# Appendix A: An Historical Analysis Relating Causes to Effects | A

G iven the complexity of the relationships involved, anticipating how communication technologies might affect the prospects of Third World countries is decidedly difficult. Nonetheless, to make sound telecommunication investments, developing country leaders and foreign aid providers must assess the full range of associated benefits and costs. They also need to understand the conditions under which success will most likely occur.

To gain a sufficiently broad understanding of these issues, it is useful to consider historical evidence drawn from analogous situations. Only an historical picture can capture all the variables and their relationship to one another. Comparing historical inferences to statistical data, it is then possible to suggest whether, and the extent to which, the conclusions of such analyses might be generalized.

To select an historical case that is somewhat analogous to the situation in developing countries today, one need look no further than the United States. Judged by European standards of the time, the United States was, in its earliest years, "underdeveloped." By the turn of the 19th century, however, the United States had been forged into a major industrial nation spanning the continent and a multiplicity of cultures. Telecommunications, as described below, played a major role in this economic and political transformation.

## COMMUNICATION TECHNOLOGY AND THE RISE OF THE U.S. ECONOMY

The important role that communication (and transportation) technologies played in the rise of the U. S. economy can be seen by tracing the development of these technologies in conjunction with the nation's industrial development. Between 1830 and 1887, a plethora of new technologies emerged and gradually replaced many of the social and institutional communication networks that had hitherto sustained economic activities in the New World. The deployment of these technologies, together with the social and organizational changes that they facilitated, increased economic activity and fostered economic growth in a number of interrelated ways (see table A-1).

| TABLE A-1: Selected Innovations in More Generalized Information-Processing and Computing Technologies, 1880–1939 | | | |
|---|---|---|---|
| Year | Desk-top calculating | Digital computing | Analog computing | Punch-card processing |
| 1880 | | | | |
| 1882 | | | | |
| 1884 | Keyboard | | | Electric |
| 1886 | add-subtract | | | tabulator |
| 1888 | calculator | Part of | | |
| 1890 | Multiplier | analytical | | |
| 1892 | | engine | | |
| 1894 | Four- | | Equation | |
| 1896 | function | | solver | |
| 1898 | calculator | | 80-element | Automatic |
| 1900 | | | harmonic | bin sorter |
| 1902 | | | analyzer | Plug-board |
| 1904 | | | | tabulator |
| 1906 | | | | |
| 1908 | | | | |
| 1910 | | | Gyrocompass | |
| 1911 | | | computer | |
| 1912 | | | Profile | |
| 1913 | | | tracer | |
| 1914 | | End-game | 80-input tide | |
| 1915 | | chess machine | predicator | |
| 1916 | | | Battle | |
| 1917 | | | tracer | |
| 1918 | | | | |
| 1919 | | | | Printing |
| 1920 | | Electro- | | tabulator |
| 1921 | | mechanical | | |
| 1922 | | calculator | | |
| 1923 | | | | Electric |
| 1924 | Electric | | Product | keypunch |
| 1925 | printing | | integraph | |
| 1926 | calculator | | | |
| 1927 | | | Electric | |
| 1928 | Multiple- | Calculators | network | 80-column |
| 1929 | register | linked as | analyzer | punch |
| 1930 | cumulating | difference | Differential | card |
| 1931 | calculator | engines | analyzer | |
| 1932 | | | | |
| 1933 | | Mechanical | | Punch card |
| 1934 | | programmer | | accounting |
| 1935 | | | Electrical | machines |

*(continued)*

| | | | TABLE A-1: Selected Innovations in More Generalized Information-Processing and Computing Technologies, 1880–1939 (Cont'd.) | |
|---|---|---|---|---|
| 1936 | | | analog | linked for |
| 1937 | | | computer | computing |
| 1938 | | | Electronic | |
| 1939 | Electronic | Bell Labs | analog | |
| | calculator | Model I | computer | |

SOURCE: James R. Beniger I, *The Control Revolution: Technology and Economic Origins of the Information Society* (Princeton, NJ: Princeton University Press, 1986), p. 400–401.

From the 15th century until the development of the railroad and the telegraph in the last half of the 19th century, material goods were transported very slowly—at the speed of draft animals if they traveled by roadway or canal, or "at the whim of the winds" if they traveled by sea.[1] Because transportation and communication over long distances was difficult and slow, trade was discouraged and markets were geographically limited in size. At such distances, merchants did not have a great deal of information on which to base their sales. Prices differed significantly from market to market and considerably exceeded the costs associated with distribution. As a result, most merchants refrained from long-distance trading. When they did engage in such trade, they generally remained at home, relying on merchants in other trade centers to sell their goods on a commission basis. To minimize and spread the sizable risks involved, they sold a wide variety of products rather than specializing.[2] Given the 4-month lag in transatlantic communication, as well as European mercantilist policies, trade between the American colonies and Great Britain was generally limited.

Although the speed of transportation and communication did not greatly increase in post-revolutionary America, the volume of trade did grow as a commercial infrastructure was gradually established, and as more effective means of transportation and communication were deployed.[3] Equally important to the development of trade was the establishment of a network of people who, in their various roles as middlemen, helped to convey market information and goods across both the North American continent and the Atlantic Ocean. Included among them were shippers, financiers, jobbers, transporters, insurers, brokers, auctioneers, and retailers.

The impacts of these developments were cumulative. Trade gave rise to more trade. As markets expanded, so did the density of merchant exchange networks and the amount of available market information. As a result, distribution costs declined, and merchants were further encouraged to engage in trade. Moreover, with larger markets and better information, merchants faced fewer risks, and thus they were able to specialize in particular aspects of trading such as importing, wholesaling, retailing, or exporting. This increased specialization led, in turn, to greater coordination of markets and reduced costs, making trade even more attractive.[4]

The positive effect that increased information exchange had on trade was clearly exhibited, for example, with the development of the transatlan-

[1] James R. Beniger, *The Control Revolution: Technology and the Economic Origins of the Information Society* (Cambridge, MA: Harvard University Press, 1986), p. 219.

[2] Ibid.

[3] The commercial infrastructure was comprised of commercial banks (1780s), a federal banking system (1791), State insurance regulations (1799), federal bankruptcy law (1800), and joint stock companies (1810). The new technologies included a federal postal service (1791), the first turnpike (1795), coastal steamboat travel (1809), mail delivery by steamboat (1813), regular packet service to England (late 1810s), steam railroads and Atlantic clipperships (early 1830s), local postal delivery service (1836), regular transatlantic steamship service (1847), and regular steamboat to California (1849). Ibid., p. 130.

[4] Ibid.

tic cable in 1866. Before the completion of the Atlantic telegraph, New York financiers were unwilling to trade in London markets, unless prices were very attractive, because it took six weeks to clear prices and have their orders executed there. The completion of the undersea cable radically changed the situation, bringing about an immediate convergence of prices on both sides of the Atlantic.[5]

Also critical to the growth of markets was the development of mass media technologies such as power-driven, multiple rotary printing and the national postal system. By drawing audiences into larger and larger communities, these technologies accelerated the marketing of consumer goods on a national scale. The increased use of syndicated material in newspapers and the advent of nationally circulated magazines in the late 1800s anticipated true mass communication.[6] Catalogs also became popular as an advertising medium. In 1887, Montgomery Ward distributed nationally a 540-page catalog that offered more than 24,000 items for sale.[7]

Despite the development of national markets and greatly increased trade, specialization and rationalization of production was limited until the late 1800s by the relatively low speed of transportation and communication technologies. Specialization can only take place, and productivity can be increased only to the extent that goods can be moved, processed, and distributed, and that the production process itself can be coordinated.[8] It was only with the development of the railroads in the 1830s and the telegraph in 1844 that the requisite speed and control in the processes of production and exchange could be achieved. By increasing the speed of communication and extending the range of possible control, the railroad, the telegraph, and later the telephone facilitated the growth of large-scale organizations with modern management structures, a first step in the centralization of production and distribution.[9]

Given the speed of the new technologies, the growth of the modern corporation was not limited by national geographic boundaries. Employing communication technologies to coordinate their activities, a number of these new enterprises invested abroad in what proved to be very successful international ventures.[10]

Although communication technologies affected all economic relationships, their impact was not distributed equally nor experienced uniformly. As Joseph Schumpeter has pointed out, technology gives rise to economic growth through the process of "creative destruction."[11] Thus, although the economy as a whole prospered as a result of communication and information technologies, some sectors of society found themselves worse off.

For example, the invention of the telegraph served, in some cases, to diffuse economic power. In the early history of the United States, New York City was able to capitalize on its position as a national information center to become the center of worldwide trade.[12] News continued to flow faster and more fully in and out of New

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[5] Kenneth D. Garbade and William L. Silber, "Technology, Communication, and the Performance of Financial Markets 1840-1975," *Journal of Finance*, vol. 33, June 1978, pp. 819–832.

[6] Theodore Peterson, *Magazines in the Twentieth Century* (Urbana, IL: University of Illinois Press, 1964, 2d ed.).

[7] Beniger, op. cit., footnote 1, pp. 18–19.

[8] Ibid., p. 208; and Alfred D. Chandler, Jr., *The Invisible Hand: The Managerial Revolution in American Business* (Cambridge, MA: Harvard University Press, 1977).

[9] Ibid., and Beniger, op. cit., footnote 1. Before the development of these technologies, businesses were usually run by their owners who, focusing on a single line of products, generally operated either a single unit of production or a single unit of distribution. There were only a few salaried managers who typically worked directly with the owners. Alfred D. Chandler, Jr., "The Evolution of Modern Global Competition," Michael E. Porter (ed.), *Competition in Global Industries* (Boston, MA: Harvard Business School Press, 1986), p. 405.

[10] For a description of these undertakings see, Porter, op. cit., footnote 9.

[11] Joseph Schumpeter, *The Theory of Economic Development*, trans. by R. (Cambridge, MA: Harvard University Press, 1934).

[12] See Ronald F. Abler, "The Geography of Communications," Michael Eliot Hurst (ed.), *Transportation Geography: Comments and Readings* (New York, NY: McGraw-Hill, 1974).

York than any other city, giving it a strong economic advantage. Southern cities, in fact, communicated faster with New York City than within their own region, a fact that engendered increasing resentment in the South for cultural as well as economic reasons.[13] With the invention of the telegraph, however, New York's central position in the national market began to erode. The opening of the New York-Philadelphia Line enabled brokers in one city to learn prices in the other, and to place orders before the market had closed. Similarly, prices in other distant markets, such as western grains, also became items of trade through instantaneous communication.[14]

Communication technologies also served to undermine the middleman's role in the wholesale trade. As marketing tasks were vertically integrated together in large-scale firms, the middleman's function of transmitting and distributing market information and goods was no longer required. The new mass retailers, such as department and chain stores as well as mail-order houses, could use technology to circumvent wholesalers, purchasing from manufacturers directly and thereby reducing their costs.[15]

The new technologies also favored large firms at the expense of small ones, contributing to the growth of oligopoly.[16] As the scale of operations also grew, size served as a barrier to entry because most small firms lacked the resources needed to function nationally or regionally. With the development of national advertising, the small, local retailers, who had once served their communities with little competition, found themselves facing a succession of challengers—department stores, mail order firms, and chain stores.

Rural areas were hit particularly hard because advances in transportation and communication technologies were linked to the decline of agriculture and the corresponding rise of industrialization. By extending their ties and expanding their markets, communication technologies made rural communities less self-sufficient and more vulnerable to external developments and events over which they had little control.[17] Industrialization, for example, brought with it new kinds of problems, with which increasingly smaller

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[13] See Robert Albion, The Rise of New York Port, 1815–1939 (New York, NY: Charles Scribner's Sons, 1939); and Allen Pred, "Urban Systems Development and the Long Distance Flow of Information Though Preelectronic U.S. Newspapers," *Economic Geography*, vol. 47, October 1971, pp. 498–524.

[14] See Garbade and Silber, op. cit., footnote 5, and Richard DuBoff, "The Telegraph and the Structure of Markets in the United States," *Research in Economic History*, vol. 8, 1983. As Duboff notes with respect to the cotton market, "Data on cotton prices in New York show diminishing fluctuations over time. The average spread between lowest and highest prices narrowed steadily, except during the Civil War and its aftermath, and the steepest decline in high-low price ranges and dispersion of prices from decade averages came in the 1850s—'the telegraph decade.' as it might well be called." Richard Duboff, "The Telegraph and the Structure of Markets in the United States," *Research in Economic History*, vol. 8, 1985, p. 257.

[15] As Beniger notes, "Between 1869 and 1879 the ratio of wholesale to direct sales rose to 2.40 from 2.11, with only $1 billion worth of goods passing directly from manufacturers to retailers in the latter year, while some $2.4 billion worth went by way of wholesalers. After 1889, however, when wholesaling's predominance had already declined slightly to 2.33, the ratio began to fall ever more sharply: to 2.15 in 1899, to 1.90 in 1909, and to 1.16 by 1929." Beniger, op. cit., footnote 1, p. 258.

[16] As described by DuBoff, "...The telegraph dramatically enlarged information networks; it saved time, reduced the need for large inventories, decreased financing requirements, and prompted elimination of middlemen. But 'competition' and 'monopoly' are not, as neoclassical theory implies, polar opposites. The telegraph improved the functioning of markets and enhanced competition, but it simultaneously strengthened forces making for monopolization. Large-scale business operations, secrecy and control, and spatial concentration were all increased as a result of telegraphic communication." Richard DuBoff, op. cit., footnote 14.

[17] For the classic discussion of how communication technologies can disadvantage local, vis a vis metropolitan, areas, see Harold Innis, *The Bias of Communication* (Toronto: University of Toronto Press, 1951). According to Innis, communication technologies that served to overcome the barrier of distance and time tended in the long run to make rural areas overly dependent on urban centers. As James Carey notes with reference to Innis' work "Innis attempted to show how localities and regions resisted the spread of communication, how the relationship was decided by a protracted series of conflicts over the spread of standard time, the mail order house, parcel post and rural free delivery, the department store and the regionalized corporation." See James W. Carey, "Space, Time, and Communications: A Tribute to Harold Innis," James W. Carey (ed.), *Communication as Culture: Essays on Media and Society* (Boston, MA: Unwin Hyman, 1989), p. 143.

farm communities could not deal.[18] To meet these developing needs, new towns and trade centers emerged, located at a reasonable traveling distance from farm communities. Taking advantage of improved transportation and communication networks, these centers were, in turn, linked more and more to urban areas, leaving rural areas to fend for themselves.[19]

Notwithstanding the problems associated with the deployment of communication technologies, rural areas could not have afforded to forgo them, for the shifts in the national economy were not accidental. They were closely associated with the development of regional and national infrastructures, and a rural area's proximity to these trade networks proved to be a critical factor in determining its ability to survive.[20]

As is clear from this historical account, communication technologies contributed to growth in the United States in a number of interrelated ways, many of which served to reduce transaction costs. First, communication technologies dramatically increased both the speed and the number of economic transactions that could take place. Second, by diminishing the relevance of geographic distance, communication technologies facilitated the expansion of trade and markets. At the same time, the development of mass media technology served to reinforce national markets by helping to mold tastes and preferences into a more uniform cast. In turn, this increased market size led to greater specialization, standardization, and economies of scale. By enhancing intrafirm coordination, communication technologies allowed businesses to grow vertically and horizontally, and thus to exploit these economies.

Communication technologies also served to restructure relationships among economic actors, making some better and some worse off. Most vulnerable were whose who were either replaced, or bypassed, by technology. Winners were those who, being the first to gain access, were able to use communication technologies to reorganize their activities in response to the fundamental social and economic changes entailed in the process of industrialization, thereby gaining competitive advantage.

This brief account of U.S. economic development also highlights that the role of communication technologies was not constant over time. Rather, it increased along with technology advance and as markets grew and business processes became more complex and information intense. Initially, for example, middlemen and their personal networks provided the medium by which market information was transported, and market interactions consisted almost entirely of face-to-face exchanges. With the onset of industrialization, mediated communication replaced most of this primary contact.

## COMMUNICATION TECHNOLOGY AND THE EVOLUTION OF POLITICS IN THE UNITED STATES

Just as communication technologies served to promote U.S. economic growth and development, so too they played a critical role in the political evolution of the United States. Like political leaders in many developing countries today, the U.S. Founding Fathers were faced

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[18] According to Swanson, rural communities were "self-contained production units." However, with industrialization, "Previous social formations, such as the rural church or the one room six grade schoolhouse, gave way to the demands of new industrial employers and regional and national trade. Rural schools were not expected to prepare children for the financial and technical demands of a rapidly industrializing agriculture and nonfarm sector. Local socioeconomic networks such as cooperative harvesting (and risk taking) and quasi-barter exchange systems that mediated local production and consumption under non-commercial conditions were gradually subordinated to and/or eclipsed by new institutions," See Louis Swanson, "Rethinking Assumptions About Farm and Community," in A.E. Luloff and Louis E. Swanson (eds.), *American Rural Communities* (Boulder, CO: Westview Special Studies in Contemporary Social Issues, 1990), p. 22.

[19] Ibid.

[20] As one observer described in 1850: "[Business merchants, farmers, bankers, shippers, and others soon learned the] great advantages of this mode of instantaneous communication of intelligence [which] is with them not so much as a matter of choice as of necessity, for, without availing themselves of it, they must necessarily be behind in that which is essential to the success of their business." As cited in Ibid., p. 21.

with the mammoth task of "building" a nation in the context of a democratic political system. At a minimum, this effort entailed establishing national sovereignty and national security; maintaining internal security and social welfare; and assuring an open political system based on participation, deliberation, and representation.[21] Communication technologies, and the rules that governed their use and development, were critical not only to carry out these activities, but also in determining the relationship—as well as resolving the tensions—among them. Serving as a mechanism for both national integration as well as individual (and group) differentiation/participation, these technologies provided a mechanism for balancing the need for political participation as well as social control.

Political activities not only depend on communication; they also require constraints on the manner in which communication occurs. Thus, those in powerful positions have always attempted to control, or even restrict, access to communication pathways.[22] While limitations on communication may not accord with some characterizations of democracy, many political theorists have argued, in fact, that constraints on participation are necessary in order to preserve democracy. Aristotle, for example, favored "constitutional government" but was opposed to "direct democracy," which he called perverted

because it failed to protect the rights and interests of the minority.[23] James Madison made much the same case in Federalist Paper 10, when he argued on behalf of "a government in which a scheme of representation takes place." Accordingly, democracy can be said to depend on the establishment of a delicate balance between "too little" and "too much" political communication.

In negotiating this balance, "communication gatekeepers" play a critical role.[24] Gatekeepers are the individuals or groups in a society that determine who makes decisions about the flow of information and knowledge. How, and to whom, the role of communication gatekeeper is assigned varies across cultures, in different historical contexts and organizational settings. Technological developments can also determine where and how gatekeeping takes place, and who will assume the role.

In the United States, the role of communication gatekeeping was established early in American history. Fully appreciating the role that communication could play in forging a cohesive nation state, the Founding Fathers were, at the same time, deeply aware of its potential for disruption. Three years before the Declaration of Independence, they had—as "revolutionaries"—wrested control of the posts from the British.[25] Setting up a "Constitutional Post," which transmitted news from New Hampshire to Virginia,

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[21] The United States was designed to be a representative or republican form of government. This design reflects the Founders' belief that, while government should be based on popular sovereignty, it should also protect the minority against majority rule. Thus, while power was given to the people, it was done in a limited, or restricted, fashion. Qualified participants were defined narrowly to include only white, property-owning males. Moreover, the President and the Senate were not directly elected by the people but rather were indirectly chosen by the Electoral College and the state legislatures. And finally, "the people" were themselves divided into two constituencies—one at the federal and one at the state level.

[22] As Donohue et al. have noted, "When man devised the first rudimentary form of mass communication centuries ago, he immediately developed ways of controlling it. Printer, king, teacher and merchant were almost equally inventive in contriving ways to bring information under control. Their diligence arose from man's historic recognition of a fundamental social principle: knowledge is basic to social power." See George A. Donohue, Phillip J. Tichenor, and Clarice N. Olien, "Gatekeeping: Mass Media Systems and Information Control," F. Gerald Kline and Phillip J. Tichenor (eds.), *Current Perspectives in Mass Communication Research* (Beverly Hills, CA: Sage Publications, 1972).

[23] *Aristotle in Twenty-Three Volumes, XXI Politics*, translated by H. Rackham (London: Heinemann, 1977), book III, p. 207.

[24] The term "gatekeeper" is borrowed from the field of journalism. For a discussion see D. M. White, "The Gatekeeper: A Case Study in the Selection of News," *Journalism Quarterly*, vol. 27, fall, 1950, pp. 383–390.

[25] Newspapers and pamphlets served as the primary vehicles for public protest and revolt, providing a network of political communication that was crucial to revolutionary activities. And, with the revolution, printers, functioning as editors and publishers, took on a key role. In fact it was in their shops that many a political story and idea were exchanged. See Richard Buel, Jr., "Freedom of the Press in Revolutionary America: The Evolution of Libertarianism, 1760–1820," Bernard Bailyn and John B. Hench (eds.), *The Press and the American Revolution* (Worcester, MA: American Antiquarian Society, 1980), pp. 59–97; and Frank Luther Mott, *American Journalism* (New York, NY: Macmillan Co., 1941).

they sought to fuse the colonies into a unified whole.[26]

This respect for the power of the pen, together with concerns about its ability to foment opposition, may account for the reluctance of the Constitution's authors to let journalists interpret the events of the Constitutional Convention for the public. For while prohibiting newspaper coverage of the proceedings, they themselves made very effective use of newspapers and other communication outlets to build support for the ratification of the Constitution. Disguised as the columnist Publius, Alexander Hamilton, John Jay, and James Madison wrote a series of newspaper articles on behalf of the Constitution. These *Federalist Papers* proved critical in generating public understanding of, and support for, the new government.

Taking a longer term view, the Founding Fathers also recognized that building a nation required the development of a unified market, the forging of a common culture, and the creation of a democratic polity. And they believed that the widespread flow of communication was essential to these tasks. Arguing that open communication was required to maintain a pluralistic society, James Madison wrote, for example:

> Popular government without popular information, or the means of acquiring it, is but a prologue to a farce or tragedy, or perhaps both. Knowledge will forever govern ignorance, and a people who mean to be their own governors must arm themselves with the power which knowledge gives.[27]

To foster such communication, the Founding Fathers incorporated three important provisions in the Constitution. These included the First Amendment provision for free speech; the authorization of intellectual property protection under Article 1, Sec. 8; and Article 1, Sec. 8, Paragraph 7, which gives government the power to establish post offices and postal roads.[28] Moreover, as early as 1792, both political parties agreed that the government should subsidize newspapers. [29]

The Founders, it should be added, were also well aware of the more pragmatic aspects of political communication. Recognizing their own needs to communicate with constituents, the Members of the First Continental Congress granted themselves free postage, a privilege that was continued after the Constitution was adopted.

Communication was intended not only to integrate the nation; it was also expected to foster diversity, providing individuals and groups a means to join together to express and promote their views. It was believed that the only way to guard against domination by a majority faction was to promote a large number of diverse competing ones.[30] Writing to Thomas Jefferson, James Madison summed up this view:

> *Divida et impera*, the reprobated axiom of tyranny is, under certain qualifications, the only policy by which a republic can be administered on just principles.[31]

Americans were well suited to play this role.[32] From the outset of the new republic, they demonstrated a penchant for joining factions and establishing associations, a trait that did not escape the observation of Alexis de Tocqueville when he visited American in the mid-1800s. As he described in *Democracy in America:*

> Nothing...is more deserving of our attention that the intellectual and moral associations of

[26] Ward L. Miner, *Goddard: Newspaperman* (Durham, NC: Duke University Press, 1962), pp. 111–136.

[27] Saul K. Padover (ed.), *The Complete Madison: His Basic Writings* (Millwood, NY: Kraus Reprint, 1953), p. 337.

[28] See Ithiel de Sola Pool, *Technologies of Freedom* (Cambridge, MA: The Belknap Press of Harvard University, 1983), pp. 16–17.

[29] *Inside Congress* (Washington DC: Congressional Quarterly, 1979), p. 127.

[30] See Marc F. Plattner, "American Democracy and the Acquisitive Spirit," in Robert A. Goldwin and William Sebambu (eds.), *How Capitalist is the Constitution?* (Washington, DC: The American Enterprise Institute, Constitutional Studies Series, 1982), chap. 1.

[31] James Madison to Thomas Jefferson, Oct. 24, 1787, Galliard Hunt (ed.), *The Writings of James Madison*, 9 vols. (New York, NY: G.P. Putnam's Sons, 1906), as cited in Ibid.

[32] For cross cultural comparisons, see Robert Wuthnow (ed.), *The Voluntary Sector in Comparative Perspective* (Princeton, NJ: Princeton University Press, 1991).

America. Americans of all ages, all conditions, and all dispositions constantly form associations. They have not only commercial and manufacturing companies, in which all take part, but associations of a thousand other kinds, religious, moral, serious, futile, general or restricted, enormous or diminutive. [33]

In promoting their activities, these burgeoning groups and factions took advantage of improvements in printing technology and the postal delivery system. Political groups, for example, used newspapers both to foster party cohesion, and to disseminate the party's perspective to outlying communities."[34] At the same time, taking advantage of postage-free printers' exchanges, the party papers received political information from States and localities. Thus, their editors helped to synthesize a national political community that transcended local orientations.[35] The various social movements of the 19th century developed similar communication mechanisms to advance their causes.

Despite this growth in social and political communication, the United States remained a society of "island communities"—cities and towns with limited interaction—throughout most of the 19th century.[36] One constraint on national integration was the failure of the communication infrastructure to keep pace with the nation's geographical and cultural expansion. Before the advent of the railroads and the telegraph, the postal system provided the primary bridge that connected a population that was increasingly dispersed and socially differentiated.

Resistance to cultural intrusion—made possible by communication—also played a role in inhibiting national integration. Notwithstanding their desire to have access to national news and market information, many communities resisted the potential economic and cultural influence that was associated with them.[37] Improvement in communications thus gave rise to a cultural debate about how to foster national integration through communication without undermining the viability of local communities. These cultural issues exacerbated the growing conflict between the North and the South, which led ultimately to the collapse of the union and the outbreak of civil war.

The Civil War lasted four years and took 600,000 lives. It signaled a breakdown in the legitimacy and hence control of the political system, as well as its failure to effectively manage conflict among competing interests. In the aftermath of the war, the need to integrate the nation and to build consensus was as great, if not greater, than before.

As in the early years of the Republic, political leaders in the Reconstruction Period looked to communication and transportation to bind the nation. Even before the Civil War had ended, Congress passed the Morill Act and the Pacific Railroad Act, which provided land grants to both higher education and transcontinental railroads. This aid was considered by most Americans "as an investment in national unity and economic growth that would benefit all groups in society."[38]

Publicly supported education was also promoted at the community level. This commitment

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[33] Alexis de Tocqueville, *Democracy in America* (1963 ed.), as cited in U.S. Congress, Office of Technology Assessment, *Global Standards: Building Blocks for The Future* (Washington DC: U.S. Government Printing Office, 1992), p. 46.

[34] William Chambers, *Political Parties in a New Nation* (New York, NY; Oxford University Press, 1963), p. 42.

[35] As Kielbowitz points out, print communications remained relatively open throughout the 1800s, largely because of government efforts to ensure access. Subsidized postage rates allowed readers to subscribe to distant publications. Any town with a newspaper and post office could become a source of news for the rest of the Nation. See Richard B. Kielbowitz, "News Gathering by Printers' Exchanges Before the Telegraph," *Journalism History*, vol. 9, summer 1982, pp. 42–48; and Samuel Kernell, "The Early Nationalization of Political News in America," *Studies in American Political Development* (New Haven, CT: Yale University Press, 1986), pp. 255–278.

[36] Robert Wiebe, *The Search for Order, 1877-1920* (New York, NY: Hill and Wang, 1967), p. xiii.

[37] As described by McPherson, "Southern self-condemnation of this 'degrading vassalage' to Yankees became almost a litany during the sectional crisis from 1846 to 1851. 'Our whole commerce except a small fraction is in the hands of Northern men,' complained a prominent Alabaman in 1847. 'Take Mobile as an example—7/8 of our Bank Stock is owned by Northern men...Our wholesale and retail business—everything in short worth mentioning is in the hands of men who invest their profits at the North... Financially we are more enslaved than our negroes." James M. McPherson, *Battle Cry of Freedom: The Civil War Era* (New York, NY: Oxford University Press, 1988), p. 92.

[38] McPherson, op. cit., footnote 37, pp. 451–452.

to public schooling was, in fact, so intense that it gave rise to a national crusade.[39] Concerned about the problems of reconstruction in the South, the influx of Catholic immigrants, and the advent of industrialization in the North, Americans saw public schooling as a way of preserving the social, economic, and political system. By educating American youth in public schools, they hoped to inculcate them with a common set of patriotic, Protestant, and republican values.[40]

With the industrialization and urbanization of American society, it was expected that schooling would serve not only to prepare American youth for a common political role as citizens, but also to prepare a growing number of people from increasingly different social, economic, and ethnic backgrounds for an increasingly differentiated set of economic roles. To perform this economic function, the public schools were restructured in accordance with business principles.[41]

These efforts to promote national integration were reinforced by continual advances in communication technologies, which greatly improved their prospects for success. In the last half of the century, new media and media distribution channels were developed, making it possible to communicate on a national scale. These included the telegraph, nationally distributed magazines, motion pictures, the telephone, and radio.

The telegraph helped to homogenize social existence across the nation. Because of high costs, the telegraph was initially used solely by businesses and the press; few people used it for social communication, at least in the United States.[42] However, the impact of the telegraph was experienced more broadly. By fostering the standardization and the central processing of news reports, the telegraph allowed Americans to share common accounts of the "latest" national and international news stories.[43] Delivered by fast trains, weekly editions of metropolitan newspapers shaped the political sentiments of farmers a thousand miles away.[44]

The telegraph also served to standardize the routine of people's daily lives. Before the railroad and telegraph, society's "island communities" geared their time to local rhythms. For example, Michigan had 27 time zones, Indiana 23, and Wisconsin 39. The advent of the railroad required the coordination of schedules over large areas, and conducting business via telegraph required knowledge of precise times around the world.[45]

The national distribution of inexpensive popular magazines also fostered national integration. Entrepreneurs launched national magazines in the 1880s and 1890s expressly to serve as vehicles for advertising brand name consumer items featured by mass retailers.[46] This new genre of

[39] Bernard Bailyn, *Education in the Forming of American Society* (New York, NY: W.W. North, 1980); and Lawrence A. Cremin, *Traditions in American Education* (New York, NY:Basic Books, Harper 1976).

[40] Rush Welter, *Popular Education and Democratic Thought in America* (New York, NY: Columbia University Press, 1962); and David Tyack and Elisabeth Hansot, "Conflict and Consensus in American Public Education," *America's Schools: Public and Private, Daedalus*, summer 1981; Robert A. Carlson,. *The Quest for Conformity: Americanization Through Education* (New York, NY:John Wiley & Sons, 1975); "Public Education as Nation Building in America: Enrollments and Bureaucratization in the American States 1870–1930," *American Journal of Sociology*, vol. 85, No. 3, November. 1979.

[41] David K. Cohen and Barbara Neufeld, "The Failure of High Schools and the Progress of Education," *America's Schools: Public and Private, Daedalus*, summer 1981; Sol Cohen, "The Industrial Education Movement, 1906–1917," *American Quarterly*, spring 1968, pp. 95–110; and Martin Trow, "The Second Transformation of American Secondary Education," *International Journal of Comparative Sociology*, vol. 7, 1961.

[42] In European countries, where the telegraph was a government monopoly supervised by the postal authorities, people made greater use of the wires for personal correspondence.

[43] Before the telegraph, editors obtained nonlocal news through the mails essentially cost free. They culled their exchanges and selected accounts deemed suitable for local readers. News-gathering by wire, in contrast, entailed more costs; press associations, such as the New York Associated Press, were organized to spread the expense of news-gathering and transmitting among many users. See F.B. Marbut, *News From the Capital* (Carbondale, IL: Southern Illinois Press, 1971).

[44] McPherson, op. cit., footnote 37, pp. 12–13.

[45] James Carey, "Technology and Ideology: The Case of the Telegraph," *Prospects*, vol. 8, 1983, pp. 303–325.

[46] Theodore Peterson, *Magazines in the Twentieth Century* (Urbana, IL: University of Illinois Press, 1964), pp. 1–43.

magazines, epitomized by Curtis Publishing Co.'s *Saturday Evening Post, Ladies' Home Journal*, and *Country Gentleman,* cut subscription rates to attract a mass middle-class audience. With advertising-filled periodicals blanketing the nation, the heavily subsidized second-class mailings grew 20 times faster than the population in the four decades after 1880.[47]

Motion pictures also did much to shape a national community of tastes, style, and culture. Weekly attendance in the United States rose from an estimated 40 million in 1922 to 115 million 8 years later.[48] With this explosive growth, which cut across geographic and socioeconomic lines, came concerns about the effects of the new medium. While the censors watched for scenes that seemingly encouraged crime or sexual promiscuity, they missed a more subtle yet pervasive effect: film's power to nationalize tastes for cultural fare as well as consumer goods.[49]

Radio augmented the effects of magazines and motion pictures as agents of national culture. Although radio was originally envisioned as a local medium, local stations were soon taken over by national networks.[50] Within 10 years, 97 percent of all radio stations were affiliated with a network. Through the 1930s and 1940s, radio was the preeminent medium of mass impression, eclipsing newspapers, magazines and even film.

The role of the telephone was distinct, but by no means less important. The telephone empowered the individual. In contrast to the telegraph and mass media, it allowed people to formulate and receive messages, and to represent themselves, directly, without resort to any institutional intermediaries. With the telephone, any person could organize groups and canvass and lobby on behalf of a particular politician or social cause. Using telephones for such purposes was initially limited because of cost. Even at the turn of the century, telephones cost $200 a year, a sum that was well beyond the means of most workers, for example.[51]

Telephones also reinforced community ties, especially in rural areas. Whereas the telegraph and mass media technologies had directed local community attention outward, most telephone conversations were local in nature.[52] Between 1907 and 1927, for example, the average's person's local point-to-point communication—letters, telegraphy, and telephony—increased primarily because of growth in telephone use.[53] This reinforcement of social interaction at the local level played "a part in the preservation and even in the enhancement of local patterns of attitude, habit and behavior, and served as an inhibitor of the process of cultural leveling which is so often assumed as an outstanding and unopposed tendency of American life."[54]

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[47] Ibid.

[48] Malcolm Wiley and Stuart A. Rice, *Communication Agencies and Social Life* (New York, NY: McGraw Hill, 1935).

[49] Garth Jowett, *Film: The Democratic Art* (Boston, MA: Little Brown and Co., 1976), p. 202.

[50] A number of factors promoted the development of national networks, including agreements among key industry players; audience demand for expensive programming; a system of financing based on national advertising; and the incentive structure embedded in national regulatory decisions. See Christopher Sterling, "Television and Radio Broadcasting," in Benjamin Compaine (ed.), *Who Owns the Media? Concentration of Ownership in the Mass Communication Industry* (White Plains, NY: Knowledge Industry Publications, Inc., 1979).

[51] Ithiel de Sola Pool, *Forecasting the Telephone: A Retrospective Technology Assessment* (Norwood, NJ: Ablex Publishing Co, 1983), p. 82.

[52] Changes in William Allen White's *Emporia* (Kansas) *Gazette* during the 1920s, as a result of the telegraph, illustrate some of the consequences for rural areas. According to Griffity: "The net effect, then of the *Gazette's* increased advertising and greater access to syndicated materials was to diminish the very centrality of its community. Emporians could no longer gain the impression from reading their local newspaper that Emporia—or their own lives—mattered much in the scheme of things... [The community's citizens] may also have been aware of a concomitant waning of a sense of the legitimacy of their day-to-day lives. For, rather than focusing on local events, the paper dramatized far-away people and places. Instead of recording the life passage of their neighbors, it reported the abnormality of strangers." As cited in Richard Kielbowitz, "The Role of Communication in Building Communities and Markets," contractor report prepared for the Office of Technology Assessment, November 1987.

[53] In 1907, an average of 4.5 months elapsed between each toll telephone call but only 3 days between each local call. Wiley and Rice, op. cit., footnote 48.

[54] Ibid., pp. 153–154.

The value of telephony to rural communities and markets was reflected in penetration levels; some Midwestern states had more phones per capita than Eastern states. The benefits of the telephone were many; rural households used the phone to summon doctors, visit each other, obtain weather reports, learn about sales in towns, and follow prices for agricultural commodities in local or regional markets.[55] Not surprisingly, residents in rural areas heralded the telephone's potential to end their isolation. Impatient to receive service, a number of towns and cities launched their own systems, with farmers in some cases constructing crude systems using barbed wire attached to fence posts.

In integrating the nation, communication technologies served not only to break down barriers of geography, culture, and class. These technologies were used at the same time to circumvent traditional information gatekeepers and political intermediaries such as the press and political parties.

It was not long after telephones had been invented, for example, that politicians came to see them as being central to their activities. In 1878, Congress set up the first telephones in Washington to connect the Public Printer's Office with the Capitol so that members could order extra copies of their first speeches. With the deployment of telephones in more and more homes, they began to be used to canvass voters. By 1910, one commentator noted, "In a political campaign the telephone is indispensable."[56]

Politicians also used communication technology to establish a direct relationship with the public. Thus, President Roosevelt used his "fireside chats" to lift spirits during the depression and to rally Americans behind the war effort. Similarly, in 1948, the Republican, Democratic, and Progressive parties all held their conventions in Philadelphia to take advantage of the coaxial cable, which allowed them to broadcast the proceedings over four networks to 18 stations in nine cities.[57]

Whereas network television tended to focus a single message to a large number of viewers, the development of cable television enhanced viewers' choices, and allowed them to select programming that was more closely targeted to groups of specific viewers. The original goal of community antenna television (CATV) was to provide a practical way of enhancing television signals for communities on the fringe or outside of good broadcasting reception. Eventually, however, cable operators were able to expand their markets by importing broadcast signals, thus being able to offer many more programming channels as well as better service.

Communication technologies, it should be emphasized, were employed not only in the realm of politics. Towards the end of the 19th century, the government itself began to make greater use of these technologies for purposes of both national defense and public administration. In the First World War, for example, radio technology (radar) proved critical in controlling long-distance sea and air transportation. By 1922, radar technology was capable of detecting ships at sea and planes in flight, for which purpose it was deployed on all U.S. battleships during the Second World War.[58]

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[55] These latter two applications were among the few by which the telephone enhanced the competitive position of small producers and retailers. For discussion of the impact of telephony on rural communities, see Michael Olsen, "But It Won't Milk the Cows: Farmers in Colfax County Debate the Merits of the Telephone," *New Mexico Historical Review*, vol. 61, January 1986.

[56] Ithiel de Sola Pool, *Forecasting the Telephone: A Retrospective Technology Assessment* (Norwood, NJ: Ablex Publishing Co., 1983), p. 82.

[57] Ruben Frank, "1948 Live ...From Philadelphia...It's the National Conventions," *The New York Times Magazine*, April 17, 1988, pp. 37, 62–65.

[58] Beniger, op. cit., footnote 1, p. 414. Having witnessed the military benefits of radio technology first-hand during World War II, the U.S. Government intervened to help establish the Radio Corporation of America (RCA), which subsequently bought out the British-dominated American Marconi Company. In this way, the Government helped to solidify the U.S. position in international communication. See Daniel Czitrom, *Media and the American Mind* (Chapel Hill, NC: University of North Carolina Press, 1982), p. 86.

The Government also took advantage of computers and data processing technology to help provide public services and oversee an ever more complex and interdependent domestic economy (see table A-2). In 1930, for example, the Census Bureau used punch card tabulating machines for the first time, increasing average punching rates from 500 to 700 cards per day and daily tabulating rates from 10,000 to 80,000 persons per day.[59] Other agencies were quick to follow suit; tabulating machines were subsequently used, for example to centralize federal records on insurance, public health and vocational education, to monitor the economic depression, to maintain employment statistics, to control security exchanges and over-the-counter markets, as well as to process social security taxes and benefits payments.[60]

From this account of the ways in which communication technologies have affected the evolution of U.S. politics, four major impacts can be identified. First, communication technologies helped to integrate the nation by extending nationally oriented messages over broad geographic areas in a manner that bypassed traditional local, cultural, or socially based information gatekeepers. Second, communication technologies provided at the same time mechanisms for individuals and groups to access information, identify and organize like-minded people, and promote their ideas at all levels of government, thereby holding the government accountable and assuring the representation of their views. Third, communication technologies provided government the means to administer laws, maintain order, assure the national defense, and promote the general welfare in an increasingly complex and interdependent social and economic environment, which required dealing with events such as industrialization, the depression, and the Second World War. Finally, by supporting all of these functions on a relatively equal basis, communi-

cation technologies helped to maintain the balance—necessary to sustain democracy—between participation and control.

Looking at the role of communication technologies in American politics, however, it is clear that these technologies have been neither equivalent nor technologically neutral with respect to political outcomes. Although the telegraph and mass media fostered national integration, they served at the same time to diminish the interests of particularistic groups. On the other hand, the telephone facilitated political organization at all levels, while cable broadcasting increased the number of outlets available for competing political perspectives. With a range of technologies available, striking the appropriate balance between participation and control was more easily accomplished.

Channeling information to some gatekeepers while circumventing others, communication technologies also helped to determine the distribution and locus of political power. Over the course of American history, for example, the role of information gatekeeper was shifted from the local newspaper proprietor, to the legislative representative, to the political party leader, to the television news analyst, transforming American politics in the process.

Although communication technologies have strongly influenced American politics, these technologies were not autonomous in their effects. Fully aware of their political potential, the American Founding Fathers established a basic legal framework in the Constitution that has served to establish the general direction in which communication technologies have evolved. Within that framework, politicians, vendors, users and other stakeholders have all sought to ensure that technologies match their preferences. In interpreting the impact of technologies, the institutional context in which technology evolves must always be kept in mind.

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[59] Describing the impact of tabulating machines on government some 80 years later, the National Commission of Federal Paper Work estimated that "Federal agencies are today churning out forms, reports, and assorted paper work at the rate of over 10 billion sheets per year. That's 4.5 million cubic feet of paper," As cited in Beniger, op. cit., footnote 1, p. 420.

[60] Ibid., p. 420.

| TABLE A-2: Selected Innovations in Information Processing and Communication, 1830–87 | |
|---|---|
| **Year** | **Innovation** |
| 1830s | Wagon lines carrying freight between rural towns and ports begin to operate on regular schedules |
| 1837 | Telegraph demonstrated, patented |
| 1839 | Express delivery service between New York and Boston organized using railroad and steamboat |
| 1840s | Freight forwarders operate large fleets on canals, offer regular through-freight arrangements with other lines |
| 1842 | Railroad (Western) defines organizational structure for control |
| 1844 | Congress appropriates funds for telegraph linking Washington and Baltimore; messages transmitted |
| 1847 | Telegraph used commercially |
| 1851 | Telegraph used by railroad (Erie)<br>First-class mail rates reduced 40-50 percent |
| 1852 | Post Office makes widespread use of postage stamps |
| 1853 | Trunk-line railroad (Erie) institutes a hierarchical system of information gathering processing and telegraphic communication to centralize control in the superintendent's office |
| 1855 | Registered mail authorized, system put into operation |
| 1858 | Transatlantic telegraph cable links America and Europe, service terminates after 2 weeks |
| 1862 | Federal Government issues paper money, makes it legal tender |
| 1863 | Free home delivery of mail established in 49 largest cities |
| 1864 | Railroad postal service begins using special mail car<br>Postal money order system established to insure transfer of funds |
| 1866 | Telegraph service resumes between America and Europe<br>"Big Three" telegraph companies merge in single nationwide multiunit company (Western Union), first in United States |
| 1867 | Railroad cars standardized<br>Automatic electric block signal system introduced in railroads |
| 1874 | Interlocking signal and switching machine, controlled from a central location, installed by railroad (New York Central) |
| 1876 | Telephone demonstrated, patented |
| 1878 | Commercial telephone switchboards and exchanges established, public directories issued |
| 1881 | Refrigerated railroad car introduced to deliver Chicago-dressed meat to Eastern butchers |
| 1883 | Uniform standard time adopted by United States on initiation of American Railway Association |
| 1884 | Long-distance telephone service begins |
| 1885 | Post Office establishes special delivery service |
| 1886 | Railroad track gauges standardized |
| 1887 | Interstate Commerce Act sets up uniform accounting procedures for railroads, imposes control by Interstate Commerce Commission |

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