

Communications Revolutions and International Relations

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Published in *Technology, Development, and Democracy: International Conflict and Cooperation in the Information Age*, pp. 25-53. Edited by Juliann Emmons Allison. SUNY Series in Global Politics. Albany: State University of New York Press, 2002.

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CHAPTER TWO

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CHERIE STEELE AND ARTHUR STEIN

Nobody who has paid any attention to the peculiar features of our present era will doubt for a moment that we are living at a period of [a] most wonderful transition, which tends rapidly to accomplish the great end to which all history points the realisation of the unity of mankind. ... The distances which separated the different nations and parts of the globe are rapidly vanishing before the achievements of modern invention, and we can traverse them with incredible ease. ...

—The Prince Consort, March 1850

A communications revolution is underway.

Without the vast increase in the power of computers, computer software, satellites, fiber-optics cables, and high-speed electronic transfers, markets could not act as one, and economic and other information–politics, ideas, culture, revolutions, consumer trends–could not be delivered instantaneously to the more than 200,000 monitors connected into this global communications system. (Kennedy 1993, 50-51)

The personal computer and the internet will, we are told, transform economic, social, and political life, including international relations, by creating new forms of community and interaction not yet imaginable.¹ “This new civilization, as it challenges the old, will topple bureaucracies, reduce the role of the nation-state, and give rise to semiautonomous economies in a postimperialist world” (Toffler 1980, 10-11). We are entering the information age.

There is talk of virtual communities and even “the virtual state” (Rosecrance 1996).²

This is not the first such revolution that has occasioned such wondrous rhapsody. It is important to recognize that the world has evidenced earlier revolutions in both transportation and communications. Steamships, railroads, automobiles, and airplanes transformed the ability to move people and materials vast distances in ever shorter amounts of time. Telegraphy, radios, and telephones transformed the ability to communicate over immense spaces even faster than people could move.

Each development was thought to herald a new age of international politics. People would be able to travel and interact with others and the result would be more understanding. Thomas Henry Buckle, a prominent British author of the nineteenth century, referring to British-French relations, wrote, “every new railroad which is laid down, and every fresh steamer which crosses the Channel, are additional guarantees for the preservation of that long and unbroken peace which, during forty years, has knit together the fortunes and interests of the two most civilised nations of the earth” (quoted in Blainey 1973, 20).

Four themes underlie this rosy view. First, a continuous component of liberal views on international politics has been the pacific consequences of contact and communication. “The greater the contact, the greater the respect” (quoted in Stein 1993) epitomizes the view that conflict is rooted in miscommunication and misunderstanding and that increasing interaction improves the prospects for cooperation. The Internet is only the current expression of hopes voiced during the last two centuries, hopes that underlay the modern Olympic movement, world’s fairs, cultural exchange programs, and so forth.³

Second, also reliant on the view that conflict is rooted in misperception, is the idea that improved communications lowers forecasting errors, and reduces or eliminates accidental wars. Communications revolutions, more than ones in transportation, hold special significance because of the central role of information in our understanding of how the world works.⁴ A revolution in the theory of games has transformed our understanding of almost all strategic interaction as being about information. Game theory now sees many social realizations as the products of incomplete information. Indeed, in these works, conflict is a product of incomplete information; thus any improvement in the speed and quality of information transmission in the theory holds the potential for changing the prospects for conflict.

Third, developments in transportation and communication increase trade and economic interdependence which, in turn, produces international cooperation (Stein 1993). In this way, technological developments lead to peace indirectly rather than directly (see Kedzie, in this volume). Thus, revo-

lutions in transportation and communication bring greater cooperation either by way of increasing contact and understanding or by way of commerce and its pacifying consequences.

The fourth impact of such technological revolutions, which in turn affects international politics, is the impact on the state and on the relationship between ruler and ruled. Better communications can help a ruler both keep tabs on citizens and also can help a ruler build support by controlling what version of events citizens see. Greater control leads to greater stability, by lessening internal conflicts and, in turn, by lessening the possibility of conflict spilling over to surrounding states or of diversionary wars. Furthermore, improved communication between the ruler and the ruled increases the pacifying impact of public opinion on foreign policy. In particular, as trade leads to greater prosperity, the demand for the continuation of such (peaceful) trading relationships grows.

Real improvements in transportation and communications during the nineteenth century did not necessarily fulfill this promise of peace, however. Internal improvements in transportation and communication transformed the prospects for state power, improving the relative power position of those states most able to take advantage of the technology. The prospects for war and peace changed as relative positions shifted. Furthermore, technology that so clearly could be used to lower the costs of trade and increase profits could also be used to improve military power. Communications technology, excellent for transmitting orders for goods across oceans, could also improve the coordination of military maneuvers over long distances; vessels that transported people and goods could also transport soldiers and weapons. Toward the end of the century, states that had industrialized and grown richer, in part due to communications and transportation improvements, expanded. As they pursued both wealth and military power made possible with the new technology,⁵ their expansion posed new threats and intensified rivalries in the period leading up to World War I. And the speed of such communications and transportation technologies made possible the rapid mobilization of troops and the quick exchange of diplomatic messages immediately preceding World War I, which severely limited the opportunities for a diplomatic solution to the crisis.

Relative Returns and International Political Transformation

In a quite general framework (drawn from Steele 1995), broad technological change is the key determinant of changes in the prospects for war or peace (see also Webster, in this volume). States are assumed to be interested both in security and welfare but find the prospects for those affected by the nature of technology. Technological changes that disproportionately increase the returns

to states from war-making result in a more belligerent world. Conversely, technological changes that predominantly increase the returns to states from commerce and exchange result in a less belligerent world. The rise of territorial states or trading states is a result of technological change. Major changes in the nature of international politics and the international system come from technological revolutions. However, technological changes that increase the returns from both military and trading strategies may improve the relative position of technologically advanced states but do not, in themselves, transform the system from a conflictual one to a peaceful one, or vice versa.

This argument is much broader than the current analytic debate about the relative dominance of offensive and defensive weapons. The security literature contains the argument that technology would change the prospects for war by changing the balance between defensive and offensive weapons. A world in which offensive weapons are dominant is one that is more prone to war, one in which defensive weapons are dominant is less prone to war. But this narrows the focus solely to the prospects for successful warfare and ignores the reasons for waging war.

The purposes as well as the prospects for war matter. Given the nature of technology, additional territory is more or less valuable and more or less readily controlled. Thus, the utility of military expansion is a product of more than the existence of offense dominance. Similarly, the prospects for a trading state strategy result from more than the perceived superiority of defensive weapons.

The impact of technological change is multifaceted and entails changes in the relative rates of return for different state strategies that in turn determine the prospects for world peace and stability. Assessing the impact of a revolution in communications then entails whether it produces or augments a major shift in the ratio of returns to militaristic versus pacific international strategies.

The First Communications Revolution

The history of communications development is one of continuing technological progress. Each new technology improved the speed, capacity, and reliability of communications, and the costs of communicating declined dramatically over time. Each invention held commercial and personal use. Businesses made early use of these technologies, but individuals also used them for private messages once the costs came down.

In the last two centuries, there have been two clear-cut “revolutions” in modern communications. The first occurred during the nineteenth century with the development of the telegraph (and later the telephone). This type of “point-to-point” communications meant that information could now travel

faster than people could, faster than any mode of transportation. The second revolution included the development of real broadcasting, which enabled public and private entities to send out information from one source to many people and places at once (e.g., through television pictures). The second revolution also included the development of satellites (first launched in 1960), which made it possible to cover the entire planet and beam words and pictures from anyplace on earth to any other. We are currently undergoing a possible third modern communications revolution that includes the development of the Internet and networking, linking any number of distant sites in multidirectional communications. This third “revolution” is a mix of point-to-point and broadcasting types of communications, with one new twist: the source for broadcasting information now is not a prohibitively expensive (and easily monitored) television transmitter, but any small personal computer equipped with a modem.

The first modern communications revolution, which occurred in the nineteenth century, meant that information, for the first time in world history, could move faster than people and things.⁶ Previously, information was conveyed by people and depended on means of transportation.⁷ The first telegraph message in 1832 implied virtually instantaneous communication. It required a vast infrastructure: laying of cable and the development of standard codes and operators. Point to point communication was pushed still further with the first telephone conversation in 1876. More and more varied information could now be communicated and did not necessarily require intermediaries and translation (coding and decoding) at both ends.⁸

The nineteenth century saw the development not only of point-to-point communication but also the very beginning of broadcasting, the transmission of information through airwaves. The radio, developed at the very end of the century⁹ was the first communication medium that could be sent broadly, could cross borders without permission, could be heard on moving objects such as ships, and could be heard by anyone with the ‘right equipment. The subsequent invention of television (1927) expanded the range and scope of what could be broadly transmitted over the air without requiring laying cable. Still, radio and television operate on a regional, rather than a global scale.

Each of these developments initially brought wonder and amazement and soon was simply incorporated into people’s expectations: “In the early days of cables it seemed miraculous to send a message over thousands of kilometers in a matter of hours. Pulpits, podiums, and editorial pages resounded with paeans of praise for the ‘annihilation of time and space’” (Headrick 1991, 73). As Capt. George Squier of the United States Army Signal Corp (itself a military organization created because of the new technology) put it in 1901, “The fastest mail express, or the swiftest ocean ship,

are as naught as compared with the velocity of the electrical impulse which practically annihilates any terrestrial dimension” (Headrick 1991, 4).

Like improvements in transportation, communications technologies increase the scope and scale of commercial enterprises. A message that previously would have taken a month could be sent in less than a week once the overland cable from Karachi, Pakistan, to Europe was completed in 1865; the time was further shortened in 1870 with the completion of a Bombay to London cable (Jones 1987, 103). The trans-Atlantic cable was completed in 1866, cutting the time between the ordering and the receipt of goods almost in half. Inventory requirements were reduced, and middlemen were bypassed as orders could be sent directly from wholesalers to manufacturers (Jones 1987, 104-106). Communications technologies not only facilitated growth in international trade and investment, but also made possible central control of multilocal enterprises. In 1900, the House of Rothschild had branches in Frankfurt, Vienna, Paris, and London in daily contact with each other (Kennedy 1993, 50). The communications revolution thus led to a managerial revolution that transformed the nature of productive enterprises.¹⁰

The telegraph led to the coordination of finance as well as commodity markets. By 1914, every continent was linked to London, and Britain dominated a global financial market, linking banks and stock exchanges, although firms were less directly linked (Schwartz 1994, 157).

Governments have been essential to the spread and use of modern communications innovations. While the earliest cables were laid by single entrepreneurs or by newly formed companies, in 1870 the British government nationalized its domestic telegraph companies. Further private investment in international telegraph cable followed, which, in turn, later became heavily subsidized (Headrick 1981, 162). Other Great Powers, too, fostered the development of these technologies and agreed to the creation of international communications networks: “Before quarrels could arise over the control and security of international communications, there had to be telegraph lines connecting countries to one another, and these lines required international agreements” (Headrick 1991, 12).¹¹ Indeed, “because telegraph messages often had to cross international borders, they required something that few technological innovations had required before: international cooperation” (Mokyr 1990, 124). Initially, these came in the form of bilateral agreements in the 1850s and 1860s, followed by the creation of the International Telegraph Union in 1865. In other words, besides increasing trade and financial interdependence, the communications revolution led to the creation of new international institutions needed to ease transactions. The first interstate telegraph line linked France and Great Britain in 1851: for the next forty years, private cables, mostly controlled by British companies, dominated the telegraph system. Other countries accepted British hegemony over commu-

nications and reaped the economic rewards made possible by cheaper, faster, and more reliable communications. It was a period of relative great power peace (Headrick 1991, 6).

The Dark Side

But communications revolutions have been double-edged: they have been used for war and have generated conflict even as they have increased international communications and understanding. The innovations of the nineteenth century became central to modern warfare.

One consequence of the new technologies was that they increased the scale and scope of political and military control: “Large empires went to great lengths to speed the flow of information: the Romans built roads, the Persians and Mongols established relays of horses, the British subsidized mail steamers” (Headrick 1991, 6). As one historian put it, the one new thing about the new imperialism of the end of the nineteenth century was that the imperial states had “secure and rapid means of communicating with their provinces and agents abroad” (Headrick 1991, 50). All European states pursued these efforts to control communications in newly conquered territory. France, for example, moved slowly north in Indochina starting in the 1850s, building telegraph lines as they conquered first Cochin China, then Annam, and finally Tonkin (Headrick 1991, 53).

The managerial revolution made possible by telecommunications also transformed the battlefield (Creveld 1985; McNeill 1982). Information was the key to consolidating and controlling warfare. Armies laid cables as they marched forward in the nineteenth century. Battlefields could be orchestrated by generals in the rear holding large amounts of information: In the words of Fieldmarshal Alfred von Schlieffen, “[The ‘Modern Alexander’ would direct the battle] from a roomy office where telegraph, telephone, and wireless signaling apparatus are at hand” (Van Creveld 1985, 153). According to one historian, “Effective centralized command depended on new means of transport and communication” (McNeill 1982, 248).¹²

The centrality of communication to national security meant that each communications technology became an arena of Great Power competition and rivalry. Telegraphy initially emerged during a period of relative Great Power peace.¹³ States were willing to allow this important medium of communication to be controlled by others (specifically by Britain, which also controlled the seas through which the cables were laid). But as Great Power rivalry reemerged in the latter part of the nineteenth century, competition in telegraph communications was one domain for that rivalry.¹⁴ The possibility of attacks on lines of communication, and the prospect of censorship and espionage, led France and Germany to build their own subsidized cable networks.

Not only did states compete in these technological domains, but these domains became politicized and militarized and played prominent roles in both world wars. States developed agencies specializing in monitoring and decoding others) secret communications. The new information technologies, by separating communication from transportation, created new forms of espionage and warfare (Headrick 1991, 8). In fact, the need to streamline communications in wartime and, more specifically, to handle the enormous number of messages during World War I led to enormous improvements in radio and telephone technology (Landes 1969, 422-423). States also created agencies intended to use modern communications technology for propaganda.¹⁵

Moreover, governments wanted to be able to keep secret their communications even as these forms of communication increased their ability to spy and gather information. The centrality of communications channels made them weapons of war: victory or defeat could hinge on information and who had it when (Headrick 1991, 138). An asymmetry in the nature and use of communication technology could be the difference between victory and defeat on the battlefield.¹⁶

Finally, there is the question of the impact of real-time communications on international politics. Whatever the net impact of communications upon interstate rivalries and internal state power, they do reduce the reaction time of governments and increase the pressures on central decision makers.¹⁷ The ability to communicate quickly reduces the role of foreign ambassadors and representatives. One argument, voiced as early as the beginning of this century, was that rapid communications exacerbated international conflict. Tensions anywhere around the globe were instantaneously transmitted and magnified and were more difficult to allay. Instantaneous communications reduce the diplomatic room for maneuver, make it difficult if not impossible to wait for the course of events, and increase the costs and certainly the visibility of the costs of conflict.

One early disaster attributed in part to this impact of electronic communication is the occurrence of World War I: "Diplomats failed to understand the full impact of instantaneous communications without the ameliorating effect of delay" (Headrick 1991, 139 quoting Stephen Kern, *Culture of Time and Space*). A number of examples of the role of new technologies are provided from the crisis days preceding World War I. First, Austria gave Serbia an ultimatum and only forty-eight hours to reply, after having taken almost a month deliberating on how to respond to the Archduke's assassination. When the Serbian foreign minister replied that some ministers were away and more time would be needed, he was told by the Austrian ambassador, "The return of the ministers in the age of railways, telegraph, and telephone in a land of that size could only be a matter of a few hours." Second, when Austria then declared war on Serbia, it was done with a telegram. Finally,

the ultimatums issued prior to the outbreak of war stipulated short response times. The German ultimatum to Russia on July 31 had a twelve-hour limit. Great Britain gave Germany only five hours to answer its ultimatum.¹⁸

In many ways, then, communications became weapons of control and war, and at times even exacerbated conflict. States were willing to spend vast sums both to ensure the secrecy and security of their own communications and to break and decode the communications of their adversaries and competitors. Yet the efforts to control communications as an aspect of international rivalry did not really occur until states had moved away from the trading strategies of the midnineteenth century and the tensions and conflicts of the imperialist period emerged. Once territorial expansion again became a clear goal for the European states,¹⁹ governments became much more active in controlling and developing communications technology.²⁰ Whereas communications technology had increased profits for financiers, manufacturers, and entrepreneurs during the nineteenth century as it lowered transaction costs, the same technology led to great efficiencies and increasingly effective strategies in ever larger wars in the opening half of the twentieth century.

Communications in the Twentieth Century: The Second Revolution

Satellite technology, and advances in radio, television, and telephones have led to another round of dramatic decreases in the cost of communication, increases in speed, increases in reliability and in the scope of areas that can now be linked instantaneously. Global reach and broadcasting, the ability to reach large numbers of people from one source, are dramatically different from the point-to-point communications of the nineteenth century. Governmental as well as private organizations can reach masses of citizens in their own countries and across borders. In addition, such advances in technology again stimulated international trade and commerce, and helped lead to the growth of multinational corporations and of foreign direct investment.

Again, however, governments have been quick to recognize advantages in applying improvements in communications to warfare. Satellite technology was funded by the U.S. and Soviet governments, in great part, for security reasons.²¹ Instantaneous and reliable communications were developed, which further refined certain types of warfare. These developments included accurate guidance systems for cruise missiles, “smart” laser-guided bombs such as those used in the Gulf War, and vastly improved command and control systems with which to coordinate forces and which, in turn, also become the target of war (e.g., that the United States targeted in Iraq during the Gulf War). As in the earlier communications revolution, there is both a light and a dark side to the application of these technologies.

Similar to earlier advances in communications, improvements in the twentieth century have continued to lower the cost of communicating and to broaden the speed and scope of transactions. Communications technologies provide more, and more current, information that makes possible a “more informed” judgment, both for security issues and economic issues. Our very language, the phrase “more informed,” implies the superiority of decisions made with more information. Improvements in communications lower the costs of trade and investment. They may actually lower the likelihood of accidental wars,²² due to increased access to more accurate information on both the capabilities and intentions of rivals.²³ Nothing, however, in more rapid and speedy information and communication makes it inherently a force for cooperation or conflict.²⁴ In fact, broadcasting itself was utilized by expansionist and authoritarian regimes, which took advantage of such advances in communications to spread propaganda more effectively, allowing them both to solidify their power and to whip up nationalist support for possible expansion.²⁵ The danger of rapid information in a crisis situation has already been discussed in the case of World War 1. More recently, rapid communications also increased pressure during the Cuban Missile Crisis.²⁶ Both the ability to gather complete information and to process such information fully may be limited in this type of crisis. And more rapid-though accurate-information can actually lead to war: the preemptive Israeli strike that started the 1967 Six-Day War followed observations of Egyptian troop mobilizations.

We have enjoyed a half century with little Great Power wars since 1945, although it has not been a period completely devoid of conflict. The question is, Are we likely to see these trends continue or are we likely to see a repeat of the nineteenth century, when states turned from cooperation to conflict, and began to compete even in the domain of communications? Other changes in the international system suggest that there is some reason for optimism. There is less of a focus today on an expansion of territory as a goal for states (see Steele 1995). This removes at least one cause of war. Institutions and norms have been established to help prevent the repetition of costly Great Power wars, especially in a nuclear age. This also diminishes the likelihood of conflict. Institutions and norms established to encourage cooperation and improve returns on trading and investment strategies also help mitigate conflict, including such institutions as the General Agreement on Tariffs and Trade, the World Trade Organization, and the International Monetary Fund. Access to accurate, rapid information makes these institutions more effective, helps spread cooperative norms, and, as already suggested, leads to greater levels of interdependence as the benefits of trading strategies increase. Communications innovations have magnified and inten-

sified the post-World War II shifts toward an interdependent world. It is important, however, to examine the dark side of communications technology more fully before becoming too sanguine. In the last century, communications technologies, initially helping to lower the costs of trade and to increase interdependence, were utilized by states at the end of the century to consolidate their power, control their populations, control information and thus gain a powerful propaganda tool, and to gain access to secret information about rivals in order to follow more successful predatory policies. Such uses for communications technology continue to be possible.

Communications and the Power of the State

One piece of conventional wisdom is that communications technologies empower people and reduce the power of the state. This vision of communications goes back to the last century and is even associated with earlier technologies. Thomas Carlyle, writing in 1836 about the implications of the invention in the 1450s of the printing press, said, "He who first shortened the labor of copyists with the device of moveable types was disbanding hired armies and cashiering most kings and senates, and creating a whole new democratic world" (Neuman 1996, 8).

If Carlyle's judgment was premature, it is certainly widely argued today. People, and their most immediate representatives in a communications age, the media, can obtain information quickly and directly and no longer need to rely on governments.²⁷ Moreover, the decentralization implied by communications technologies means that it is more difficult for the state to exercise central control. Thus, the current argument is that communications technologies are transforming the relationships between people, between rulers and their citizens, and between rulers. One author describes the purveyors of such arguments, "utopian techno-revolutionaries" (Surman 1996).

The result is that governments cannot lie and act with their otherwise characteristic impunity. The nuclear disaster at Chernobyl, for example, was "swiftly photographed by a French commercial satellite, and transmitted all over the world—including within the Soviet Union itself" (Kennedy 1993, 53). The result was that governments had to respond since their populations had independent sources of information. Neither Western nations nor the Soviet Union could cover it up.²⁸ The consequences for the use of military force are potentially profound. Domestic populations can see their country's soldiers fighting across the globe on their TV screens. Foreign interventions become more difficult to sustain in an age of global television. Governments in the information age will be forced to be truthful and pursue only popular policies, the argument goes. The availability of real-time information directly

accessible by individuals generates these pressures. The impact of instantaneous nongovernmentally controlled global communications has now reached an extreme as we now see public officials tune in to Cable News Network (CNN) and obtain their information at the exact same moment and from the same source as their publics.²⁹ This argument is directly equivalent to the one made about capital mobility: in an age in which capital can instantaneously flow anywhere, governments have no choice but to pursue good economic policies.³⁰

Citizens have direct access to foreign views and governments have no monopoly on the information their citizens receive. Radio, telephone, telegraph—and television, fax machines, and now cellular phones—are difficult (at best) for governments to control. Governments, individuals, or international organizations can link subnational groups together, provide monetary support, coordinate political movements, and spread ideas or emerging norms. In this case, communications are seen to have helped undermine authoritarian regimes, such as the South African apartheid regime, as communications helped interested parties organize internal resistance, rally foreign economic pressure, and spread norms of political representation.

Thus, it is now argued that the communications revolution not only constrains but can topple governments. Sermons and messages of the Ayatollah Khomeini were widely distributed on audiotape as were copies of their transcripts and this is seen as central to the Iranian revolution that brought down the shah (Rosenau 1990). As the well-connected Arab journalist, Mohamed Heikal, put it, “What was happening was a revolution for democracy, against autocracy, led by theocracy, made possible by xerocracy” (Heikal 1981, 139).

Similarly, the communications revolution, we are told, brought down Communist rule in the former Soviet Union and East Germany and the authoritarian rule of Ferdinand Marcos in the Philippines (Ganley 1991; Shane 1994; Sonenshine 1990, 29).³¹ It became clear to citizens in the East that Communist regimes could not match Western standards of living that then led to deep dissatisfaction; it became clear government information could not be trusted that then led to increased cynicism; it became clear ideas were spreading and the regime was unstable that led to the rapid spread of change once it began (Skolnikoff 1993, 96-97).³² Even where it did not bring down the regime, as in China, the communications revolution challenged the state. The Chinese government’s suppression of students in Tiananmen Square was communicated by radio, television, and fax messages back into China (Kennedy 1993, 52).³³ In short, external sources of information can undercut a regime. Indeed, governments make use of this by directly appealing to the citizens of foreign adversaries. Broadcasting information (and cultural programming) abroad has been a widely used tactic during this century.

Governments, fearful of the new technologies, have tried to retain control. In the nineteenth century, all kinds of governments made use of the new technologies: "Governments of every sort [of] autocracies like Russia, democracies like the United States, colonial regimes like India, even non-Western states like Turkey and Japan all seized upon it [the telegraph] as a means of enhancing their power and improving their efficiency. Only China stood back, seeing in the telegraph an alien intruder" (Headrick 1991, 46). Governments came to recognize that organizations mediate between machines and society and that these could be governmental ones: "These organizations . . . in effect control the flow of interactions between technology and society by purchasing, investing, subsidizing, patenting, sharing or withholding secrets, and many other means" (Headrick 1991, 9). In many countries, these organizations were organs of the state. In the twentieth century, states recognized the importance of broadcast as well as point-to-point communications. They found that the scope of their power was increased by broadcast technologies such as radio and television. In most countries these were state-owned and dominated. Not surprisingly, the most totalitarian regimes, exercising the most control of their citizenry, are twentieth-century phenomena and make extensive use of the new technologies (see Taylor 1990).³⁴

In wartime, all states, totalitarian and democratic alike, have heightened the extent of control. Britain licensed shortwave radio sets and monitored owners during World War I. Japan simply banned such sets entirely (Taylor 1990,211).³⁵ More recently, Communist regimes have held out for different technical standards to make communications more difficult.³⁶ China cracked down on fax machines and cellular phones after Tiananmen Square and controls the Internet, resisting horizontal communications links in an effort not only to limit the spread of reformist ideas, but to maintain control over information and the tools of propaganda (see Skolnikoff 1993, 97-101).

It is not easy, however, to control the content of information given modern day communications and increased transnational links. This loss of control was evident in the fall of the Soviet Union, the end of the apartheid regime in South Africa, and the demonstrations in Tiananmen Square. It is not impossible to retain at least some governmental control over communications (as China continues to do), but it is very costly, and probably impossible to retain total control in an age of satellites. Many governments have tried to do so and failed. The only sure way to control the content of messages is to limit the access to, and availability of, the technology severely; this, of course, means severely limiting the accessibility of a vital economic tool. Governmental control is eroding: in an earlier era, states consolidated their position in part by expanding communications technology while still controlling the content of the information available to citizens and in part by

utilizing their monopoly over the presentation of information to manipulate the forces of nationalism.

Governments and the Development of Communications Technology

The difficulty in limiting outside information in order to control domestic forces does not mean that governments no longer support the development of these new technologies for both economic and national security goals, or that they do not reap great advantages from them. They continue to be extensive and early users of advances in communications. In the nineteenth century, governments were at first slow to recognize the military and political consequences of technological developments. But it did not take long for them to see the possibilities and the essential need for incorporating innovative ideas. In the twentieth century, governments are in the forefront of much of the initial research and often subsidize much of the development of communications technology.

Even in open societies in which the media is not controlled, broadcast communication allows political leaders to address citizens directly without an intermediary. It allows them direct appeals and increases their relative power. Moreover, even open democratic governments that do not directly control the media have found that the media can be quite constrained and military censorship can be effectively used. This may not always be the case in peacetime, but governments have been able to control information in wartime. The British government, for example, was able to get the kind of media coverage it wanted during the Falklands War in 1982, and coalition forces were able to confine the media during the Gulf conflict (Atkinson 1993, 159-162).³⁷

Governments have been central to the development and growth of technologies of mass communication. They have also been at the forefront of the development of new communications technology for warfare. The nature of the two world wars, for example, transformed the U.S. government's relationship with universities as scholarship that was potentially useful to the military began to receive public support and funding.³⁸ Yet, they have been constrained as well as strengthened by these technologies. For example, the development of communications satellites initially followed a development path similar to that of the telegraph in the nineteenth century. The United States, the hegemon, initially gave avid support to efforts by private enterprise to develop a communications satellite system.³⁹ The U.S. government supported the creation of INTELSAT (International Telecommunications Satellite Organization), established in 1964 as an international not-for-profit organization to launch and manage communications satellites (McNeil 1990). Other nations at first accepted U.S. hegemony in this area. Over time, how-

ever, as with the telegraph, states began to chafe under U.S. control.⁴⁰ Unlike in the nineteenth century, however, twentieth-century pressures for unregulated competition won the day. In a world in which territory is less of a concern for Great Powers, and one in which benefits for pursuing economic strategies surpass benefits for military strategies (Steele 1995), support for international organizations and cooperative control over communications has overcome security concerns and efforts to maintain independence. Today over two hundred nations, including China, Vietnam, Iran, Russia and the former Soviet republics are members of either INTELSAT or the newer INMARSAT (International Mobile Satellite Organization), established in 1979. Hegemonic control has been replaced by a multinational organization, lessening the chance of conflict because smaller states are (at least somewhat) less vulnerable to superpower whims.⁴¹ The number of countries that share access to communications satellites will continue to grow in the future; hegemonic monopolistic control is limited. Increasing these ties will lead to continued pressure for intergovernmental cooperation, which has been a prerequisite to the cross-border flow of information and the wiring of the world.

A Third Communications Revolution at the End of the Millennium?

Recent developments, such as the Internet and the World Wide Web, are again leading to prophecies of revolution.⁴² It has all been said before. As with other advances in communications, the technology itself can be used for commercial or military ends. The improvements in the speed of communication can lower the costs of trade and investment, or can broaden the speed and scope of military action. Such improvements can improve information for customers and for commercial rivals, or for military allies and enemies. More accurate information can help prevent misunderstandings, or the increased speed and flow of information can create pressured or crisis situations that may increase cognitive errors.

The claims for the new technology are similar to the claims in earlier communications revolutions, particularly to the changes in the twentieth century. Specifically, networking and the Internet have a similar effect on government control as broadcasting (as opposed to point-to-point communications): transnational ties improve just as governmental control over their own citizens weakens. The wired world, it is claimed, will provide community, democracy, empowerment, wealth, and peace. There is talk of cyberocracy and cyberology and the cybercratic state (Ronfeldt 1991).⁴³

The technology of the information age certainly improves transnational communications, yet governments continue to try to gather information both about rival states and their own citizens. Gathering information and maintaining control over it is still seen as a core security interest. Still, the newest

improvements in information technology are occurring in a time of limited Great Power war and high levels of interdependence. Domestic demands for the pursuit of prosperity are increasing, accompanied by increased pressure to deregulate communications and allow for the free flow of information, which comes from both corporate and financial institutions as well as from private citizens. Transnational ties between individuals, corporations, and groups continue to increase. The end result is that governments do try to retain as much control over information as possible-but it is becoming more difficult and more costly to do so.

Ironically, the Internet itself is a product of U.S. defense concerns. It began during the Cold War as a network created by ARPA (Advanced Research Projects Agency) of the Defense Department (called "ARPANET"). Its structure, in which packets of information can travel via a multiplicity of routes and reroute around bottlenecks, was designed to ensure uninterrupted routing of data even in a nuclear war. Now that very structure makes Internet control by governments more difficult (Lewis 1996): intentionally created bottlenecks or roadblocks are as easily overcome as unintended ones.⁴⁴

Also ironically, the initial reaction of many computer literate U.S. citizens to the arrival of computer networks in the late 1980s was that they were a retrograde and regressive force.⁴⁵ Today the very networks that make surveillance and central control possible are once again being lauded for the personal freedom they provide and for the new communities they make possible. But there are some opportunities for government to reassert control. The fact that they have limited incentives to do so, or that they show little willingness to pay the opportunity costs associated with doing so (in terms of lost commercial benefits), does not mean that they cannot do so.

In most societies, including democratic ones, the desire to control Internet communications stems neither from a concern about political opposition nor from a perceived need for emergency surveillance but from a concern with the dissemination of certain kinds of information.⁴⁶ Governments are being pressed to regulate and prevent certain information from being gathered and spread. Most typically, the concern is over pornography,⁴⁷ but other issues have also arisen.⁴⁸ A loss of control over security issues and defense technologies is also seen as a vital concern.

Democratic governments, again including the United States, want to be able to exercise control and surveillance of information. The U.S. government has been extraordinarily active in limiting the ability of private actors to encrypt their communications and has pressed for a "key recovery" plan so that it might be able to decrypt messages when necessary (Clausing 1997). In 1993, the U.S. State Department ruled that a graduate student in mathematics could not publish his encryption program nor discuss it at any open meeting that might be attended by foreigners unless he registered as an international

weapons dealer.⁴⁹ Governments continue to insist that all nongovernmental information should be open to governmental surveillance.

An array of states, autocratic to democratic, are linking their societies to the Web but many are continuing to exercise substantial constraints.⁵⁰ Vietnam and Saudi Arabia permit access only through a single government-controlled gateway. Singapore treats the Net as a broadcast medium and requires content providers to register with the state.⁵¹ China requires users and providers to register with authorities. The Chinese telecommunications minister stated in June 1995, "as a sovereign state, China will exercise control on the information" entering China. "By linking with the Internet, we do not mean the absolute freedom of information." China's official Xinhua News Agency stated that individuals and organizations are not "allowed to engage in activities at the expense of state security and secrets" and "they are also forbidden to produce, retrieve, duplicate, or spread information that may hinder public order." The fear persists that influential forces from outside state borders may undermine authoritarian regimes.

Governments' capabilities for monitoring both people and objects from a distance are also continually improving in all states. Again, improved capabilities in themselves can be used either for benign or more pernicious goals. There has been pressure to protect privacy rights and to block the dissemination of information about people's Web activity, something that is easily monitored and of great commercial value. New technology can even be used to monitor the physical whereabouts of individuals.⁵² While this is nominally to help people in distress, the notion that the government can track anyone's exact whereabouts through his or her (mobile) telephone uncomfortably reminds us that Big Brother Is Watching.

Internationally, there are also some forces working against pressures toward transnational links and deregulated communications. There are concerns, for example, about U.S. dominance in information technologies. Countries are choosing to hook up to the Net but are maintaining controls and negotiating the terms of their integration into the global communications networks. As was the case with earlier technology (e.g., the telegraph or communications satellites), smaller governments do not want to be dependent on a hegemonic power's good will for access to communications.

Finally, the U.S. military establishment (and presumably others as well) are planning for war in the information age. There are studies of information war, cyberwar, and netwar.⁵³ RAND has already undertaken, at Defense Department request, cyberwar simulation exercises. As before, the latest communications technology has wartime consequences and can be used for military advantage (Arquilla and Ronfeldt 1993). The new information technologies can be used by advanced states like the United States to disrupt both an enemy's decision-making process and its ability to carry out military

actions effectively-but increased reliance on such technologies create new vulnerabilities as well.

Still, the system does not seem to be headed toward rivalry and conflict. The end of this century does not appear to be a repeat of the prior one, at least as far as Great Power tensions are concerned. Despite the active involvement of the military establishment in the development and application of communications technology, and despite the often strenuous efforts by some states to use such technology to control information and their citizens, on balance, states appear to be utilizing the new communications technologies more to increase cooperation and interdependence than to expand at the expense of others. Although military applications for these technologies continue to be developed, the benefits of cooperation currently appear to outweigh the benefits of predation. This will not last if other factors in the system emerge to increase conflict: communications technology alone cannot lead to peace. The newest technology increases the speed and scope of both economic and military communications; it is useful for both. Transnational links may be increasing but governments are still able to assert control over the access to technology, should they decide it is in their interest. But the balance today looks to be in favor of continued pacific strategies, at least for now.

Conclusion

Revolutions in communication underlie both international cooperation and international conflict. They increase the returns to both. They increase the amount of independent information available to citizens but also increase the power of the state.⁵⁴

The dual impact of communications on international relations was recognized by Charles Bright, a leading expert on submarine telegraphy. He recognized the fact that rapid communications produced ruptures that could have been avoided with more time to think, but they also prevented ruptures by rapidly learning the interests and concerns of other governments. His conclusion, "But, on the whole, experience distinctly pronounces in favour of the pacific effects of telegraphy" (Headrick 1991, 75). Ironically, he was writing in 1898. Would he have struck the same balance were he writing two decades later?

The international political history of communications is that they parallel and amplify trends in international relations. The

telegraph, appearing in an era of peace, was long thought to be peaceful by nature; it did not become an object of dissension until the turn of the century, when nations turned antagonistic for other

reasons. The radio, in contrast, was born into a world of jittery jingoism and started life as a weapon in the commercial and military rivalries of the great powers. (Headrick 1991, 117)

Conflict between the Great Powers spilled over into telecommunications, as “conflicts over cable networks were a metaphor for the clash between an old and satiated empire and an upstart rival” (Headrick 1991, 177). During the earlier nineteenth century, when states pursued trading strategies and wealth, communications led to greater interdependence and cooperation. At the end of the nineteenth century and into the twentieth, as states again pursued expansionary policies and territory, communications improved war-fighting capabilities and led to massive, bloody, Great Power conflicts.

The central feature of the information revolution occurring in the 1990s is that it comes during a period free of major conflict between the Great Powers. Indeed, it is precisely this peace that has allowed such technologies to become so widely available so quickly. This communications revolution, like the ones before it, will lead to increased communication and higher volumes of information flow and will become integrated into the fabric of daily life, especially in the rich advanced postindustrial nations of the world. It will facilitate commerce and contact and make possible new ways of producing, new ways of organizing, and new ways of communicating and living. It will lead to more cooperative institutions necessary to manage increased interdependence and communication.

But states will continue jealously to guard their prerogatives and will find new ways to use the technology to control even as they are constrained by it and need to react to it. Moreover, the nature of competition will manifest itself in communications as well. Peaceful commercial competition will see states engage in practices to assure domestic information firms and domestically located systems. And should political rivalries rearise among the Great Powers, communications technology will be an arena of conflict like others.

A revolution in the nature of relationships among the Great Powers may very well be occurring. But it is not being driven by changes in communications technology. Other recent changes in the international system have increased the incentives for states to choose more pacific strategies. By themselves, changes in communication only heighten and magnify the dynamic implications of other technological changes.⁵⁵

Notes

1. One author even suggests that the Internet will constitute “the fifth internationale” of the Labor movement (Waterman 1996). The author’s paper

talks of “new social movements. . . creating a new kind of internationalism, or global solidarity, this being in large part a ‘communication internationalism.’”

2. “A popular and somewhat shallow interpretation of these trends . . . is that the economic consequences of globalization can only be beneficial” (Kennedy 1993) 52).

3. We characterize the liberal argument that increased contact and communication leads to increased cooperation as “sociological liberalism” (Stein 1993). The quotation at the beginning of the article, from the Prince Consort, comes from a speech preceding the opening of an international exhibition. The modern exponent of the pacific impact of communication was Karl Deutsch. The obvious retort is that familiarity can breed contempt as well.

4. Information has emerged at the heart of our understanding of physical, biological, and social phenomena. There are some who argue that a new paradigm has emerged in physics in which “physical systems are viewed as . . . processing information” (Wright 1988, 62, quoting a 1984 article). Similarly, the genetics revolution in modern biology transforms our view of human nature, and genes are now conceptualized as encoding information. Biology textbooks in the 1950s used to begin with definitions of life. They no longer do. Virtually every textbook definition of life could apply to a computer Virus.

5. Completion of submarine cables in the 1870s, along with such innovations as curb transmissions (a second pulse following the first to improve quality) and duplex telegraphy (enabling messages to be sent in opposite directions at the same time) all helped increase the speed of communications while lowering the cost. This lowered transaction costs for trade and also allowed for tighter centralized control of distant colonies. Whereas a couple of dozen telegraph messages were sent between India and Britain in 1870, two million were sent in 1895. Britain had monopolized underwater cables early on, but as competitive tensions increased between the Great Powers late in the century, Germany and France, fearful of relying on British good will, laid their own cables in the 1890s (v.i.). This era also saw the birth of radio. The first patent for wireless telegraphy was taken out in 1896; Marconi’s first customer was the British War Office for use in the Boer War (Headrick 1991, 118).

6. Dr. H. H. Crippen, on board the SS Montrose, was quoted as saying about the wireless, “What a marvelous invention it is! How privileged we are to be alive in an age of such scientific miracles!’ He was arrested for murder when the ship arrived in New York because of a wireless message sent by Scotland Yard to the ship’s captain (Vansittart 1984, 213).

7. The use of semaphores, smoke signals, and pigeons constitute the minor exceptions.

8. All of the communications inventions were really a series of inventions. They combined separate technological innovations and required improvements to be reliable (Mokyr 1990, 123).

9. The first patent for wireless telegraphy was taken out in 1896; the first documented wireless broadcast was Christmas Eve 1906 when Reginald Fessenden broadcast from Brant Rock, MA (McNeil 1990, 726).

10. During this period the modern corporation emerged. Economic historians document the centrality and importance of this development (Yates 1989).

11. Stein (1993) makes a similar point about the implications of trade for international cooperation. Whether trade does or does not increase cooperation among states, trade itself reflects the prior agreements of states to facilitate and allow exchanges among their nationals.

12. By the second half of the twentieth century a White House Situation Room could be in direct contact with forces in the field and battlefield decisions could be made by political commanders. President Truman exercised a degree of control that his field commander in Korea, General MacArthur, found intolerable. President Johnson found it easier to control air strikes over Vietnam than to govern the nation (Buchan 1972, 173).

13. Nonetheless the period was not totally devoid of conflicts involving various Great Powers, including the Crimean War (1854-1856), the Franco-Austrian War of 1859, and the Wars of German Unification in the 1860s.

14. Nation-states saw the strategic uses of cables in small wars at the end of the century. The United States, for example, cut cables to prevent communication between Spain and the Philippines in 1898. The United States also censored the cables it did allow to continue operating (Headrick 1991, 82-83). Even Great Britain, which controlled most of the world's cables, decided to subsidize "strategic cables" (ones that only passed through British controlled territory or water) so that vital communication with critical areas would not have to go via cables not controlled by Britain. Britain's communication superiority was instrumental, though not decisive, in its ability to get the French to back down during the Fashoda crisis. Britain had communications with the area; France did not. British messages were shown to the French and used to deceive them (Headrick 1991, 84-85).

15. There is abundant literature devoted to both topics; however this is not the place to reproduce that material. For a broad historical overview of propaganda see Taylor (1990).

16. Perhaps the best example, "one of the greatest blunders in military history," is provided by Russian decisions in the Battle of Tannenberg in the early days of World War I. Earlier, Russian czar Nicholas I, fearful of the consequences of widespread telegraphy, turned down a contract with Samuel F. B.

Morse, the inventor. As a result, Russian telegraph lines were so rudimentary that the Russian military used the radio to transmit orders (Neuman 1996). Finally, a momentous decision was made in the field by Russian general Samsonov, who ordered that radio messages be transmitted in plain language and not in code. The Germans listened in and the Russian suffered a massive defeat in East Prussia in mid-August 1914, with one hundred thousand men taken prisoner (Headrick 1991, 155-156).

17. At this point, the argument intersects with the modern literature on crisis decision making and on the consequences of short response times for the quality of decisions.

18. The short response time was in part due either to the issuing party's interest in waging war (in which case the ultimatum itself constitutes a relic of an earlier day and age) or by the requisites of offensive military plans with strict timetables.

19. See Steele (1995) for a more extensive discussion of the link between technology and changing goals.

20. For example, use of the telegraph by governments earlier in the nineteenth century focused on consular matters, travel plans, requests for information, ceremonial matters, and the like. The Foreign Office began to use the telegraph more and more for security issues after the turn of the century. There were roughly 200 messages a year between Washington and London between 1866 and 1910. Exchanges increased to about 550 a year from 1910 to 1914, 15,000 per year from 1914 to 1919, and between 500 and 1300 per year in the 1920s and early 1930s (Headrick 1991, 74; see also Webster, in this volume).

21. Once the Soviets put up two satellites in 1957 (Sputnik I and II), followed by the first man in space (Yuri Gagarin in April 1961), the United States feared it was facing a technology gap in the Cold War (as well as a propaganda gap). The United States committed to the space program; communications satellites followed.

22. It is not clear how many truly accidental wars actually occur.

23. The Hot Line between Moscow and Washington, for example, lessens the chance of a nuclear accident.

24. This point mirrors that of the impact of misperception on international politics: misperception can cause otherwise avoidable conflict but need not and can lead to otherwise unattainable cooperation (Stein 1990).

25. For an elaboration of this argument, see Gordon (1974).

26. For a general discussion on impaired cognitive function in crises, particularly dealing with the effects of time pressure, see George (1980, 25-55). For a discussion on the occurrence of crises due to limited information, see Powell (1987, 717-735.) For a discussion on the limited effects of misperception on war, see Stein (1990, 55-86).

27. This argument presumes either that there are no state monopolies of information or that the ability of communications to permeate national boundaries is such as to make all government communications monopolies inherently contestable.

28. More recently, an Israeli newspaper “just went to Moscow and bought Russian spy satellite photographs of new Scud missile cases in Syria. Then [it] hired a private U. S. expert on satellite photos to analyze the pictures. Then. . . [it] published the package as a scoop, without ever quoting a government official” (Friedman 1997).

29. Neuman (1996) tells the story of Ambassador Strobe Talbott on the phone with an official at the Russian Foreign Ministry. Both were watching events unfold on CNN even as they were negotiating about them.

30. Montesquieu argued back in the eighteenth century that bills of exchange allow commerce to “elude violence, and maintain itself everywhere,” and as a result “rulers have been compelled to govern with greater wisdom than they themselves might have intended” (quoted in Hirschman 1977, 72). Stein (1993) characterizes such arguments as “financial liberalism.”

31. A similar argument is made about hierarchical organizations, that the new communications technologies will liberate people in the workforce (Fukuyama 1995, 23-24).

32. Control over communications is vital in bringing about change. Eugenia Bogdan of Romanian television announced, a few days after the fall of Nicolae Ceausescu, “If television falls, the revolution falls” (Skolnikoff 1993, 272).

33. Discussions about communication revolutions sometimes imply that all communications are good and progressive. Experience with the Internet and other communications technologies is that they are readily adapted and used not just by progressive forces but by reactionary ones. People have discovered that right-wing kooks and leftist revolutionaries have gone on-line with great facility.

34. This was, of course, the basis of Orwell’s vision in 1984. Perhaps, not surprisingly in a time quite different than the one in which he wrote, Orwell’s argument has been turned on its head (Huber 1994).

35. The nature of censorship is intimately linked to the nature of technology and to the kinds of fears of foreign influence. Within a century after the invention of the printing press, the Papacy had barred the works of more than five hundred authors. The Nazis censored jazz as a degenerate form of music. The United States Supreme Court exempted motion pictures from free speech protection, treated them as purely a business, and upheld the constitutionality of state censorship laws. Most recently, countries have excluded movies for a variety of cultural offenses.

36. Just as Russia adopted different railroad gauges to make movement across the border more difficult, the Soviet Union adopted a different VCR standard to make it difficult to play foreign tapes on domestically produced VCRs.

37. Both militaries had learned lessons from the U.S. experience with media coverage of the Vietnam War.

38. In the United States an array of scientific fields with potential military applications were subsidized, including mathematics (useful for cryptography) as well as the study of mass communications (Simpson 1994).

39. The first communications satellite to relay data, voice, and television, Telstar, was launched in 1962. National Aeronautic and Space Administration (NASA), a governmental agency, provided the launch, although a private corporation (ATT) owned the satellite. A few months later, Congress authorized creation of COMSAT (Communications Satellite Corporation) as a private corporation.

40. The Soviets created "Intersputnik," the Europeans worked on a European-wide system called "Symphonie," and tensions increased over demands for limited geostationary orbits and limited space in the frequency spectrum (Skonikoff 1972, 58).

41. The newest generation of satellites, both for data and cellular telephones, will be placed in lower orbits than previously, in part solving the problem of competition for limited geosynchronous orbits. Even the launch monopoly of superpowers has been challenged since 1979: the European Space Agency (ESA) can launch satellites with the Ariane rocket; China and India have launching capabilities, while Japan and others have their own satellites.

42. Transnational links for both individuals and groups can be expected to continue to grow in pure numbers in the near future: access to the Internet from private households has grown from 50 million households in 1996 to around 150 million in 2000; corporate use, has grown even more dramatically (Evans 1998).

43. "Anyone with a modern is potentially a global pamphleteer" (Markoff, 1995, A).

44. An Internet axiom, attributed to the engineer John Gilmore, states, "The Internet interprets censorship as damage and routes around it" (Lewis 1996).

45. Techies had lauded the personal computer revolution, for it allowed for the decentralization of computer power. Within corporations, for example, the personal computer meant freedom from the control of management information systems departments. Throughout corporations, there were guerrillas sneaking in personal computers defying the attempts of central computing to rationalize and systematize. Professionals with a computer on

their desk were freed from central control. When IBM introduced networks, the move to wire and hook everyone up was seen by many as the empire striking back. Other divisions would again be dependent on the management information systems people. Their files and their programs would again be elsewhere subject to others' whims and control. Communications can be monitored.

46. The United States and Germany presented alternative visions of Internet regulation in 1997 (Giussani 1997).

47. Even the United States passed the Communications Decency Act to control such Internet content.

48. In France, Holocaust-denying propaganda is illegal, whereas the spread of anti-Semitic propaganda is a crime in Germany. Both statutes have been used against Internet providers as well as against other media (Human Rights Watch 1996).

49. The mathematician took the government to court and prevailed (Flynn 1997).

50. Information on the 'net can reach users by one of many pathways, avoiding bottlenecks. But governments can control the gateway to the Internet, much as they used to own or at least control access to the cable in the nineteenth century. For the time being, at least, access to the Internet is easier for governments to control than access to broadcast information has been (which can cross borders without governmental permission). Once access to the Internet in general is available, however, the government cannot easily control the content of the information accessible.

51. Singapore also filters CNN broadcasts and bans private ownership of direct-broadcast television dishes (Sanger 1997).

52. The Global Positioning System (GPS), which uses geosynchronous satellites to pinpoint locations within twenty yards, was first used by the American military to help soldiers find their way in the Iraqi desert. The Russians have a similar system (the Global Navigation Satellite System, or GLONASS). Two-way messaging (using a small transmitter or pager) utilizes the Remote Determination Satellite Service (RDSS). The Federal Communications Commission has recently required that cellular and personal communications systems be able to provide a caller's number and, by the year 2001, locate a user to within 125 meters two-thirds of the time (Stutzman and Dietrich 1998).

53. In the aftermath of the Gulf War, "more than 120 countries [were] reported to be developing 'information warfare techniques'" (Shenon 1996, A22).

54. "They [communications] have both increased the power of governments and decreased their freedom of action" (Buchan 1972, 174).

55. During the last two centuries, revolutions in communications and transportation have proceeded alongside revolutions in the nature of warfare. Many attribute the advent of nuclear weapons as portending a transformation in the nature of warfare (Jervis 1989; Steele 1995).

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