6	3.8	4.2	4.5	4.8*	5.1*
Book publishing and printing	2.1	NA	3.6	NA	NA	NA	NA
Libraries	70.1	76.4	82.9	89.4	98.1	107.3	119.8*
Schooling	25.9	26.6	28.3	30.3	32.3	34.6*	37.4*
Research and development							
Federal information institutions							
Census Bureau	0.1	0.1	0.1	0.1	0.1	0.1	0.1
National intelligence community	4.0+*	NA	NA	NA	7.0*	10.0+**	6.0+**
National Technical Information Service	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Social Security Administration	1.0	1.2	1.3	1.4	1.9	2.2	2.6
County agents, government	0.3	0.3	0.4	0.4	0.4	0.4	0.5
Banking and credit	61.1	68.9	77.6	101.3	136.2	NA	NA
Insurance	92.6	103.5	113.8	123.6	133.1	NA	NA
Legal services	8.5	9.6	10.5	12.2	13.7	NA	NA
U. S. Gross National Product	982.4	1,063.4	1,171.1	1,306.6	1,413.2	1,516.3	1,691.6

*estimated

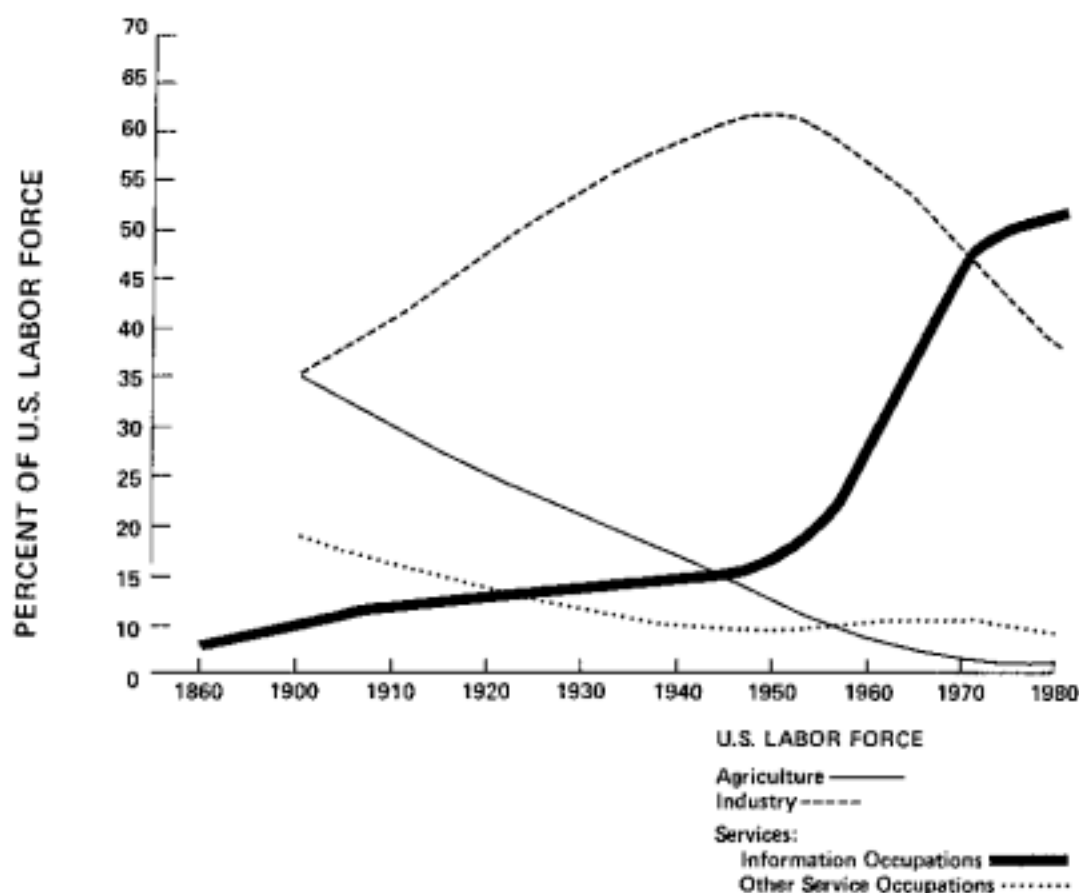
**official government figures computed by different methods for each year.

The information industries are those where creating, storing, processing, distributing or using information are primary functions. Elsewhere, these functions are incidental to some other primary role. The massive information processing performed by railroads or supermarkets puts them within the in-

formation sector but not the information industries. Approximate annual gross revenues shown here for 1970-1975 provide a rough index of the relative sizes of the information industries. Double counting has not been eliminated.

**THE INFORMATION SECTOR
EMPLOYS NEARLY 50% OF
THE LABOR FORCE . . .**

Figure 2.



Growth in information-processing service occupations is the major factor in the increase of all service occupations relative to industrial and agricultural occupations. This finding by Edwin B. Parker and Marc Porat is based on their analysis of U. S. Bureau of Labor Statistics data (*Social Implications of Computer/Telecommunications Systems*, Report No. 16, Program in Information Technology and Telecommunications, Center for Interdisciplinary Research, Stanford University, February 1975).

**THE INFORMATION SECTOR
IS STILL GROWING AND
CHANGING, NATIONALLY . . .**

Figure 3.
**AVERAGE ANNUAL GROWTH OF
VARIOUS TRANSACTIONS**

TYPE OF TRANSACTION	AVERAGE ANNUAL PERCENTAGE INCREASE (in percent)							
	1940-75	1940-45	1945-50	1950-55	1955-60	1960-65	1965-70	1970-75
Checks passed through the Federal Reserve System	7.8	2.7	9.2	7.1	5.9	6.9	11.1	11.9
Telephones in use	6.4	5.4	10.9	6.2	6.4	5.2	5.7	4.8
Individual Social Security beneficiaries	27.3	96.0	34.0	25.8	17.3	8.1	5.1	4.5
Individual federal tax returns	8.6	47.9	1.1	2.0	1.0	2.2	2.0	3.2
Public welfare recipients	4.2	-9.8	13.8	-0.8	4.4	2.0	15.4	4.2
Airline passengers	18.4	32.1	32.8	23.9	9.6	12.7	13.3	4.6
Persons entering hospitals for treatment	4.3	12.2	2.7	2.8	3.8	3.0	2.1	3.0
Persons covered by private hospitalization insurance	11.4	32.2	27.7	6.5	4.2	2.6	2.9	2.1
Motor vehicle registrations	4.7	-0.9	11.7	5.5	3.6	4.5	4.0	4.7
Passports issued	24.3	98.3	18.7	15.2	12.3	11.2	13.4	1.0
Students enrolled in colleges and universities	6.3	2.5	7.2	3.3	7.0	10.9	8.7	4.6
Applications processed for federal employment	0.6	NA	NA	0.6	1.6	-2.8	-0.1	3.5
New York Stock Exchange daily volume	12.2	17.9	7.9	6.0	3.6	20.6	16.9	12.5
Pieces of mail handled, U.S. Postal Service	3.7	7.3	3.8	4.5	3.1	2.6	3.6	1.0
Abstracts produced by Chemical Abstracts Service	7.7	-7.4	15.1	9.2	11.1	9.4	8.1	8.4
U.S. population	1.4	1.2	1.7	1.8	1.8	1.5	1.1	0.9
U.S. Gross National Product	4.1	12.5	-1.1	4.6	2.5	5.1	3.2	2.1

. . . AND INTERNATIONALLY.

Figure 4.
**CHANGING PATTERNS
OF WORLD TRADE IN
ELECTRONICS PRODUCTS**

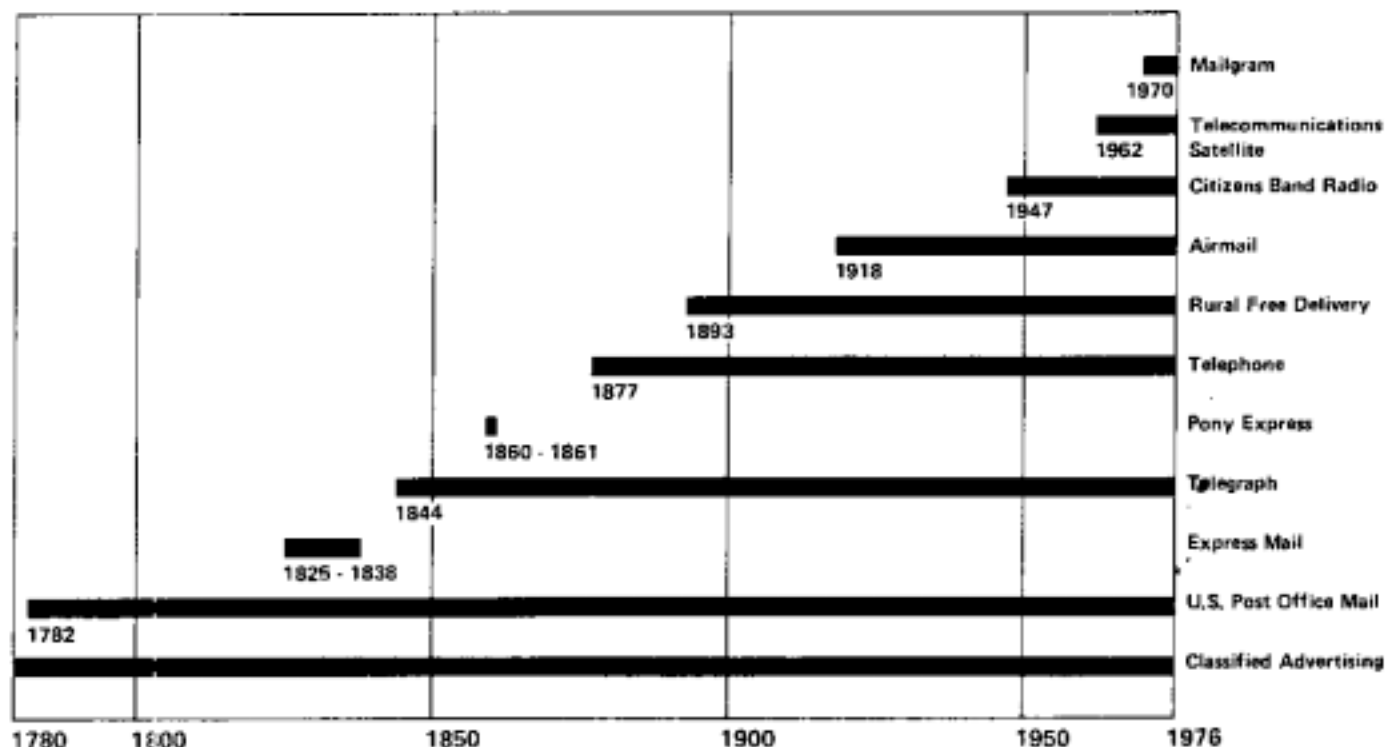
	IMPORTS	EXPORTS	BALANCE
		(in millions of dollars)	
CONSUMER ELECTRONICS			
1967	562	98	-464
1971	1,487	169	-1,318
1972	1,993	231	-1,762
1973	2,259	318	-1,941
1974 (est.)	2,337	383	-1,954
1975 (est.)	1,870	346	-1,524
1976 (est.)	2,000	380	-1,620
TELEPHONE AND TELEGRAPH EQUIPMENT			
1967	31	46	+15
1971	79	61	-18
1972	86	77	-9
1973	125	113	-12
1974 (est.)	162	160	-2
1975 (est.)	100	200	+100
1976 (est.)	130	250	+120
COMPUTERS AND CALCULATING EQUIPMENT			
1967	59	475	+416
1971	232	1,217	+985
1972	348	1,340	+992
1973	344	1,715	+1,371
1974 (est.)	388	2,196	+1,802
1975 (est.)	423	2,300	+1,877
1976 (est.)	467	2,480	+2,013

The trends in U.S. imports and exports in three categories of electronics goods.

Source: Adapted from the Office of Telecommunications, and the U.S. Dept. of Commerce, *U.S. Industrial Outlook*, 1976, pp. 280, 292, 313.

**INFORMATION RESOURCES
WERE ONCE INCOMPATIBLE,
SCARCE AND COSTLY.**

Figure 5.
CHOICES FOR PERSONAL
COMMUNICATION

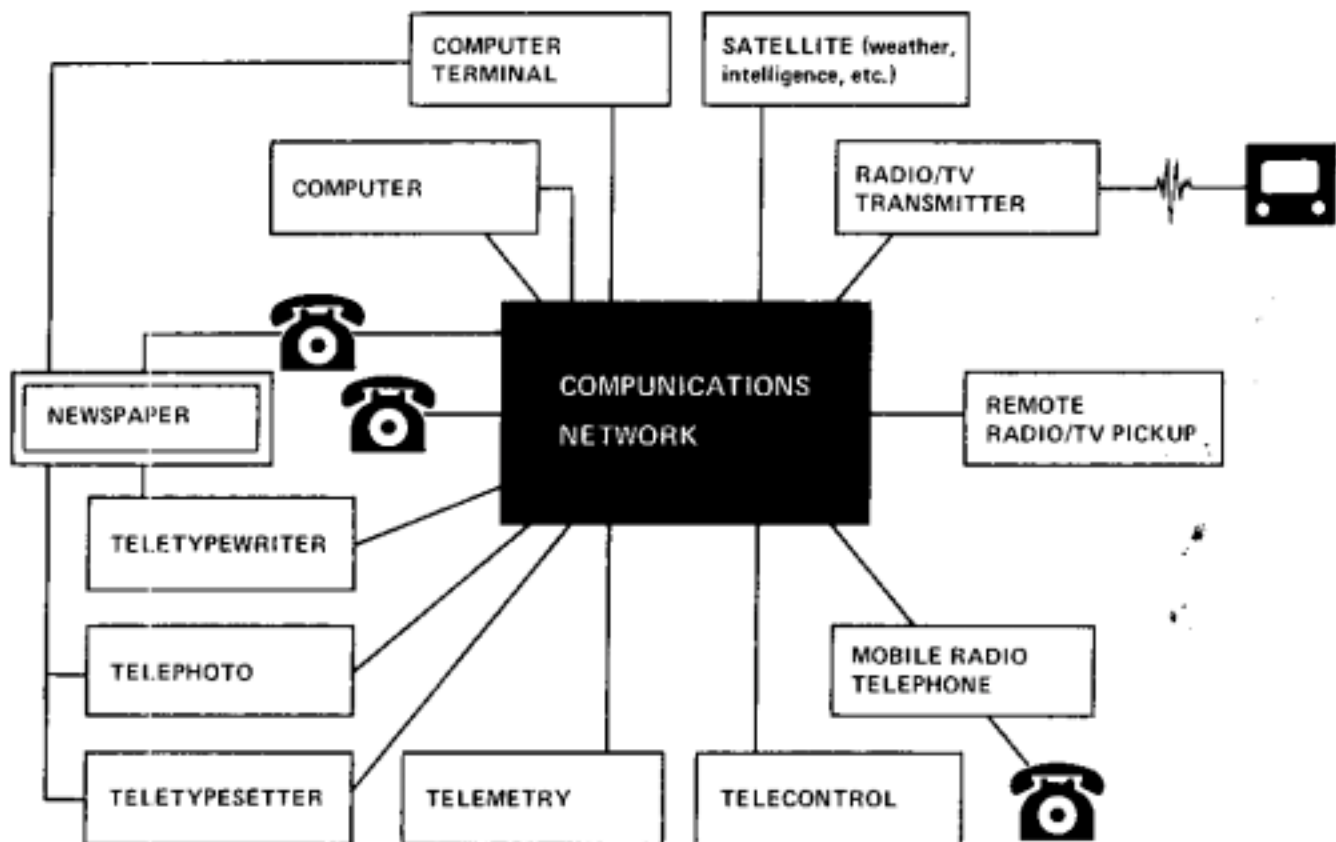


The choices for personal communication have grown rapidly. New technologies and new services developed in the last half of the 19th century, but each developed independently. The changes for sending a message can vary widely. When the Pony Express started in 1860, a letter cost \$10 an ounce, but by the time the service shut down the next year it was \$2 an ounce. In 1919, a three-minute station-to-station call from New York to San Francisco cost \$16.50. By 1946,

the charge was \$2.50. It is now \$1.45. In 1800, it cost 17¢ to mail a one-page first-class letter 300 miles. Now it is 13¢ for the first ounce and 11¢ for each additional ounce to anywhere in the country. A telegram could cross the country for \$7.45 for a 10-word-minimum message in 1866. In 1876, the same message went for \$2 and by 1946 it was \$1.20. In 1970, a 15-word-minimum telegram from coast to coast was \$2.25, but by 1975 it was \$4.75.

**NOW INFORMATION
RESOURCES ARE
VERSATILE . . .**

Figure 6



At first, it was a telephone network, and telephones still predominate, but many other kinds of communications are also carried. The national broadcasters took their places starting fifty years ago. As computer and communication facilities have come more and more to share the same technology in the past twenty years, the network has developed toward an integrated computer/communications or communications network. This network is an infrastructure basic to most social functions, including many that reach directly into the home.

... ABUNDANT AND CHEAP.

Figure 7
TIME, MONEY AND MEMORY

STORAGE MEDIA	ON-LINE CAPACITY (Bytes)	ACCESS TIMES	DOLLARS PER BYTE	BYTES PER CUBIC FOOT
Magnetic cores Metal-oxide semiconductors	1 million	1 microsecond	\$.10 on-line	25 thousand
Magnetic bubbles Semiconductor charge-coupled devices	10 million	.2-1 milliseconds	\$.017 on-line (1978)	100 thousand
Magnetic disk	2.5 billion	35 milliseconds	\$.00013 on-line	5 million
Magnetic tape	1 billion	seconds	\$.0000002 off-line \$.00033 on-line	250 million off-line 1 million on-line
Mass stores	250 billion	10 seconds	\$.000004 on-line	100 million
Paper	2-6 thousand per page	minutes	\$.000001	1.5 million
Microfiche	1-5 million per fiche	minutes	\$.00000002-.00000005	2 billion

The cost of storing information has decreased greatly during the past 10 years. New technologies, such as magnetic bubbles or electron beams, promise to continue the trend.

Computers process information in "bits", each representing a "yes-or-no", "one or zero" answer. Typically, 8 bits are used to represent a character or "byte". The 256 possible combinations of 8 bits are used to represent the digits, letters and most of the symbols commonly used in business and science.

"On-line" capacity, comparable to the capacity of a juke-box, measures the amount of information that can be kept on a computer

and accessed without manual intervention. To get at more information, you have to change storage units manually. Indicated on-line capacities are for a moderately large computer system.

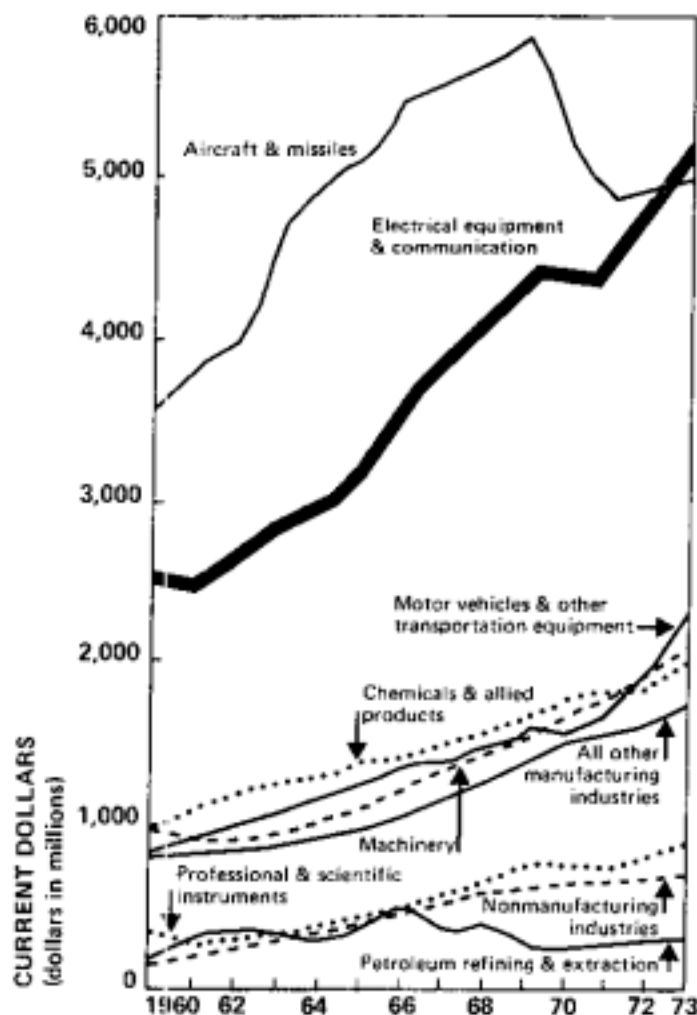
"Off-line" computer storage is dominated by magnetic tape because of its extremely low cost. The recent introduction of several types of Mass Store devices has encouraged moving the data in manual magnetic tape libraries to "on-line" storage. However, for permanent archival storage, microfiche remains the unchallenged leader.

Source: Estimates, as of May 1976, are by F. Grant Savers, Digital Equipment Corporation.

INFORMATION RESOURCES ARE STILL GROWING AND CHANGING.

Figure 8.
RESEARCH AND DEVELOPMENT

EXPENDITURES 1960-1973



EXPENDITURES AS PERCENT OF NET SALES, 1973

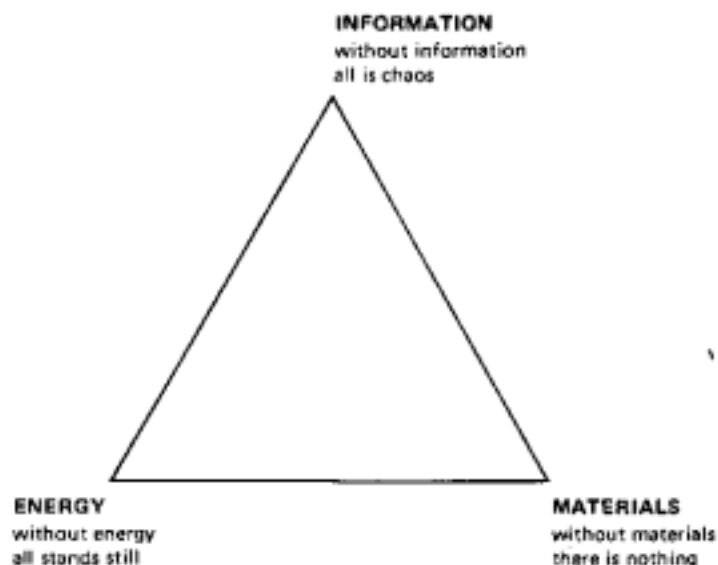
Chemicals and allied products	3.5
Drugs and medicines	7.3
Machinery	3.8
Office, computing and accounting machines	9.6
Electrical equipment and communication	7.1
Electronic components	5.3
Communication equipment and communication	8.7
Aircraft and missiles	13.5
Professional and scientific instruments	5.6

Research and development expenditures are high in the electrical, data processing, and communications and control industries both absolutely and compared to net sales. Other industries are heavy users of these technologies in their own research and development, particularly aircraft and missiles, drugs and chemicals.

Source: National Science Foundation, *Science Indicators*, 1974, Figure 4-5, p. 88. National Science Foundation, *Research and Development in Industry, 1973*, May 1975, Table B-35, p. 51.




**LIKE MATERIALS AND
ENERGY . . .**

Figure 9.



**. . . INFORMATION IS A
BASIC RESOURCE.**

Figure 10.

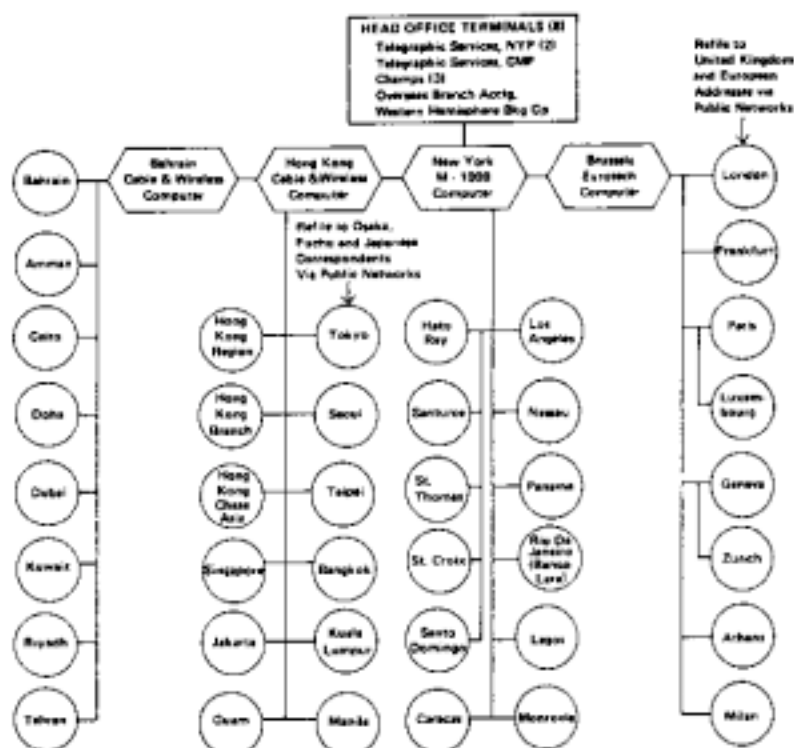
			
MÔDES	PRE-INDUSTRIAL	INDUSTRIAL	POST-INDUSTRIAL
Transforming Resource	Natural Power Wind, Water, Draft animals, Human muscle	Created Energy Electricity — oil, gas, coal Nuclear power	Information Computer and data- transmission systems
Strategic Resource	Raw Materials	Financial Capital	Knowledge

© American Institute of Physics

Source: Bell, Daniel, "Welcome to the Post-Industrial Society", *Physics Today*, Vol. 29, No. 2, February 1976, p. 47.

**INFORMATION RESOURCES
EXTEND STRATEGIC
STRENGTH . . .**

Figure 11.
**CHASE MANHATTAN
INTERNATIONAL TELETYPE
NETWORK**



**. . . AND EXPOSE STRATEGIC
WEAKNESS . . .**

Figure 12.
**SWIFT BANKING NETWORK
(Society for Worldwide Financial
Telecommunications)**



Figures 11 & 12: Modern information resources give businesses close, quick control of assets and operations around the world as around the corner. At the same time businesses grow more dependent on the reliability of widespread technical facilities, and on internal political developments of important exchange points like Belgium, the Netherlands, and Hong Kong. Today, these are "free ports" for information, but will they always be?

Fig. 11, Source: Chase Manhattan, April 10, 1977.

Fig. 12, Source: Wadman, Laurence E., Jr. "SWIFT — Building an International Communications Network", *The Magazine of Bank Administration*, Vol. LI, No. 9, September 1975, p. 36.

... FOR INDIVIDUALS ...

Figure 13.
CARD TRANSACTIONS, 1973

Type of Card	Number of Cards (millions)		Volume (\$ billions)	Average Sale Amount (\$)	Transactions (billions)	
	Extant	Active			All Amounts	Amounts over \$10
Retail store	169 ^a	?	27.0 ^a	\$18	1.50	many
Oil company	160 ^a	?	12.0 ^a	6.5	1.85	few
Bank	35 ^{a,b}	22 ^{a,b}	12.4 ^a	20	0.62	many
Travel and entertainment	6	?	5.5 ^a	20	0.28	very many
Air travel	3	?	2.2 ^a	50	0.04	all
Rent-a-Car	6	?	1.8	30	0.06	all
Miscellaneous	?	?	10.0	15	0.67	many
Totals	400	250	70.9	14.1	5.02	

^a Accuracy of these estimates has been confirmed by independent sources.

^b Accounts.

As more personal expenditures are recorded and transmitted, life is made easier and more personal information is accessible by wiretap, subpoena, or subterfuge.

Source: Adapted from *The Consequences of Electronic Funds Transfer: A Technology Assessment of Movement Toward a Less Cash/Less Check Society*, Arthur D. Little, Cambridge, Mass., June 1975, Table 4-6, p. 56.

**... INFORMATION RESOURCES
ALSO EXPOSE STRATEGIC
STRENGTH AND WEAKNESS
FOR INDUSTRIES ...**

Figure 14.

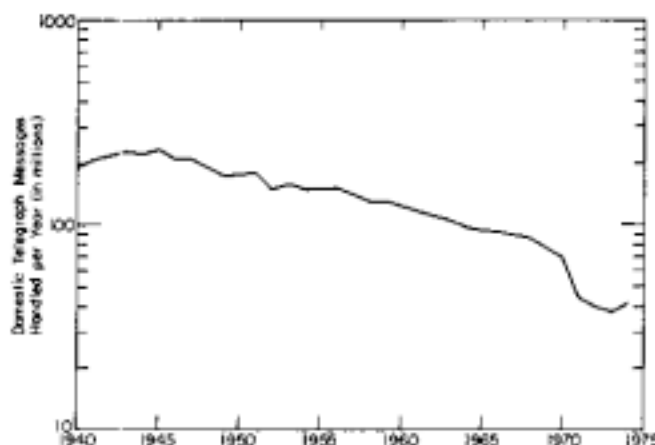
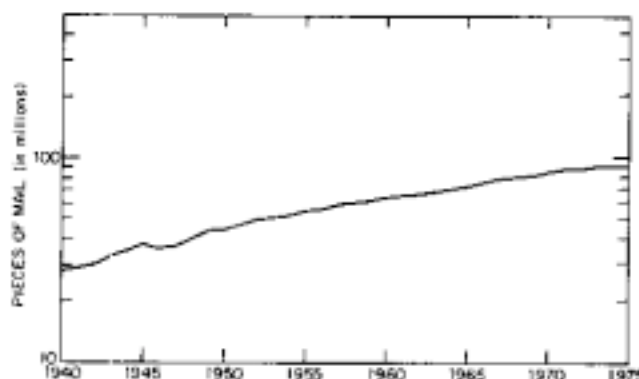


Figure 15.



Usage of telegrams has declined fivefold since World War II (Figure 14) while mail volume tripled (Figure 15). In the same period, local and toll telephone calls grew about tenfold and overseas calls nearly a thousandfold (Figure 16). A three minute New York to Paris phone call, available in 1936 only person-to-person for \$21.00, could be dialed-up for \$6.75 in 1970. The \$21.00 in 1936 is \$58.85 in 1970 dollars. The growth of traffic has attracted competition to AT&T's busiest routes (Figure 17).

Sources: Price of 3-Minute Telephone Call: Cole, J.E., G.W. Arnaud and L.H. Adams, *U.S. International Telecommunication Rate History*, U.S. Dept. of Commerce, Office of Telecommunications, December 1973, OT Report 73-25, Table V-26, p. 66. The price infator for the 1936 dollars to 1970 dollars is the change in the consumer price index.

Figure 16.

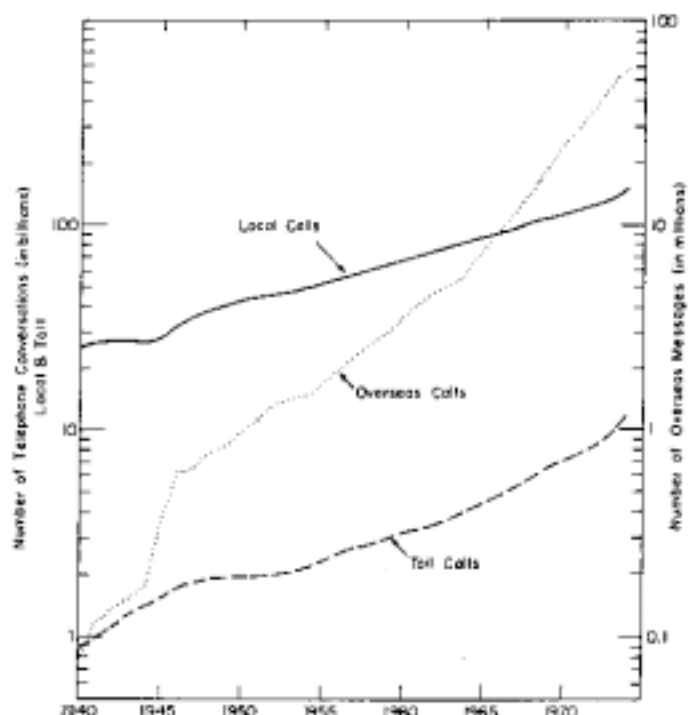


Fig. 14: Bureau of the Census, U.S. Dept. of Commerce, *Historical Statistics of the United States: Colonial Times to 1970, Part 2*, U.S. Government Printing Office, Washington, D.C., 1975, Series R 56, p. 789, and Federal Communications Commission, *Statistics of Communications Common Carriers, 1974*, U.S. Government Printing Office, Washington, D.C., Table 23, p. 168.

Fig. 15: Bureau of the Census, U.S. Dept. of Commerce, *Historical Statistics of the U.S.*, Series R 169, p. 804, and *Statistical Abstract of the United States, 1975*, Table No. 842, p. 511.

Fig. 16: American Telephone and Telegraph Co., *Bell System Statistical Manual*, 5800-Volume of Communications, p. 803 and 807.

Figure 17.
**BELL SYSTEM MAJOR
LONG DISTANCE ROUTES**



- high capacity
- - - - - medium capacity
- low capacity

Source: Mardanis, George P. et al., *The Domestic Telecommunications Industry: Economic Behavior, Competition, and Public Policy*. Systems Applications, Inc., San Rafael, Ca., May 10, 1974, p. 255.

**SPECIALIZED ("OTHER")
COMMON CARRIERS' ROUTES**



- MCI Communication (MCI)
- Southern Pacific Communications (SPC)
- - - - - Western Tele-Communications, Inc. (WTCI)
- CPI Microwave (CPI)
- RCA Earth stations
- Western Union earth stations
- ★ American Satellite (Amsat) earth stations

MCI: Coast-to-coast, uses WTCI (Ariz/Calif) and WUT (LA-SF).

SPC: Own microwave used coast-to-coast, augmented by WUT and Western circuits.

Source: Arthur D. Little, Inc. and Southern Pacific Communications.

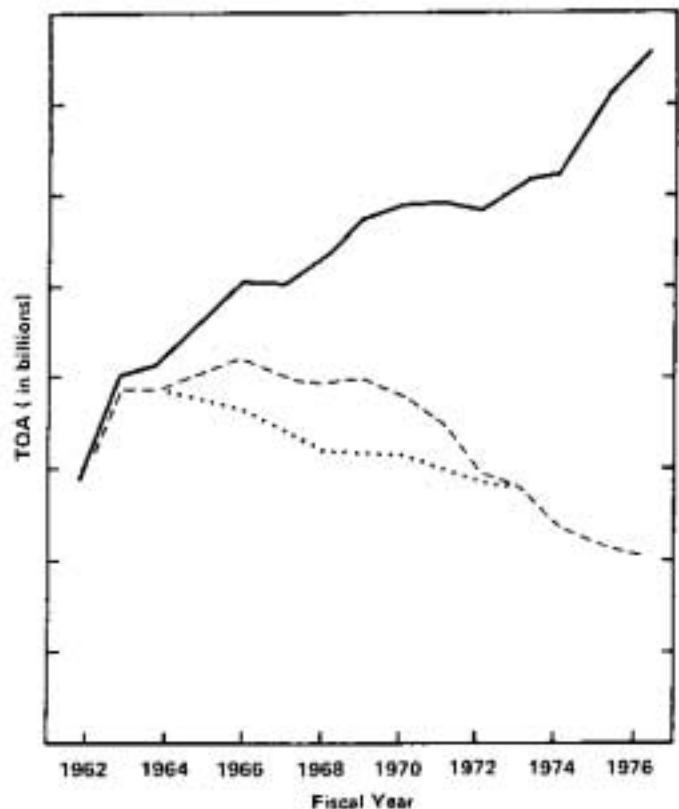
... AND INFORMATION RESOURCES EXPOSE STRATEGIC STRENGTH AND WEAKNESS FOR GOVERNMENT.

Figure 18.
TRENDS IN THE NATIONAL
INTELLIGENCE BUDGET;
FY 1962-1976*

*Includes CIA budget. Does not include costs of tactical military intelligence activities.

— current dollars
- - - constant (FY62) dollars
..... SEA incremental costs

This chart from the U.S. Senate's Church Committee report on Foreign and Military Intelligence shows "trends" in the national intelligence budget. Clearly labelled are the years, current dollars, constant dollars and the increment for Southeast Asia (SEA). The unscaled vertical axis shows Total Obligational Authority (TOA), or the size of the budget. As the committee report notes, the national intelligence budget is a "[deleted] billion 'package'".

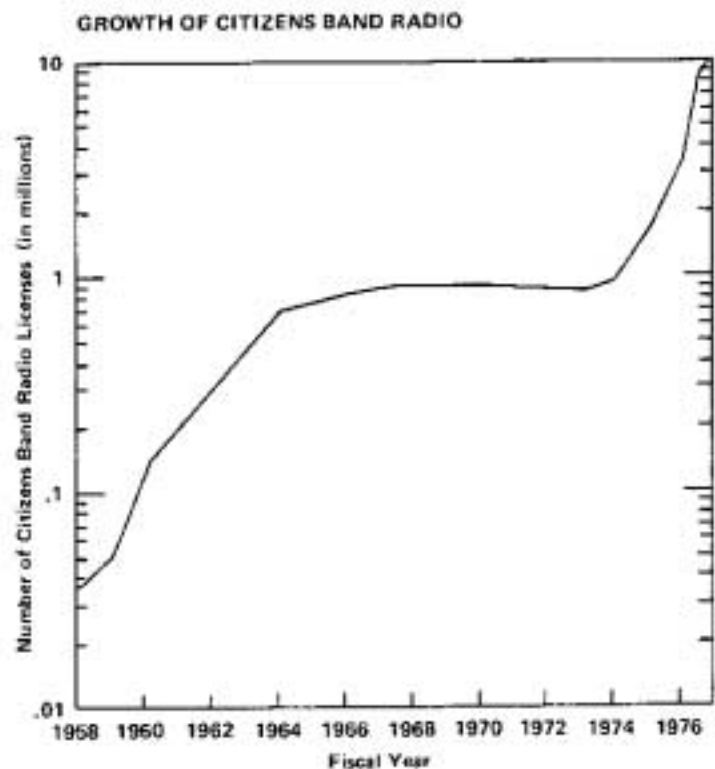


ARENAS CHANGE, BARRIERS SHIFT: FOR INFORMATION INDUSTRIES AND TECHNOLOGIES...

Figure 19.
PERSONAL MOBILE COMMUNICATIONS
CB OR TELEPHONE

Fad or forerunner, the dramatic growth of citizens band radio illustrates how technological innovation can upset traditional boundaries. In May 1977, Texas Instruments introduced equipment that allows direct dialing between CB radios. Meanwhile, American Telephone and Telegraph Co. is experimenting in Chicago with a "cellular" radiotelephone system that would permit for more mobile telephones to be linked into the national telephone network than present technology permits. Which shall prevail? At what costs? With what benefits?

Source: CB Radio Growth: Personal communication with John Small, Safety and Special Radio Services, Federal Communications Commission, April 14, 1977. Texas Instrument data: "CB Radio is Offered with Direct Dialing from Unit to Unit," Wall Street Journal, May 3, 1977.



... FOR WAYS OF GETTING AND USING INFORMATION ...

Figure 20
LIBRARY ACTIVITIES USING
CABLE TELEVISION

	U. S. libraries	U. S. schools	Canada libraries
No. of agencies reporting	22	7	14
Programming means			
Cablecasting live from libraries	4	3	0
Producing tapes for cablecasting	5	3	2
Using nonlibrary produced tapes for cablecasting	8	2	10
Not specified	4	5	3
Types of library programming			
Spot announcements	3	0	0
Children's story hours	11	0	3
Programs about library services	5	0	10
Educational programs for special groups	3	2	2
Educational programs on specific topics	4	3	3
Local news programs	0	2	1
Community events	1	0	1
Meetings or conferences	2	0	0
Talk shows or interviews	2	1	1
Audience participation	1	0	0
Video reference service	2	0	0
Not specified	5	1	1

Figure 21.
NEWSPAPER CITIES, 1880-1970

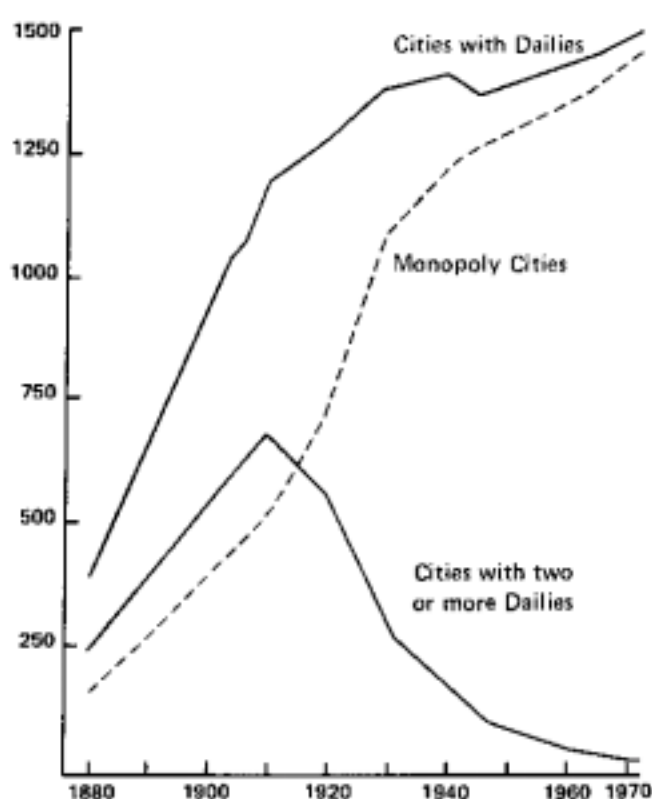
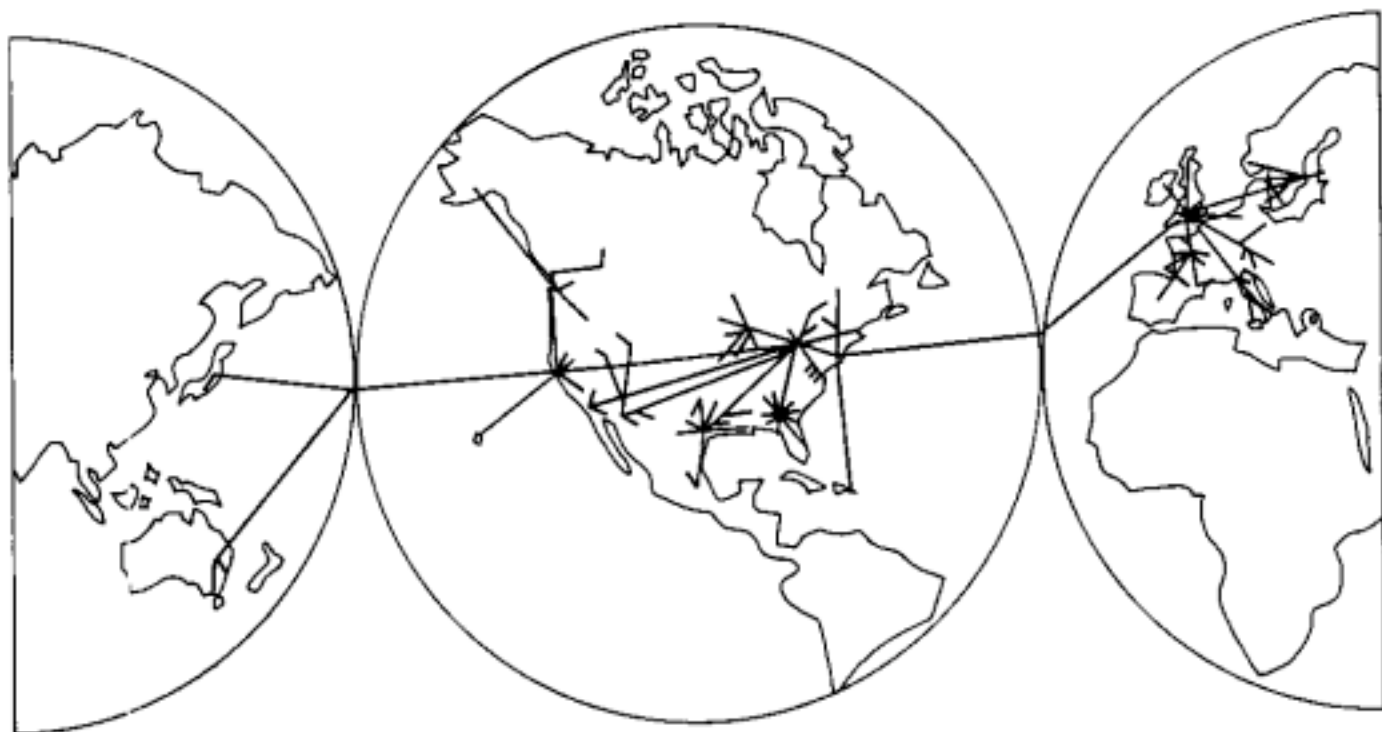


Fig. 20. Source: R.R. Bowker Co., *The Bowker Annual of Library and Book Trade Information*, 1974, Table 2, p. 109.

Fig. 21. Source: Owen, Bruce M. *Economics and Freedom of Expression: Media Structure and the First Amendment*, Ballinger Publishing Co., Cambridge, Mass., 1975, p. 78.

**... BARRIERS SHIFT
EVEN FOR NATIONS
AND CONTINENTS.**

Figure 22.



General Electric's MARK III teleprocessing network has 5,000 customers spread over 4 continents and 18 time zones with computers in Cleveland, Ohio, and Washington, D.C. The wide distribution spreads out the peak load, but individual customers need take no notice of the nature of the network. There are at least a dozen such international networks linking computers through satellite, undersea cable and terrestrial connections.

Source: General Electric Co., 1976.

**THE STAKES ARE HIGH:
POWER IS AT STAKE . . .**

Figure 23.

Rank order by GNP per capita	Country	GNP per capita (in dollars)	Rank order by EDP base as % of GNP	Rank order by phones per 100 population
1	Switzerland	5,933	4	3
2	United States	5,526	1	1
3	Sweden	5,463	13	2
4	West Germany	4,710	8	11
5	Canada	4,682	5	4
6	Denmark	4,540	3	5
7	France	4,250	7	15
8	Australia	4,054	10	6
9	Norway	4,050	14	7
10	Belgium	3,880	15	12
11	Netherlands	3,846	9	10
12	Austria	3,257	16	13
13	Japan	3,187	6	8
14	United Kingdom	2,714	2	9
15	USSR	2,223	20	18
16	Italy	2,185	12	14
17	Spain	1,491	18	16
	Worldwide average	1,147		
18	Yugoslavia	1,129	19	19
19	South Africa	830	11	17
20	Mexico	747	21	20
21	Brazil	503	17	21

National power is closely associated with highly developed computer and telecommunications resources. The anomalies are instructive. Japan's national economic planning, for instance, continues to stress the development of computer, communications and other information resources. The USSR, lagging in civilian deployment of computer and communication facilities, seeks to import them from the West.

Source: International Data Corporation, *Testimony and Background Material before the U.S. Senate Committee on the Judiciary, Subcommittee on Antitrust and Monopoly*, July 23, 1974, IDC, Newtonville, Mass., July 1974, Table No. 135, p. 81, and United Nations, *Statistical Yearbook*, 1973, U.N., New York, N.Y., 1974, p. 495-498.

HUMAN RIGHTS ARE AT STAKE . . .

Figure 24.

Legislator claims U.S. spy posts in Britain steal commercial secrets

London (AP) — The U.S. National Security Agency is stealing British commercial secrets "on a colossal scale" by eavesdropping on corporate communications from bases in Britain, a left-wing lawmaker claimed yesterday.

Tom Litterick, who represents a district in the industrial city of Birmingham, said he will ask the foreign secretary, Anthony Crosland, to raise the matter urgently with the U.S. Secretary of State, Henry A. Kissinger.

"They are using four British military installations, at Edzell in Scotland, Chicksands, Cheltenham and

one in Hampshire to monitor the communications of British commercial organizations," Mr. Litterick told reporters.

He said he obtained his information "from a former employee of the NSA who, in the course of his duties, noticed that commercial information was being decoded and transmitted to the United States and made available to American firms."

"This is nothing short of commercial espionage by an American state agency using facilities provided by the British," Mr. Litterick charged.

Wired Spies

By CHARLES OSOLIN

WASHINGTON — President Carter has approved a top-secret project to determine what action the government should take to prevent Soviet spies from gaining access to American industrial secrets and sensitive trade information, it has been learned.

According to administration sources, a major option under consideration involves the use of sophisticated electronic equipment to encrypt, or "scramble," private telephone calls involving investments, new technological developments and other delicate business information which might be useful to foreign countries.

Sources said Carter signed a

memorandum dealing with steps to counter the Soviet monitoring of American telephone calls about a week ago after a review by his National Security Council.

The project is so sensitive and so closely held that only a few top officials in the Carter administration and Congress know about it.

An informed source said that Carter ordered that the project be conducted under the over-all direction of the White House rather than exclusively under the Pentagon's super-secret National Security Agency (NSA).

He did so because of concern over possible intrusion by the military into the business world.

Fig. 24a. Source: Baltimore Sun, July 30, 1976, p. 2.

Fig. 24b. Source: The Atlanta Journal and Constitution, April 3, 1977, p. 1A.

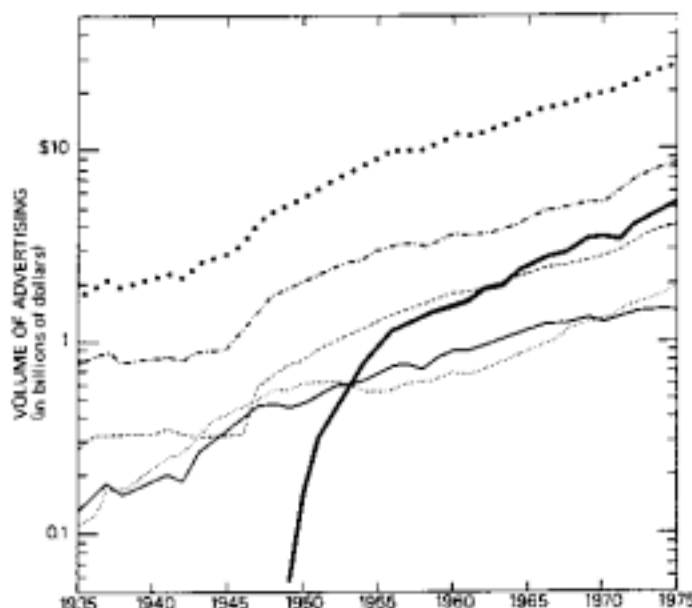
... MARKETS ARE AT STAKE ...

Figure 25.

..... total
- - - - - newspapers
..... direct mail
——— magazines
..... radio
——— television

Different media reach different markets in different ways, but all are dependent on government policies. Broadcasters are under the direct control of the FCC, while postal policies can sink or save any of the print media. Technical innovations can create new patterns, as television did in the 50's. Advertising is the only source of broadcasting revenues; newspapers draw 71 per cent of their revenues from advertising; magazines 53 per cent; movies and books, a negligible proportion.

Source: Adapted from McCann-Erickson Advertising Agency, Inc., New York, N. Y., 1976, compiled for Cram Communications, Inc.'s Advertising Age.



... INDUSTRY STRUCTURE IS AT STAKE ...

Figure 26.

THE ANSWER TO THE HEADLINE'S QUESTION: YES

BARRON'S

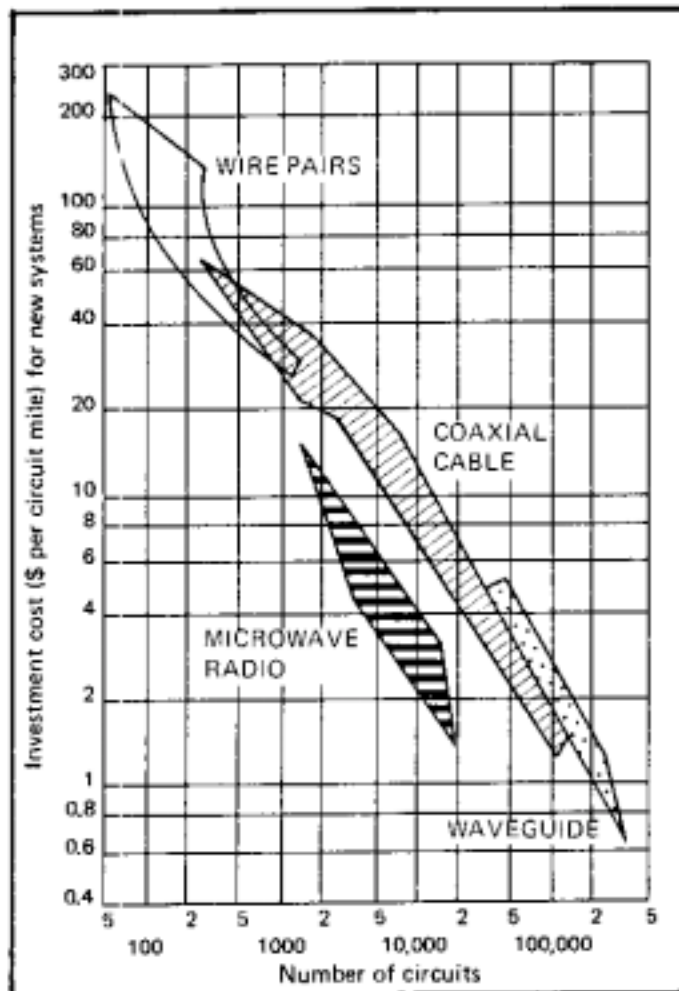
NATIONAL BUSINESS AND FINANCIAL WEEKLY © DOW JONES & CO., INC.

Ma Bell vs. IBM?

They Are Squaring Off at Each Other in Data Communications

... MONEY IS AT STAKE.

Figure 27.



Costs for transmission of information are down; carrying capacity is up. Wire pairs are the original telephone technology still in use; the others are later developments. The investment costs are expressed as a range.

Source: Adapted from O'Neill, Eugene F., "Radio and Long-Haul Transmission", *Bell Laboratories Record*, January 1975, p. 55.

THE STAKES EMBROIL USERS AND PROVIDERS AS CONFRONTATIONS CONTINUE.

Figure 28.

Aeronautical Radio, Inc.
Aerospace Industries Association
of America, Inc.
Air Transportation Association
of America
Altair Airlines
American Facsimile Services Corp.
American Newspaper Publishers
Association
American Satellite Corp.
American Telephone and Telegraph Co.
American Trucking Associations, Inc.
Associated Press
Association of American Railroads
Bank Wire
Boeing Computer Services, Inc.
Bunker Ramo Corp.
Central Committee on Telecommuni-
cations of the American Petroleum
Institute

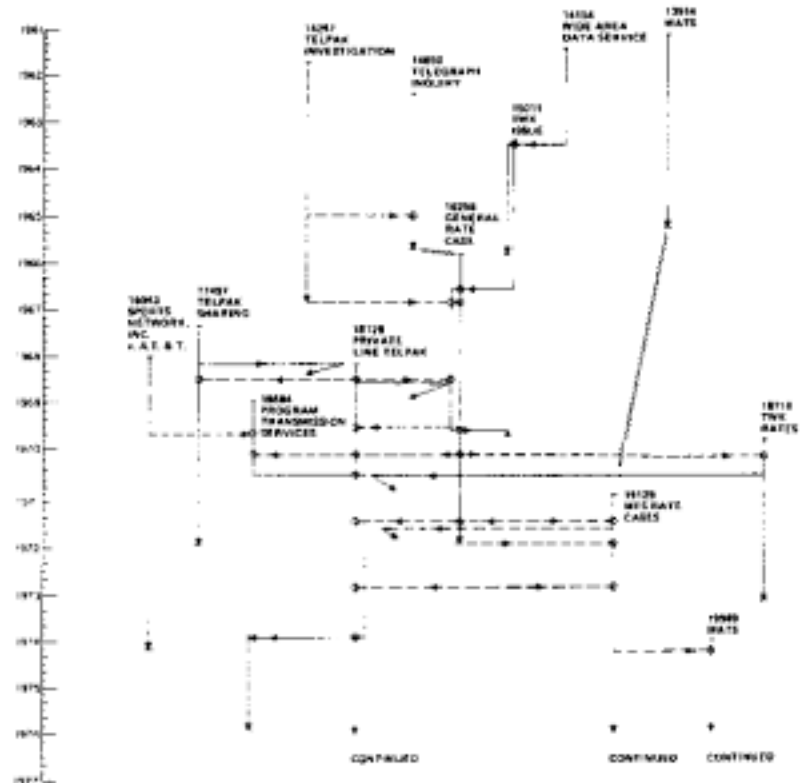
Citicorp
Commodity News Services, Inc.
Computer and Business Equipment
Manufacturers Association
Data Transmission Company
Dow Jones & Company, Inc.
Graphnet Systems, Inc.
GTE Service Corp.
International Business Machines
ITT World Communications Inc.
MCI Telecommunications Corp.
National Association of Manufacturers
National Association of Motor
Bus Owners
National Retail Merchants Association
National Data Corp.
North American Telephone Association
Orlando Communications Club, Inc.
Packet Communications Inc.
RCA Global Communications, Inc.

Remote Data Processing Services
Section of Adapso, Inc.
Satellite Business Systems, Inc.
(formerly CML Satellite Corp.)
Securities Industry Automation Corp.
Southern Pacific Communications Co.
Telenet Communications Corp.
Tymshare, Inc.
United Press International, Inc.
United Systems Service, Inc.
Utilities Telecommunications Council
Wells National Services Corp.
Western Union International, Inc.
Western Union Telegraph Company
Xero-Fax, Inc.

Department of Health, Education
and Welfare
Department of Justice
Office of Telecommunications Policy

Figure 29.
THE REGULATORY WEB

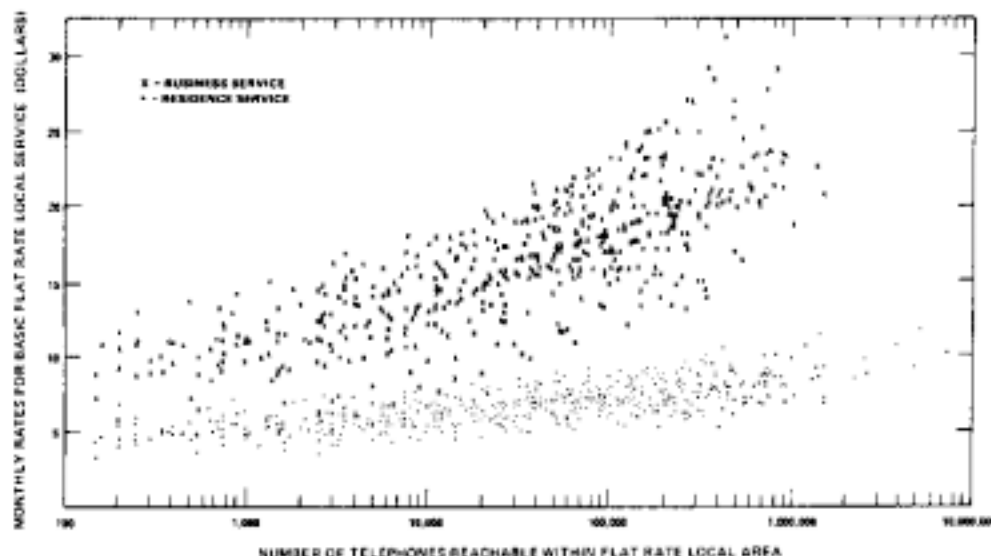
- docket
- portion of docket
- generates new docket
- termination of docket
- o dockets consolidated
or separated
- consolidation denied



Figures 28 & 29: Regulation has a reputation for being speedy, simple and cheap. This reputation has been a major reason for its attraction, but it "ain't necessarily so". Here are two examples from the world of the FCC. The listing gives all the parties actively interested in hearings on buying telecommunications service wholesale and selling it at retail. The chart shows the ramifications of a Commission proceeding on private-line telephone services that began in 1962. In both these examples, the controversy is murkier than it might be because the scope of the FCC's jurisdiction is increasingly cloudy.

**THE ISSUE IS WHO GETS
WHAT, WHEN, AND HOW . . .
. . . NATIONALLY?**

Figure 30.
HOW ARE TELEPHONES PAID FOR?



The most important difference between basic rural and urban telephone service, or between basic business and residential service, is the rates. The more phones in the local flat-rate area, the higher the flat rate. Businesses pay about twice as much for the same service in any area. The range shown here is from \$5 for residential service to \$25 for business service to

1,000,000 local phones. Electrical power rates run the other way, higher for basic residential service, lower for businesses. So, in practice, do rates for private line telephone services.

Source: Exchange Service Telephone Rates in Effect June 30, 1974, National Association of Regulatory Utility Commissioners.

Figure 31.
WHAT'S IN THE MAIL?

Business and government are using the mails in new ways. Business correspondence doubled, but mail containing transactions dropped by 12 percent. Government correspondence increased by 25 percent. Personal correspondence dropped 15 percent, but the percentage of sealed first-class mail remained relatively unchanged. Who's winning? Who's losing?

Source: Report of the President's Commission on Postal Organization, *Towards Postal Excellence*, 1968, p. 48, and a March 1976 U.S. Postal Service study.

	1968	1974
Transactions (Mail containing checks, bills, statements of account, purchase orders, etc.)	40%	35%
Correspondence	22%	26%
Personal	13%	11%
Business	5%	10%
Government	4%	5%
Advertising	26%	27%
Magazines and Newspapers	11%	11%
Merchandise	1%	1%

... INTERNATIONALLY?

Figure 32.

Article 19

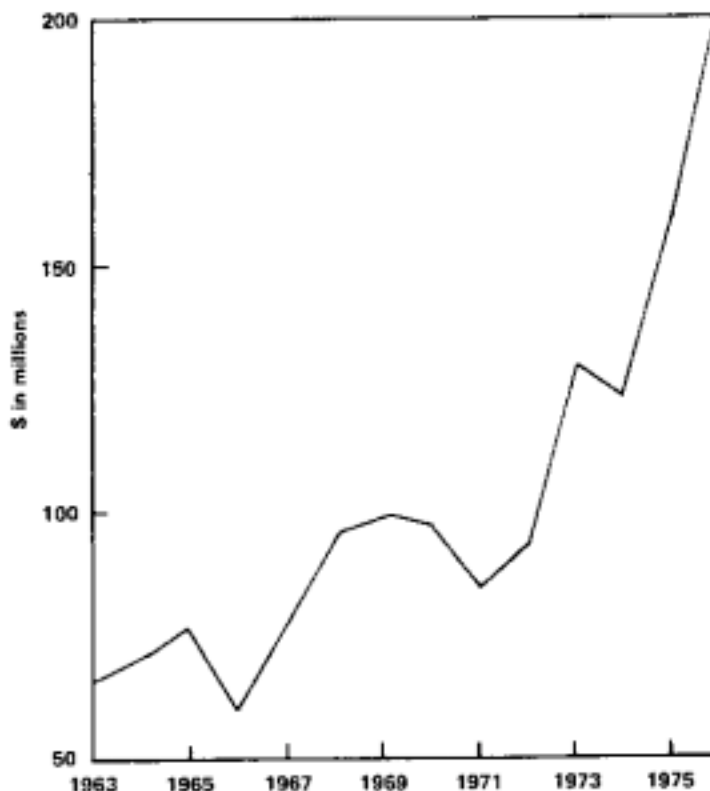
Declaration of Human Rights

"Everyone has the right to freedom of opinion and expression; this right includes freedom to hold opinions without interference and to seek, receive and impart information and ideas through *any media and regardless of frontiers.*"
(emphasis added)

United Nations General Assembly
Proclamation, December 10, 1948.



AMERICAN TV SHOWS SOLD ABROAD

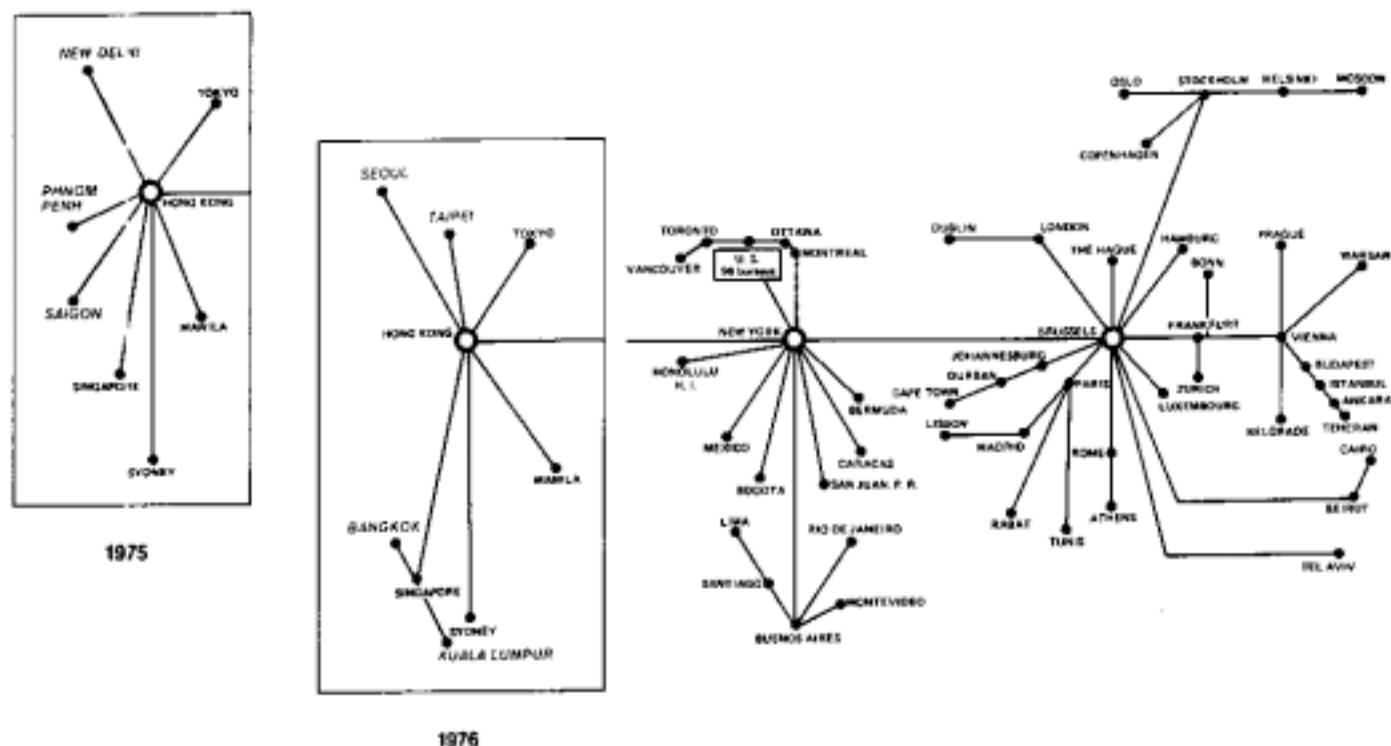


The world-wide flow of American television shows is already a potent economic issue, particularly in Canada, but the content of the shows may provoke foreign governments even more. Does the UN Declaration of Human Rights cover satellites used for direct broadcasting, agricultural mapping, mineral prospecting, or spying?

Source: Motion Picture Export Association of America, Inc., William H. Fineshaber, Jr., vice president.

**AGAIN, WHO GETS WHAT,
WHEN, AND HOW . . .
. . . INTERNATIONALLY?**

Figure 33.



Press Worried by Third World's Move to Restrict Flow of News

THE NEW YORK TIMES, MONDAY, JULY 19, 1976

Political limitations affect the global information flow more than technical problems. The end of the Vietnam War and the changes in India's government altered the information available to UPI clients everywhere.

Source: United Press International.

WHO MAKES POLICY?

Figure 34.

1	American Telephone and Telegraph Company (including Bell Laboratories, Western Electric, and Long Lines)	1	Federal Communications Commission
25	Bell Operating Companies	1	United States Postal Service
1	Western Union	x5	Other federal executive agencies (Internal Revenue Service, Rural Electrification Administration, Rural Telephone Bank, White House Office of Telecommunications Policy, etc.)
Ca. 1600	Independent telephone companies	x6	Courts
5+	Specialized common carriers and domestic satellite carriers	50	States (regulators, legislators, consumer agencies, etc.)
x1	Value-added service companies	1	National Association of Regulatory Utility Commissioners
x2	Teleprocessing service companies	x8	Municipalities (local taxation, pole rights and other rights-of-way, etc.)
x3	Electronics and business machines companies	x9	Investors supplying debt and equity capital
x4	Trade associations (Association of Data Processing Service Organizations, Inc., Computer and Business Equipment Manufacturers Association, Electronic Industries Association, National Telephone Cooperatives Association, North American Telephone Association, U. S. Independent Telephone Association, etc.)	x10	Consumers and consumer groups (including individuals, corporations, consumer groups, and government)
1	Congress of the United States	x11	Foreign nations

In folklore, Ma Bell gets what she wants from the Federal Communications Commission, but in actual practice it isn't easy. The principal players in the telecommunications arena are many and varied and they don't all want the same thing at the same time. Other information arenas tend to be less organized and more sprawling — education, for instance, or the media.

HOW ARE POLICIES CARRIED OUT?

Figure 25.

Laissez-faire	Import/export trade management
Taxes	Information exchange
Tax write-offs	Establishing or supporting an industrial base by government purchase
Regulation of price, quality and entry	Establishing new institutions
Standards	War
Research and development	Government control or monopoly
Prohibitions; financial and criminal sanctions	Building civil works
Subsidies	Propaganda
Rewards for innovation and invention	Fear
Incentives, e.g., matching funds	Police
Model legislation	

Most discussions of information policies are cast in terms of competition versus monopoly, but modern economic theory recognizes that various performance goals and diverse conditions of production are best accommodated by various shadings of the extreme structures. And this means various shadings of policy tools. Hammers are made for nails and nails for hammers, but saws are best for sawing wood. Thus, policy is made through the relationship between the government and the governed. Laissez-faire policies are useless when the government is fundamentally unhappy with the way things are going. Patents can't be awarded for non-existent inventions. The governed greatly influence the way they are governed.

Source: Listing adapted from Joseph F. Coates, *Structural Failure: The Case of Local Government*, an unpublished paper.

**HOW MUCH POLICY? FOR
WHAT OPERATIONS IN WHICH
INDUSTRIES?**

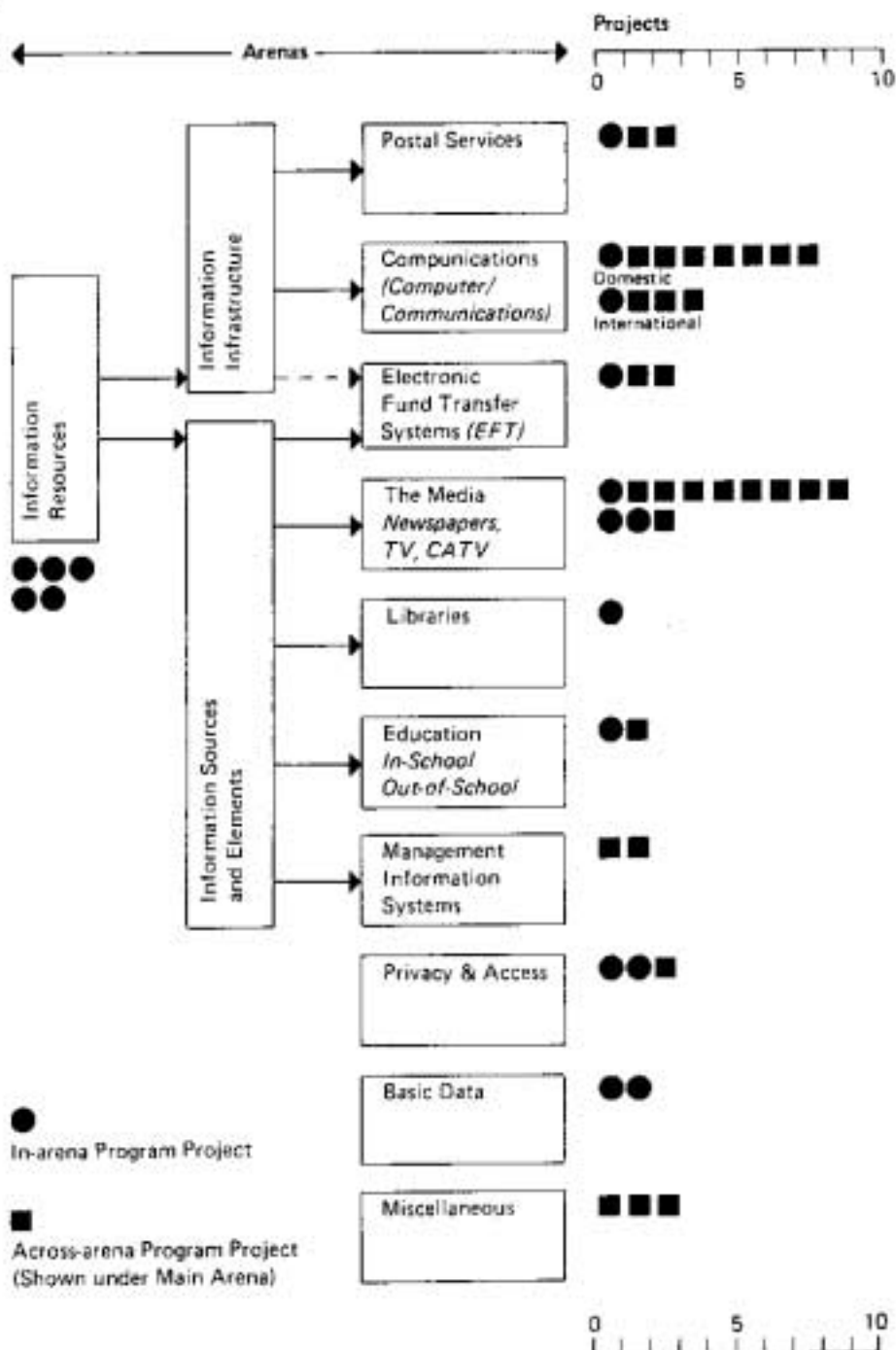
Figure 36.

ARENAS	GAMES		
Postal services	<p>In U.S., an ailing government monopoly with private competition in some services. Tradition of privacy.</p> <p>In other countries, postal services bundled with telephone and telegraph in government ministry. Little competition. Privacy variable.</p>		and services. Increasingly competing with electronic media.
		<i>TV-radio broadcasting</i>	Regulated by FCC. First Amendment protection eroded; Fairness Doctrine, etc. License renewal for individual stations; networks not regulated as such, but affected by antitrust laws. Threatened by CATV.
		<i>CATV</i>	Regulated by FCC, but not covered by statute. State and local regulation mixed. Doctrine unsettled. Competing with broadcasting and telephone industries.
Communications	<p>In U.S., communications industry private, but regulated; clashing with data processing industry, private and unregulated; difficult to distinguish the two. Both undergoing antitrust proceedings.</p> <p>In other countries, an important national asset, government supported and run in large part.</p> <p>Capacity and flexibility of international communications seen as promise or threat to national resources, sovereignty.</p>	Libraries	Many kinds—public, educational, organizational, and private—no settled doctrine on rights of access, use.
		Education	Direct government control over public education. Mixed federal, state and local jurisdiction. Some private school regulation, but little for large corporate sector training and education. Content of course materials controlled by private and public organizations.
Electronic funds transfer	<p>In U.S., extent of E.F.T. system regulation and who regulates unsettled. Banking regulators, communications regulators, state and federal, all interested. Non-banking industries vying for market. Privacy unsettled.</p> <p>Abroad, bank communications networks are policy concern, as above.</p>	Management information systems	Unregulated as such. Affected by privacy and freedom-of-information legislation. Communications component regulated to varying degrees. Much of output required by various arms of government.
The Media <i>newspapers & magazines</i>	Unregulated but affected by antitrust laws. Protected by First Amendment, tested in courts. Dependent on regulated postal rates and services, communications rates	Privacy and access	Public awareness very high. Constitutional protections, but governments important offenders, also businesses, professions. Countervailing pressures strong, doctrine unsettled. Conflicting claims of society and individuals.

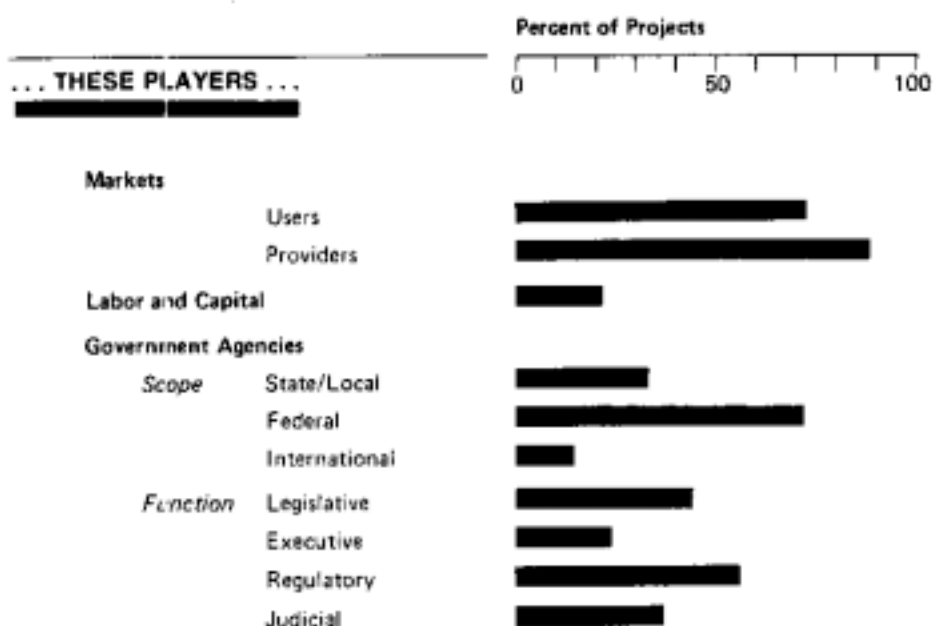
**TO ILLUMINATE THESE
ISSUES OF POLICY AND
OPERATIONS ...**

Figure 37.

... THE PROGRAM HAS CONDUCTED
STUDIES IN THESE ARENAS:



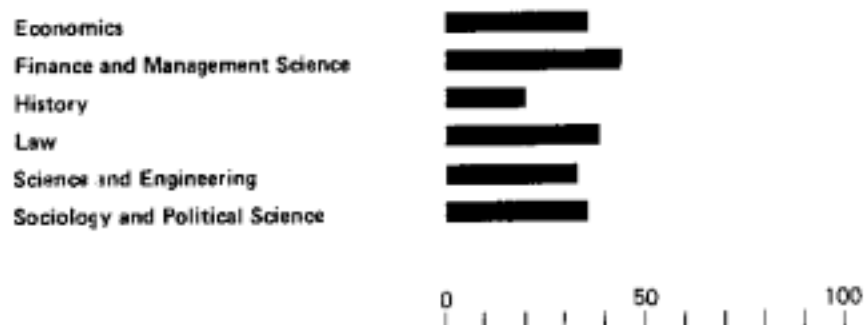
THE STUDIES DEAL WITH ...



... AND THESE STAKES ...

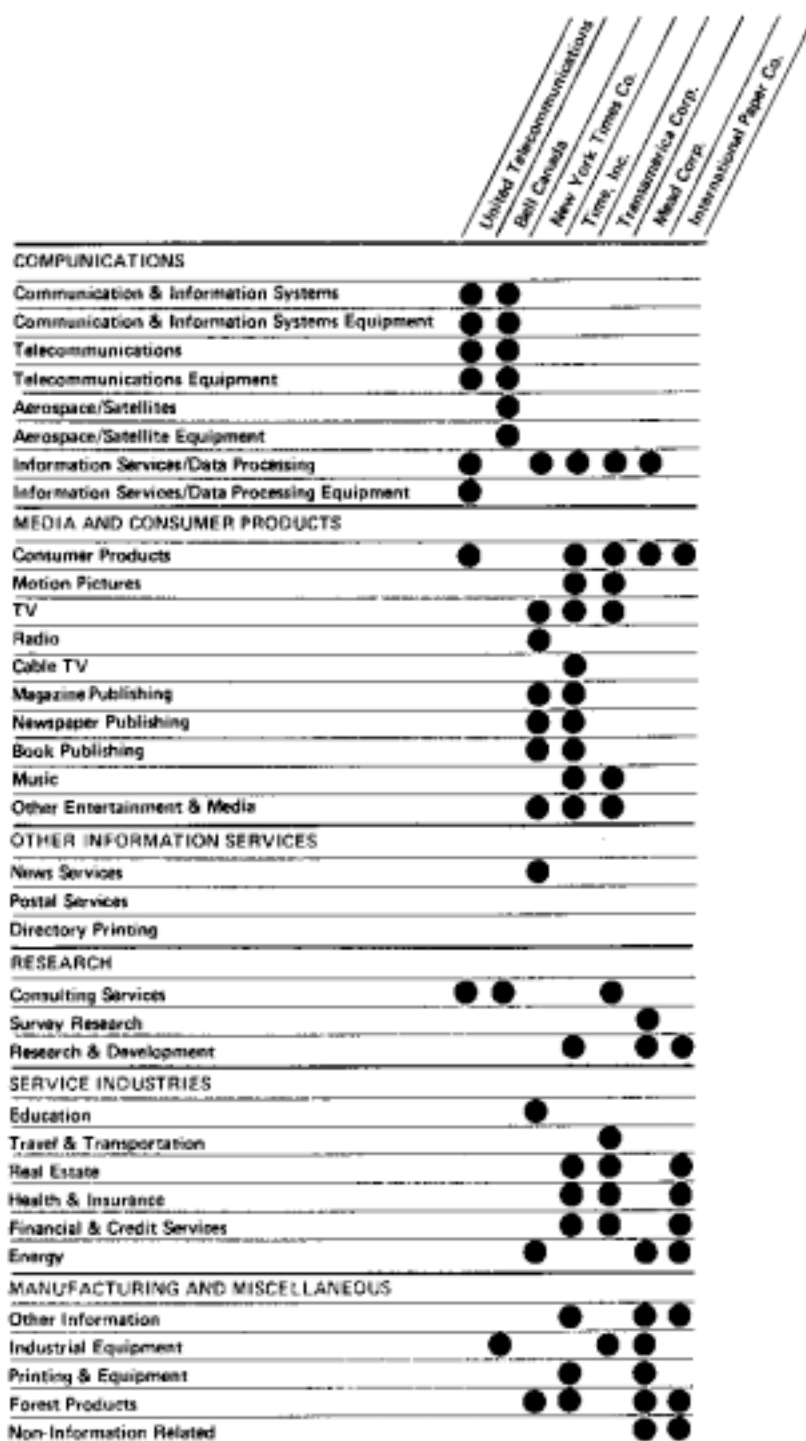


... USING THESE TOOLS.



**INDEPENDENCE AND QUALITY
ARE ENCOURAGED
BY DIVERSE, COMPETING
SOURCES OF FUNDS . . .**

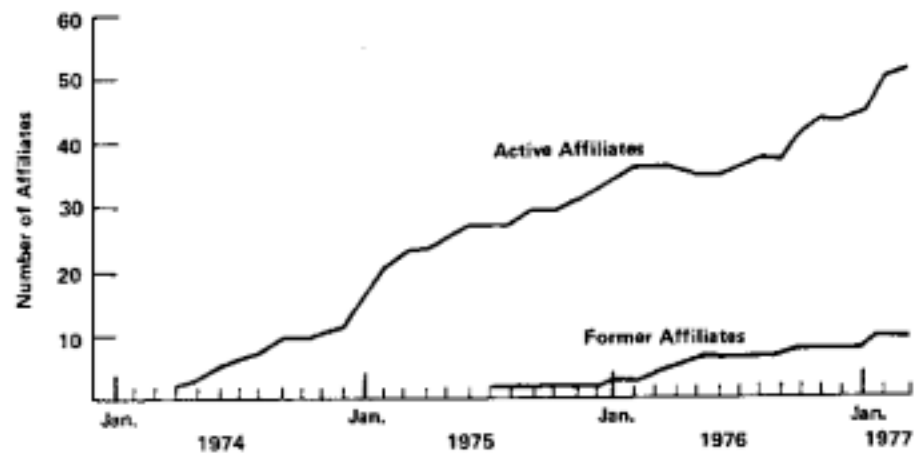
Figure 38.
**AFFILIATES AND THEIR
ACTIVITIES**



The chart shows some affiliates of the program and their major activities. Their interest in the Program is stimulated by the complex policy issues that arise nationally and internationally among industries and firms, and even within a single company.

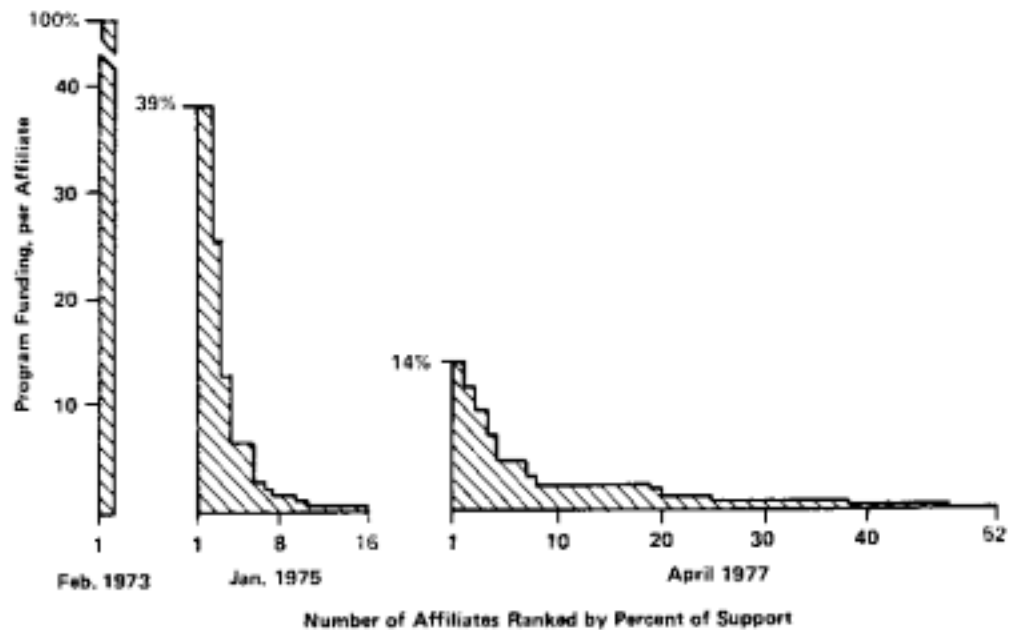
Other affiliates (not shown) — such as the Federal Communications Commission, the Communications Workers of America, and foundations — represent further elements of diversity in the Program's makeup. Affiliates are listed on page 38.

Figure 39.
**AFFILIATION WITH
THE PROGRAM**



The affiliates are major consumers of the Program's products and services. For the most part, their support is from their operating budgets; their collective pressure is for utility. Diversity and competition offset any individual pressures.

Figure 40.
**THE BASE OF SUPPORT
GROWS BROADER**



The program has grown from its 1973 beginnings by adding affiliates and decreasing dependence on a few contributors.

**INDEPENDENCE AND QUALITY
ARE ENCOURAGED BY MAKING
ALL FINDINGS PUBLIC...**

Figure 41

NATIONAL COMMISSION ON LIBRARIES AND INFORMATION SCIENCE FEDERALLY FUNDED CONTRACT		CONTRACT NO. DEC-6-76-3075	PAGE 1 OF 3 PAGES
ISSUED BY OFFICE National Commission on Libraries and Information Science 1717 K Street N.W., Suite 401 Washington, D.C. 20036		REPRESENTED PURCHASE TO 41 USC 252(e)(5)	TYPE OF CONTRACT Fixed price
CONTRACTING ORGANIZATION Harvard University 1350 Massachusetts Avenue Cambridge, Massachusetts 02138		CONTRACT FOR Study on Interaction between Traditional Library Services and New Information Services	
FUNDING NUMBERS Cambridge, Massachusetts		ACCOUNTING AND EXPENDITURE DATA 3740190 - Appropriation 2005890 - CAN	
ALL INFORMATION TO See Special Provisions, Article III		ESTIMATED PRICE \$19,184.00	
		SPONSOR National Commission on Libraries and Information Science	
		STARTING DATE June 26, 1974	TERMINATION DATE December 31, 1974

A standard negotiated contract for federally funded research.

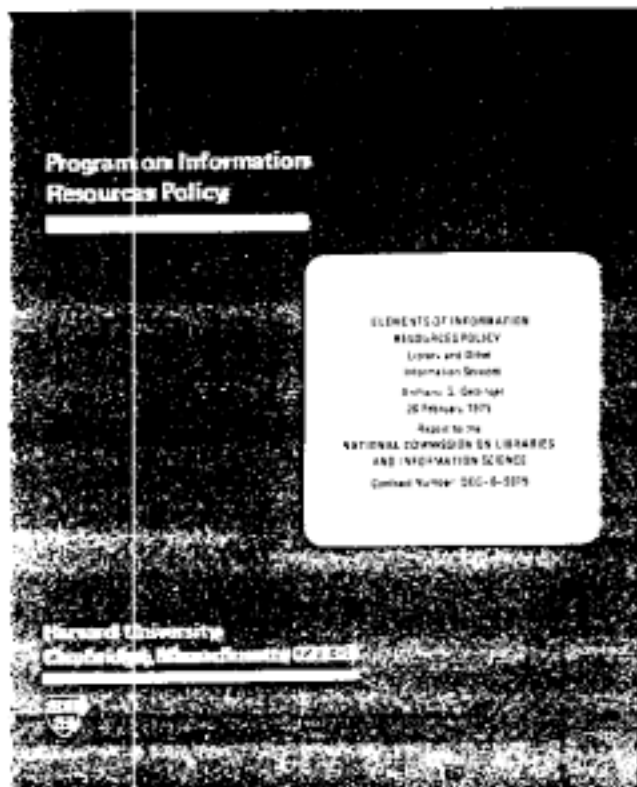
(f) Nothing contained in this clause shall imply a license to the Government under any patent or be construed as affecting the scope of any license or other right otherwise granted to the Government under any patent.

(g) The Contractor shall not affix any restrictive markings under any Subject Data, and if such markings are affixed, the Government shall have the right at any time to modify, remove, obliterate or ignore any such markings.

*End
of
SP*

(h) The Contractor further agrees that he will not publish, have published or otherwise disseminate any information of whatever nature resulting from the work being performed under this contract except as may be approved by the Project Officer designated in this contract.

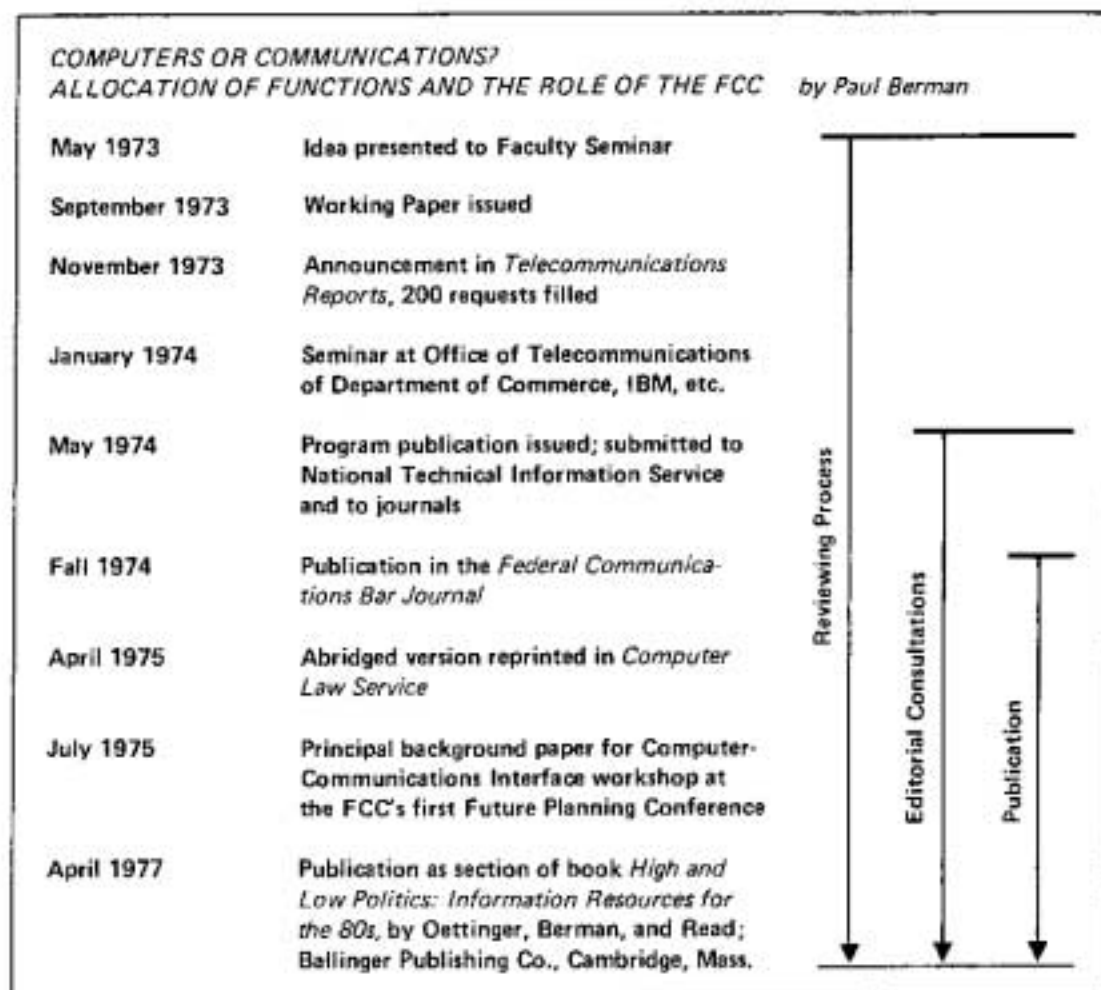
The Program does no proprietary work. The common clause giving publication control to the government is deleted here.



The final report, published by the Program as part of its regular output and available for use by all, including the government.

**... BY BUILT-IN REVIEW
BY PLAYERS AND OTHER
EXPERTS.**

Figure 42.
THE LIFE OF A STUDY



Review and revision go on throughout the course of a project. Outside reviewers are asked:

- Are we on the right track?
- Have we missed any important facts?
- Have we misrepresented anyone?

Within the Program, efforts are directed at making the most of the research. The Program staff ask:

- How does this relate to our research?
- What are the various audiences for this project?
- Is the report clear enough for the interested layman?

**TO GET THINGS DONE,
EACH PROJECT DIRECTOR
HAS FINAL RESPONSIBILITY.**

Figure 43.
EFT POLICY
AND COMPETITIVE EQUALITY
BY DANIEL PRIVES

Reviewers come from important centers of interest in the subject — competitors, regulators, and scholars — but the final responsibility remains with the project director. In this way we can represent a variety of interests without giving in to committee — built projects or turning out reports reduced to a lowest common denominator.

Commercial Bank	5
Savings Bank	1
Savings and Loan Assn.	1
Bank Trade Group	1
Bank Card Assn.	1
Bank Regulator	4
Other Government	5
Diversified Financial	1
Academic	4
Consulting	1
Telecommunications Industry	3
Retailing	1
Law Firms	2
Total	30

**THE PROJECT DIRECTOR'S
JOB:**

Figure 44.

Describe the arenas of conflict.
Name the significant players.
Enumerate the stakes of the game.
Identify the forces in action.
Mark the trends.
Discuss strategies.
Specify the policy options and
their likely consequences.

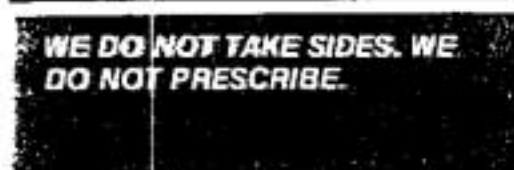
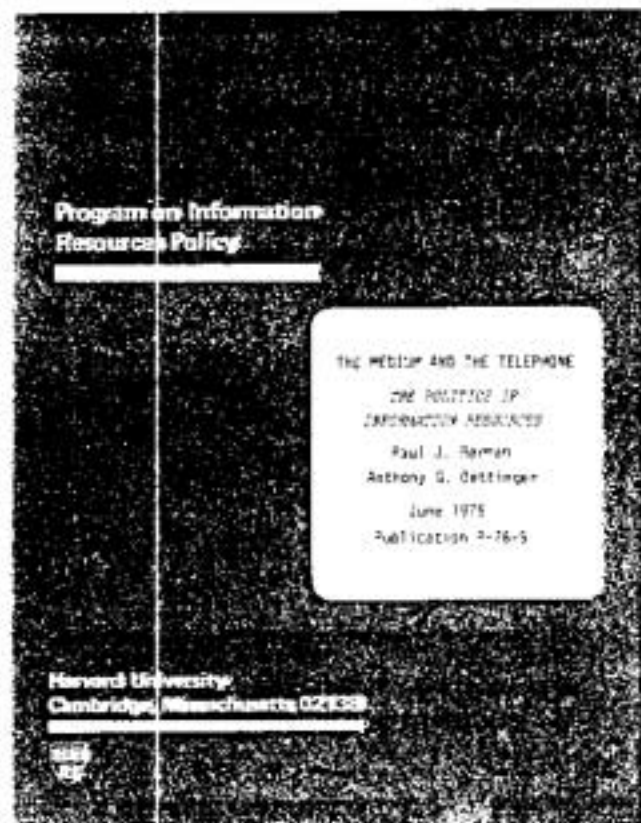


Figure 45.



PROGRAM PUBLICATION

The Program serves players from all information arenas: users and providers of information services; competitors and allies in business and industry; legislators and regulators; scholars and the general public.



VOLUME 80, No. 13

July 1, 1976

MANAGEMENT NOTES

By Lon B. Gregory

The Medium and the Phone

There's considerable interesting reading in a paper from Harvard University's Program on Information Technology and Public Policy. Authored by Paul J. Berman and Anthony G. Gelfinger, "The Medium and the Telephone: The Politics of Information Resources" is well light reading.

It does, however, provide a topical, current analysis of the telecommunications industry as it exists today in this country. And, not over-

looked are the competition, regulation, financial and engineering, legislative issues so much a part of the current scene.

It does provide an apparently objective, analytical picture of the industry as it exists today. It's loaded with data, statistics, charts and comparisons, including a goodly number we've not seen before. As much as anything, it appears as a work by someone without any particular axe to grind.

TRADE PRESS REVIEW



© 1976 Christopher H. Sterling, Department of Radio-TV-Film Temple University, Philadelphia, Pennsylvania 19122

September 1976 page 8-19

"The Medium and the Telephone: The Politics of Information Resources... There are nearly 50 tables, charts, diagrams, etc. to supplement the text in this report which is one of the best and most useful yet found in the program."

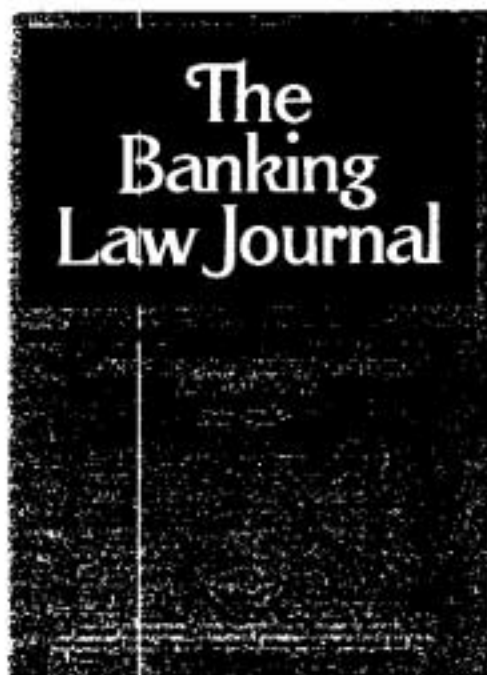
September 1976 page 8-25

"It is indeed unfortunate [the Program] reports don't get wider exposure in an academic arena, for the Harvard program is showing groundbreaking under First Amendment's pioneering 1962 study of information production in the U.S., and is providing current perspectives on major policy problem areas in all aspects of institutions and mass communications. The published materials from the program are some of the most current and cogent materials on these topics available but the pricing and the relative lack of publicity keeps the exposure down."

ACADEMIC REVIEW

PROGRAM PRODUCTS AND SERVICES:

Figure 46



PAPERS AND ARTICLES...

Social Sciences 106. Information Resources and Public Policy

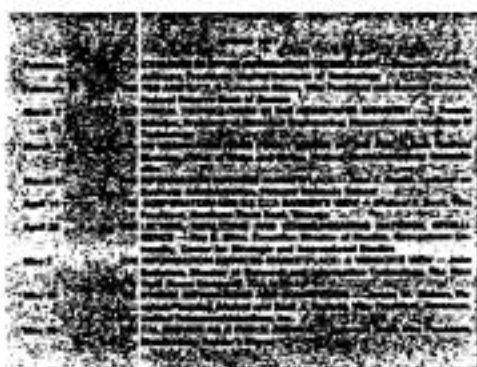
Anthony G. Dettinger

Generalist and expert roles in shaping the complex socio-technical systems that marshal and distribute the world's basic resources. Selected economic and social theory and basics of germane science and technology lead into an extensive case study of information resources as a case in point: television, newspaper, postal, telephone, computer and other information systems as they intertwine in serving the public. Among the perennial issues considered: quality and cost of service, incidence of economic and other benefits and burdens, distribution of power and control. Emphasis is on understanding how scientific, technological, economic, legal and political factors interplay as the issues are confronted by private and public policy makers.

Note: Term paper in lieu of final examination; extensive research expected of graduate students who elect this course. Prerequisite: Economics 10 or elementary calculus or equivalent.

Half course (fall term). M., W., 2-3:30 3172 (VII, VIII)

UNDERGRADUATE AND GRADUATE TEACHING...



REGULAR SEMINARS FOR RESEARCHERS AND PLAYERS...



CONGRESSIONAL TESTIMONY...



**Payment Systems, Inc.**

Announces an International Symposium



Electronic Funds Transfer Systems in the United States

[illegible]
$$\begin{aligned} \frac{1}{2}(\partial_t^2 + \partial_x^2) &= \frac{1}{2}(\partial_t^2 + \partial_x^2) + \frac{1}{2}(\partial_t^2 + \partial_x^2) \\ \frac{1}{2}(\partial_t^2 + \partial_x^2) &= \frac{1}{2}(\partial_t^2 + \partial_x^2) + \frac{1}{2}(\partial_t^2 + \partial_x^2) \\ \frac{1}{2}(\partial_t^2 + \partial_x^2) &= \frac{1}{2}(\partial_t^2 + \partial_x^2) + \frac{1}{2}(\partial_t^2 + \partial_x^2) \\ \frac{1}{2}(\partial_t^2 + \partial_x^2) &= \frac{1}{2}(\partial_t^2 + \partial_x^2) + \frac{1}{2}(\partial_t^2 + \partial_x^2) \end{aligned}$$
$$A = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$


Write Content

WORKSHOPS AND CONFERENCES...

Senator Gale McGee (left) and Representative Tim Wirth (right) were among the discussion leaders at an executive forum held in March 1977 by the Program and the Nieman Foundation for Journalism.

OFF-CAMPUS VISITS AND PRESENTATIONS...



Ma Bell fights for her monopoly

The promise of high profits through high technology has set off a spectacular battle among communications giants, in the marketplace and in Congress.

By Milton R. Benjamin
and William H. Read

It is 11 A.M. on a sunny spring day in 1941. The private line rings in the third floor midtown office of the chairman of a major oil company. "Frank," says the

firm's Washington representative. "I've just had an urgent call from the Federal Energy Administration. They want to know our petroleum reserve position, and they want it fast."

"Is this a test, George?" the chairwoman asks.

Milton R. Benjamin is an associate editor of *Newsweek*. William H. Reed is a fellow of Harvard's Program on Information Resources Policy.

STUDY PROGRAMS FOR VISITORS FROM INDUSTRY AND GOVERNMENT

Source: *New York Times Magazine*, November 28, 1976

**AFFILIATION MEANS A WORKING
PARTNERSHIP BRIDGING THE GAP
BETWEEN OPERATIONS AND
POLICY FOR THE BENEFIT OF ALL.**

Figure 47.

AFFILIATES:

American Can Company
American District Telegraph Company
American Telephone and Telegraph
Arthur D. Little Foundation
Bell Canada
Booth Newspapers
The Boston Globe
Codex Corporation
Communications Workers of America
Computer and Communications Industry
Association
Data Transmission Company
Donaldson, Lufkin & Jenrette
Executive Office of the President,
Office of Telecommunications Policy
L. M. Ericsson (Sweden)
Federal Communications Commission
Federal Reserve Bank of Boston
First National Bank of Boston
First National Bank of Chicago
General Electric Company
General Telephone & Electronics
Harper & Row
Harte-Hanks Communications, Inc.
Honeywell, Inc.
IBM Corporation
International Data Corporation
International Paper Company
International Resources Development, Inc.
Interpublic Group of Companies, Inc.
Iran Communications & Development
Institute
Lee Enterprises

Litton Industries
Lockheed Missiles and Space Company
John & Mary R. Markle Foundation
McGraw-Hill, Inc.
Mead Corporation
Minneapolis Star and Tribune Company
New York Times Company
Nippon Electric Company
Norfolk & Western Railway Company
Payment Systems, Inc.
Pitney Bowes, Inc.
Polaroid Foundation, Inc.
PRC Information Sciences Company
RCA Global Communications
Reuters, Ltd.
Rockefeller Brothers Fund
Rockwell International
Salomon Brothers
Seiden & De Cuevas, Inc.
Southern Pacific Communications
Stromberg-Carlson Corporation
Systems Applications, Inc.
Time, Incorporated
Transamerica Corporation
United Telecommunications
U.S. Department of Commerce:
National Technical Information Services
Office of Telecommunications
United States Postal Service
Western Union Corporation
Western Union International, Inc.
Xerox Corporation

SOME NOTES ON THE INFORMATION PROBLEM

There is no such thing as information resources policy. Yet information resources policy affects national power and personal privacy, individual freedom and corporate power, jobs and entertainment, money and messages.

Both these statements are true: Information policy is everywhere and nowhere. This paradox defines the interests and purpose of the Harvard University Program on Information Resources Policy.

Decisions of vital importance — national, international, corporate and personal — are being fought out in dimly lit arenas under rules that are not clear even to the lawyers, engineers, economists and bureaucrats who devised them. Rosters and scorecards are rare. Some of the players are unnumbered; others wear the wrong numbers. And no one is watching.

But the stakes are very high.

A glance at the list of information industries in Figure 1, their functions and their revenues, gives a rough indication of some of the stakes. These are industries whose fundamental production lines are information processing lines. They employ nearly half the labor force in the United States and account for more than 20 per cent of the Gross National Product. The money system is an information system. An information system gathers and transmits the news. The education system is an information system. Sports and entertainment come through an information system. Business and marketing are information systems. Much of government is an information system.

Yes, and tigers and tabbies are both cats, but so what?

There are many kinds of cats, and there are many kinds of information technologies, but it is becoming clear that there is really only one information system, no matter how disconnected the parts may seem. Information is a basic resource, fully as important as materials or energy. While materials and energy have not lacked for public scrutiny and policy attention, information resources have developed willy-nilly, their potency overshadowed by their technical details, their pervasiveness so complete they are taken for granted, like the clean air we used to breathe.

Alterations in the relations between oil and coal in the energy industries, or between steel and aluminum or wood and concrete in the materials industries have obviously large implications for public policy, ranging from military strategy to traffic control, from some nation's power to somebody's job. Alterations in the relations between the computer industry and the telephone industry — between IBM and Bell — also have large implications for public policy. The Program is trying to make them equally obvious.

The implications are not obvious now. Even in this "electronic age" with its "information explosion" and its "knowledge revolution," very few people could sketch in the common features of the communications system and the computation system, but the fact is that they are no longer separate at all. They are the same thing.

The first century of modern communications, from Morse's telegraph of 1836 through World War II, was characterized by almost complete techno-

logical distinction. Telephone and telegraph were wire-borne, but in entirely different ways. Radio and television were wireless, for the most part. Motion pictures were on film, but transported by hand like the mail. Printing was heavy industry. And, at everyone's headquarters, there were files and adding machines and more and more clerks.

There was no confusing any one of these activities with another. There was hardly any connecting one of them with another. They involved separate organizations which did not see each other as competitors and certainly not as part of anything called information resources. Each was bounded by its own technology and the market for the service it could provide; policy for each was set in terms of that service, technology and market.

But the divergence of technologies was superficial, not fundamental. Today there are more forms of information technology than ever before, but the technical barriers between them are fewer. The beginnings of the process of coming together are shown in Figure 6. Messages are data; pictures and sounds are data; words are data; and, as data, all are subject to processing by computer, and all are subject to digital transmission.

A picture is the same as a thousand words.

The tiny dots that make a newspaper picture and the tiny dots we call letters are all the same to the computer. The path from the computer's keyboard to its memory is just as much a communications channel as the hotline from Washington to Moscow. And the switching system that chooses a path for a transcontinental telephone call is as much a computer as the one that routes your checks through the banking system.

That is, both communications and computation use the same digital electronic technology, which the Program has dubbed *communications technology*. It is this shared technology that has put Bell, as the leader of the telephone industry, into competition with IBM, as the leader of the computer industry.

But technical compatibility is not necessary for industries to compete. Only the functions have to be the same. You can make a purchase with cash, a check, a bank card, a credit card, or on account with the store. These are choices among financial information resources, each depending on different organizations and using different technologies. Regardless of the choice you make, part of what you pay will go to provide the information service necessary to complete the transaction.

Each service has a different cost, to be paid in a different way. With cash, the cost is undetectably small, unless you lose it before you spend it. The bank charges you 10¢ a check, or requires a minimum balance. The credit and bank cards cost you 18 per cent annual interest on your unpaid balance. The store may charge you 50¢ for handling if they have to send a second bill. Some pay your postage, and some do not.

So how much is paying for the purchase worth to you? Is a cancelled check or itemized account worth what it costs? You can get a cash receipt for free. If a store offers credit, or accepts bank cards, how much is added to the purchase price? Is it more convenient to pay one way or another? For you? For the store? For the bank? What is the credit worth if you don't need it? If you

do? Who will have access to your purchase records? What you spend and what you buy tells a lot about you. Some banks offer direct, immediate transfer of funds through electronic systems. They'll take the money out of your account and credit it to the store's with just the push of a few buttons. Is that worth more than a check? Or less? Does it cost more? Or less? For that matter, what makes a check equal 10^4 worth of information processing and transmission while credit card service is free, if payment is received within 25 days?

Or, maybe you should have ordered by mail.

When you pay your bill, you are making your own information resources policy. You are choosing among technologies and industries, among costing and pricing practices, among regulated and unregulated information resources. You, and the store, and the bank, and the card companies are all standing around your transaction, waiting to see who gets what, when and how.

If you have never looked at bill-paying in this light, if you have never thought of the questions raised and answered every time you make such choices, you need not feel embarrassed or even left out, because almost all information resources policy is made in the same way you make yours.

Take governments, for example.

Government control of information policy in the United States is fragmented, to say the least, as shown in Figure 34, which covers telephones only. Much power remains with the states, and even with municipalities. Within the federal government, policy may stem from this or that executive agency or major government information user, from the courts and the Constitution, or from Congress. The Federal Communications Commission is the most visible federal agency with explicitly delegated authority in any arena of information resources policy.

The FCC's authority comes from the Communications Act passed in 1934, and not changed much since. The FCC covers broadcasting, telegraphy, and telephony only. Most of the components of the communications network shown in Figure 6 were non-existent in 1934. Electronic data processing was still in the future. No one anticipated that clerical work was going to be transformed into an integral part of the communications system. But the communications network shown in Figure 6 includes the telephone switching system — a computer for handling communications traffic — as well as many physically separate computers linked by telephone lines to form larger computers. The FCC has made a number of attempts to link up data processing to the categories established in the Communications Act, but the results have been mixed at best.

The Act treats information technologies as separate and incompatible. Telegraphy and telephony are defined as *common carriage*, meaning that carrying messages is analogous with carrying freight so far as the law is concerned. The Act treats broadcasting as a local phenomenon. Common carriage and broadcasting each have their bureau in the FCC and the bureaucracy to go with it.

But these technologies were not entirely separate and distinct even in 1934. The communications network in Figure 6 began in 1926 when the broadcasters and Bell got together to establish the first national radio network.

Today, after three decades of computers, space walks, transistors, integrated circuits, hot and cold war and unprecedented economic growth, information resources are versatile and abundant, not scarce and incompatible, and technological distinction is unimportant, but the FCC is still operating under the same statute.

The FCC was not established to make information resources policy, but to regulate electronic communications. Of all the forms of communications, however, the FCC's statutory authority covers only two, broadcasting and common carriage. Thus, under its mandate, the FCC is not constituted to link up to most of the communications world outside that mandate.

Nor does the FCC's mandate give it adequate access to broadcasting and common carriage. With its divided authority and its divided bureaucracy, the FCC cannot even regulate both of them at the same time. In terms of the blind men and the elephant, the Broadcast Bureau is set up for handling snakes only and the Common Carrier Bureau is set up for trees. (And, on the other side, the Anti-Trust Division of the Justice Department has what it takes for dealing with walls.)

These institutional limitations make it hard for the FCC to operate. Its charter no longer fits reality, but it cannot operate except under its charter. In fact, the FCC's charter gives it no better preparation to deal with modern information resources than do those of the Federal Home Loan Bank Board or the Senate Foreign Relations Committee, which are also having elephantine problems defining and directing information policy.

Naturally, these agencies must proceed with their assigned tasks, but the results reflect their difficulties. The FCC's response to the rise of communications has been to make room for some competition in the telephone monopoly. Figure 17 illustrates one instance. The FCC has allowed the establishment of "specialized" communications lines parallel to Bell's long-distance lines on major routes. Bell's traditional lines can handle data communications and the specialized common carriers also carry regular telephone calls. As a monopoly, Bell serves the by-ways as well as the highways, but the specialized carriers stick to the main lines. And, as a monopoly, the telephone companies must provide these competing carriers with local service linking the competitor's customers.

A monopoly with competition? And this confusion arises in the one arena where Congress has attempted to establish order. Figures 28 and 29 give some idea of the order that resulted. Other information arenas are even harder to see and understand, education, for instance, or the media. Figure 36 lists some of the most important issues in the arenas the Program has examined.

It is not that chaos is unbearable or even undesirable, or that a central information policy apparatus ever could or should be devised by Congress. The point is that these issues remain essentially unexamined while policy continues to be made by fate, fiat, or *fait accompli*.

Information resources policy is made in the same dim light as everyday decisions to pay a bill by cash, check or credit card. The implications of policy decision are scaled up considerably, however. And, if there is little attention given to information resources policy on the national level, there is

even less attention given on the international level.

What will be the effects on the international political system of direct broadcasts by satellite? American television exports are already a matter of international controversy. (See Figure 32.) Not only are they seen as taking work away from local program producers, but they are also seen as propaganda. Police shows may be violent, but they also occasionally embody Constitutional rights not found in other countries. In France, you are guilty until you prove yourself innocent. Could *Starsky and Hutch* threaten the world's systems of justice?

And what of transnational information networks like that shown in Figure 22? Or the banking networks shown in Figures 11 and 12? Since a business may consist entirely of information systems, these transnational networks may have powers and potentialities almost governmental in scope without coming under any particular form of control. On the other hand, they may be outside any particular system of protection as well, with fragile physical facilities and complicated political liabilities wherever they pass.

In the underdeveloped countries, information resources are built with great expectations. Broadcasting systems will foster national unity within borders established for European colonial purposes, many nations hope. National telecommunications systems are necessary for the development of modern industry, so they believe. Are they backing the right horses? Where should scarce national resources go? Should we export the FCC? The Bell System? IBM? None of the above?

We opened this discussion with a paradox: Information policy is everywhere and nowhere. We rest our case on the paradox, but the question remains: What is to be done?

These things are happening now. The established relationships between information technologies, organizations, markets, and regulators are being upset now, nationally and internationally. IBM and the computer industry are facing Bell and the telephone industry now. National power in information resources is being established now.

There is no official "information crisis" on front pages and political platforms, but there might as well be. There will be one. It is already close enough to be engaged. It should be met while it is still far enough away to be outflanked. The Program does not advocate the coronation of national and international information czars to run everything nicely and sensibly, nor do we advocate the abandonment of the attempt to regulate as a bad job. We don't know, but neither does anyone else. Our aim is to sketch the web of relations among information systems, to portray the diverse political, economic and technological factors that shape the structure of information resources issues. We are trying to raise the questions that are not being raised.

WHAT ARE THE ENDS OF POLICY AND WHO SAYS SO?

What should be our aims for information resources policy in the next twenty years?

What is necessary? What is desirable? How can foreign and domestic policy aims be harmonized?

What should be the scope of information resources policy?

What, if anything, will be regulated? And to what ends? Who will get what? Who will pay for what? Who will get paid? In the United States? In other countries?

Who should decide?

These issues seem complicated and boring, but would they seem so if the stakes were better known? Who is deciding now? Is the power in the right hands? These are matters for broad public debate.

WHAT ARE THE MEANS?

What are the limits of present policy instruments?

What should be kept? What should be discarded? What is missing? What is possible? What is impossible? What's the catch?

What institutions and processes might best serve our policy aims?

Public? Private? Markets? Elections? One big information company? Myriads of small ones?

These questions are still hard to ask, much less answer. So long as they remain unexamined, information resources policy will continue to be made haphazardly through institutions established for other purposes.

SOME NOTES ON THE PROGRAM

The Program lays out the policy game clearly so that all players can have an accurate overview of the arenas and an analysis of their options and of the likely consequences of exercising them.

The Program works in ways designed to encourage independence and quality.

Our money comes from many affiliates with differing stakes in information policy. Their competition and diversity lets us call things as we see them. And since their support comes from operating budgets for the most part, if they are not satisfied with our work, they leave.

We gain more than money from our affiliates. They help with data, and they also supply interested, informed reviewers of our research. These reviewers participate in every stage of research, from talking it out to final report, and further. One reviewer from industry ended up with a research project of his own.

All the Program's research is public. We do no proprietary or confidential work. Project results are usually presented in several different forms for different audiences. Program staff go to industry forums as well as academic meetings. Project directors testify before the Congress and elsewhere. Written research reports often become articles in popular, trade or scholarly journals or books. Published research is used as text material by industry and government, as well as at Harvard and other schools.

Sole responsibility for the final results rests with the project director. We want the advantages of collective knowledge and individual responsibility. Project directors come from a variety of backgrounds in industry, government and academic life. They include senior business executives and undergraduates, regulators and entrepreneurs, legislative staff and professors with endowed chairs.

In summary, the Program uses diverse, interested support, regular review of research, public availability of results and centralized project control to achieve quality and independence.

CHAIRMAN

Anthony G. Oettinger, Chairman of the Harvard Program on Information Resources Policy, is Gordon McKay, Professor of Applied Mathematics, Professor of Information Resources Policy and a member of the Faculty of Public Administration at Harvard University.

He is chairman of the CATV Commission of the Commonwealth of Massachusetts and was a consultant to the Executive Office of the President of the United States through the National Security Council from 1975 to 1977 and the Office of Science and Technology from 1961 to 1973.

He is a member of the Research Advisory Board of the Committee for Economic Development and was an advisor to the CED subcommittee that prepared the report *Broadcasting and Cable Television: Policies for Diversity and Change*, issued by CED in April 1975. Since 1956, he has served as a consultant to Arthur D. Little, Inc., on the uses of information technologies in many industries; he served as a principal consultant to the team that prepared *The Consequences of Electronic Funds Transfer - A Technology Assessment of Movement Toward a Less Cash/Less Check Society*, a report for the National Science Foundation published by the Government Printing Office in June 1975.

From 1966 to 1968 he was president of the Association for Computing Machinery. He is a member of the Council on Foreign Relations and a Fellow of the American Academy of Arts and Sciences, the American Association for the Advancement of Science and the Institute of Electrical and Electronics Engineers.

As chairman of the Computer Science and Engineering Board of the National Academy of Sciences (1967-73), he led the preparation of NAS reports on *A Technical Analysis of the Common Carrier User Interconnections Area* (Lewis S. Billig, Project Director), *Databanks in a Free Society: Computers, Record Keeping and Privacy* (Alan F. Westin, Project Director) and on *Libraries and Information Technology - A National System Challenge* (Ronald L. Wigington, Project Director). He is the author of *Automatic Language Translation: Lexical and Technical Aspects of Run, Computer, Run: The Mythology of Educational Innovation* and of numerous papers on the uses of information technologies. His most recent book, with Paul Berman and William Read, is *High and Low Politics: Information Resources for the 80s*, published by Ballinger Publishing Co. in 1977.

DIRECTOR

John C. LeGates is Director of the Program, and Lecturer in Information Resources Policy. His experience prior to joining the Program has been in the business community, developing and managing computer and communications systems.

At EDUCOM, he was the executive director of the Educational Information Network (EIN) and the author of several articles on computer networking. Earlier, as Vice President of Cambridge Information Systems, Inc., he was director of the technical staff, and responsible for the company's nationwide marketing efforts. He also directed the development of the Massachusetts General Hospital Integrated Information System.

At Computer Advisory Services to Education, Inc., he was vice president and director. At Bolt, Beranek and Newman, Inc., he was responsible for exploring the potential of the TELCOMP language in education.

His studies were in mathematics (Harvard) and philosophy (Yale).

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John F. McLaughlin is the Executive Director for Postal and Allied Arenas. He spent sixteen years with the Federal government, first with the Federal Aviation Agency's Research and Development Service and then more than twelve years at the Headquarters of the Post Office Department and the Postal Service. During his last four years with USPS, he was the Director of Strategic Planning. In that role, he also headed the task force that prepared the USPS Staff Study, *Necessity for Change*, and he was the principal author of that report.

He has a bachelor's degree in history from Princeton University and studied at M.I.T. as a Presidential Fellow in Systems Analysis.

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