Chapter Thirteen

SOCIETAL IMPLICATIONS*

Brian Nichiporuk and Carl H. Builder

The societal implications of the information revolution are both pervasive and profound. Prior revolutions—industrial, political, and social—may justly claim the same, but none before have conveyed power so widely or quickly downward to individuals, not just to a new set of elites. Political revolutions have sometimes diffused power more widely—as in the American Revolution—but most often they have transferred power from one elite to another. The revolutionary changes introduced through gunpowder diffused power from the castled and armored knight to a larger cadre of cannoneers and musketeers, but the transfer of power was from one very small elite to a somewhat larger elite. The information revolution is remarkable in part because it is diffusing the power of almost unlimited information to any and all who seek it. Not all may seek or elect to exploit the emerging abundance of information, but it is there for the taking, and the power it conveys depends only upon the creativity, imagination, and boldness of the individual. Never before in human history have so many had such easy access to so much potential power for so many diverse purposes.

This chapter sketches some of the major societal implications of the information revolution—changes in geopolitics and commerce that are largely due to the development of the information technologies. Not all of these implications are certain or irreversible, since they

*Brian Nichiporuk and Carl H. Builder, "Societal Implications," taken from *Information Technologies and the Future of Land Warfare*, MR-560-A, pp. 25–45. Some text was omitted for this version.

have not yet played out, and not all can be laid entirely at the doorstep of the revolution; but most observers do foresee major changes in social structures, commerce, and the international system.

The union of computers and telecommunications is making vast amounts of information available to large numbers of people who simply did not have such access even a decade ago. Access to overflowing information storerooms by groups, peoples, and organizations around the globe is facilitated by four characteristics of information that set it apart from physical commodities:[1]

- Information is not resource-hungry; it can often be exploited to conserve the use of physical resources.
- Information is easily transportable; it moves around the world on the wings of energy too small to be sensed without instruments.
- Information is diffusive; it leaks like a universal solvent despite great and continuing efforts to contain or restrict its spread.
- Information is shareable wealth; it seldom costs and often profits an individual to share information with one or many others.

In comparison to most industrial processes and their products, the dissemination of information requires negligible energy or other physical resources. Modern telecommunications make the transport of information a trivial matter—as we can see daily in the seamless operation of global equity and currency markets. Information, by human nature and by its own, tends to "leak" more readily than physical commodities. Monopolizing a physical resource is easier than monopolizing even a niche in the global information market; and as physical commodities find global markets—such as oil—the possession of physical resources counts for less and market information counts for more.[2]

The diffusion of power downward to individuals through the rapid spread of information on a worldwide basis is having three first-order effects. It is

- weakening traditional hierarchical structures,
- facilitating many types of transnational enterprises, and

- eroding some traditional prerogatives of national sovereignty.

Each of these first-order effects is developed further below.

A WEAKENING OF HIERARCHIES

Hierarchical organizations have been a salient characteristic of human civilization; they are the basis upon which most authority, power, and command and control have been exercised for millennia.[3] But the information revolution is weakening these structures through two different processes:

- The shift from relative poverty to abundance in information permits individuals to bypass hierarchies that have—deliberately or inadvertently—controlled or limited information.
- Alternative human organizational forms—based mainly on the network—have proved more effective and efficient for transacting information than hierarchies. In information-intensive enterprises, hierarchical organizations may not be competitive with networks.

An example of the first process, bypassing, is to be found in the breakdown of the nuclear family in the information era. Before the flood of information through television, children acquired most of their information through hierarchical structures in the family, church, and school. Their parents, clerics, and teachers could control what children saw, read, or heard. Television short-circuited those controls. If some parents were determined to control access to that attractive and compelling medium in their own homes, they could not control it in the homes of others.

Businesses, particularly those at the cutting edge of the information-intensive enterprises—computing, entertainment, and brokering—found that their networked employees could and would bypass their hierarchical business organizational structures. The tools of the trade—networked computers or other information devices, like fax machines—enabled employees to jump over divisional and echeloned barriers to get the information they needed to do their jobs, without the paper trail so characteristic of bureaucratic hierarchies.

An example of the second process, competitiveness in information-intensive enterprises, is to be found in the computer industry itself. Self-networked teams have proved superior to hierarchical business structures in developing new software and hardware.[4] The Hollywood film industry and the Nashville music industry—both quintessential information enterprises—have always been organized more as networks than as hierarchies. But the assaults upon hierarchies—whether in the form of bypassing or competitiveness—are bound up with the nature of the information revolution, which is empowering individuals with uncontrolled and uncontrollable information and increasingly shifting the content of enterprises from physical to informational commodities.

During the industrial era,[5] commercial organizations learned to adopt the hierarchical structure of the military as the most efficient way to organize individuals and allocate resources to *control* their markets.[6] With economies built mainly on the conversion of physical resources such as coal, steel, and petroleum to physical products, commercial industries dealt constantly with scarcity, bulk, limited substitutability, high transportation costs, and the risks of hoarding. Hierarchical institutions, with clear lines of authority and stark distinctions between superior and subordinate, were better suited than family or collegial relationships for ensuring economic growth and market equilibrium.[7] And since most labor during the industrial era was performed through repetitive operations—conducted according to rigid standard operating procedures—hierarchical organizations were both logical and efficient.[8] The hierarchy thus became the preferred form of organization not only for militaries, but also for businesses, civil service bureaucracies, political parties, and the media.

Today, as the wealth production in the most advanced economies is increasingly derived from information rather than physical resources, hierarchical business institutions are becoming relatively less competitive. In the United States in the year 2000, as much as 66 percent of the work force will be working in information-related areas.[9] Where they are organized according to hierarchical principles, they will find themselves and their companies less competitive than those adopting more network-like structures. Not only will hierarchically organized businesses find that their organizations no longer reflect their actual processes, they will find much of their

structure to be a burden rather than an asset to productivity and competitiveness.

Throughout the developed world, many traditional hierarchies will be weakened as a result of the information revolution. Both the ability and the need to filter information before it reaches the individual are declining in most parts of the world. In addition to large corporate hierarchies, one can expect social institutions, the established media, and many parts of governments and militaries to be affected.[10] These other hierarchical institutions are not immune to the forces behind the information-driven changes now so evidently transforming commercial organizations.

There are two structural reasons why power is shifting away from traditional hierarchies and toward individuals. First, the information processing and filtering roles performed by many levels within traditional hierarchies have become obsolete. The advent of the global media and networks has greatly reduced the value added by multiple layers of information processing between the individual and the source of information.[11] Individuals can now sort through reams of unprocessed information and make their own assessments and decisions about its worth. Hierarchies need no longer serve as the exclusive conduit of information to the individual.

Second is the changing nature of the work force in advanced economies. As shown in Figure 13.1, information workers have outnumbered manual workers in the U.S. economy since the mid-1970s—the threshold of the most recent phase of the information revolution. Information workers generally do not need the structure or control provided by traditional hierarchical organizations, since their jobs require them to innovate and adapt on a daily basis.[12] Indeed, they operate most efficiently when they are given the autonomy to attack problems with their own independent approaches. Traditional hierarchies were designed to manage manual workers who mostly followed standard operating procedures each and every day. As the proportion of these workers drops in most national economies, the power and presence of traditional hierarchies will decline.

More and more human transactions in the developed world will be centered on the efficient exchange of information and commodities,

SOURCE: Theodore Modis, *Predictions*, New York: Simon & Schuster, 1992, p. 257.

Figure 13.1—The Growing Proportion of Information Workers in the U.S. Economy

and those will rely more on networks and markets than on hierarchies. The preferred commercial organizations of the future are likely to be those with comparatively few management or "control" layers and in which production employees operate in autonomous multidisciplinary teams.[13] More of their workers will need to innovate on a daily basis. Managers in such organizations will manage more through motivation, exhortation, and incentive rather than solely through authority, mandates, and directives. The previous statements notwithstanding, hierarchies will not disappear, because social order will always require human transactions having to do with authority, power, and command and control. Indeed, in most fields of human endeavor, organizations will probably tend to evolve into hierarchy/network hybrids in which certain key functions will continue to be carried out in a hierarchical fashion. But in a break from the past, the network "component" of these hybrids will be significant.

The survival of hierarchical forms in many organizations will be due to the fact that management and administration are about more than just information flow. They also have to do with ensuring that budgets are adhered to, employees follow certain standards of conduct, timelines are met, clients are kept apprised of the firm's activities, the capital stock is kept up to date, and accurate market analysis occurs. At least some of these tasks will need to be carried out in a hierarchical manner.

In general, it seems plausible to make the argument that functions that are time urgent and require reactive behavior will tend to be executed by groups that are relatively hierarchical in nature, while those that are less time urgent and allow for proactive behavior will be relatively more networked. For example, in armies one would expect the fire support function to stay hierarchical. This is because its command-and-control arrangement must be capable of responding rapidly to complicated and ever-changing lists of different classes of targets. On the other hand, echelon above division (EAD) combat service support (CSS) functions may well turn out to be organized more as networks, because there is somewhat less time urgency involved and commanders can be a bit more proactive. They can decide for themselves, for example, which units ought to have priority for depot repair service before a major offensive begins. These examples are only general illustrations, but they serve to demonstrate that hierarchies will never be entirely swept away.

One final cautionary note is in order. The shift from hierarchies to hybrids (and in some cases to pure networks) will occur at an uneven rate around the world because of cultural/developmental factors. In the nations of North America, Western Europe, and Northeast Asia, the change is taking place fairly rapidly. But in areas like the former Soviet Union and the Middle East/Persian Gulf, for example, the shift may take considerably longer (and in some countries it may never occur). It is difficult to imagine the Iranian, Iraqi, Russian, or Ukrainian militaries adopting networked forms of command and control in the near future.

FACILITATING TRANSNATIONAL ENTERPRISES

Some observers proclaim that the information revolution is creating a borderless world in which transnational activities will proceed

without friction.[14] Although this assessment is probably extreme, it is true that the development of information technologies is facilitating all sorts of transnational enterprises that heretofore have been limited by communications and information. Perhaps the starkest example is to be found in the growth in the size and power of the global foreign-exchange markets.

Before the 1970s, national central banks had substantial control over the prices of most major goods through their ability to manipulate interest rates and intervene in foreign currency markets. By the 1990s, however, the advanced state of computing and telecommunications technology had shifted some of the power from national central banks to the global currency market, which now trades over $1 trillion worth of currency per day.[15] The global currency market has become something of an independent actor on the world stage, sometimes forcing national governments to adjust their financial and monetary policies to prevent currency devaluation. Transnational networks of this magnitude could not exist before the world reached the current levels of reliable, near-instant, and almost limitless informational connectivity.

The feasibility of transnational activity allows large firms to disperse their operations across the globe. A maker of personal computers can, for example, now place its manufacturing plant in Europe, its finance division in the United States, and its marketing staff in the Far East. Such an arrangement would put it at no disadvantage compared to a competitor with all its operations in one city. Moreover, the dispersed enterprise can take advantage of talent, tax codes, and labor and physical resources that may vary from one part of the globe to another. This facility for global dispersal makes it easier for large corporations to avoid tariffs, unfavorable tax laws, and excessive regulation in certain countries by simply moving facilities to more appealing business environments. Strategic partnering between large firms, especially in high-tech industries, is yet another consequence of the increasing ease of transnational activities.[16]

Unfortunately, the increased feasibility of transnational enterprises has a dark side as well. Transnational terrorism and organized crime are both facilitated by transnational communications networks and global markets for commodities.[17] New kinds of illicit associations are made possible—between traditional political guerrilla or terrorist

groups on the one side and religious fundamentalist groups and organized crime syndicates on the other. For example, there is evidence of at least one of the ethnic factions in the Yugoslav civil war (the Muslims) becoming involved with drug-smuggling operations. Even more disturbing are the reports that the Italian and Russian Mafias may be organizing international networks to sell weapons-grade nuclear materials from the former Soviet Union to the highest bidder.[18]

The issues of possible future transnational terrorism and organized crime point up the fact that there is indeed a "downside" to the information revolution. Along with the numerous benefits it has spawned there are substantial risks. The large, interdependent computer networks that now control many important public infrastructures (air traffic control systems, financial market records, energy grids, telecommunications networks) could be vulnerable to sudden, catastrophic failures that would not have been possible one or two decades ago. Such failures need not even be the result of foul play. While the greatest threat of "info catastrophes" will probably come from the deliberate attacks of terrorists, one must not discount the possibility that natural disasters (such as a large earthquake) or simple human error could generate such events. In today's world, there is less time available to prevent the occurrence of such disasters once an initial mistake or disruption has damaged part of an interdependent network system.

In addition to the greater opportunities created for nefarious transnational enterprises and info catastrophes, there is also the more general concern about increasing social instability in some nations as a result of the information revolution. As power diffuses downward to individuals, it is possible that the weakening of traditional lines of authority and traditional hierarchies will create systemic pressures toward a period of global instability, one in which the different types of political actors in the international system grope their way toward an understanding of their place in the coming order.

ERODING NATIONAL SOVEREIGNTY

The traditional powers of the nation-state will suffer somewhat as a result of the information revolution. It is very likely that the nation-state will remain the most powerful actor in international events for

the foreseeable future. However, nation-states will increasingly find their powers curtailed by the availability of information to those who reside both within and outside their borders; and those powers that remain will increasingly have to contend with nonstate actors who are acquiring power through the availability of information. Typically, hierarchical institutions become the victims of abundant information, while networks thrive on it. Since so many of the institutions of the nation-state are hierarchical and so many of the transnational organizations are networked, the net flow of power today tends to be out of the nation-state and into nonstate actors. Nation-states still have the advantages of the disproportionate concentration of power they built up over the past three centuries, as well as the inherent "neatness" of the international political order they can produce. Only tomorrow will reveal how far this shift in power will go, who the principal challengers to the nation-state will be, and, indeed, what may be the fate of the nation-state.

The areas in which national governments now have considerably less control than they did before the information revolution include

- Currencies and their valuation
- Markets and prices
- Businesses and their regulation
- Borders and the movements of people and commodities across them
- Information available to their publics.

Currencies are now traded on global markets that can ignore what national governments may say about their value. The important commodity and product markets have gone global; they are no longer heavily subject to the policies of national governments or even cartels of national governments. Only where the sources of commodities are extremely limited in the world—such as the sources for diamonds—can national governments or cartels succeed in controlling prices. Even though much of the world's oil flows out of the Persian Gulf, there are enough other global sources at only marginally higher costs to keep Persian Gulf producers from exercising much control over prices. In a global market, other producers, standing idle, will come on line with small changes in prices.

Multinational corporations are free to move operations from one site to another, depending upon where they find favorable situations for their operations. Production plants are increasingly in excess, standing by for more favorable circumstances to reinstitute production. If Brazil, say, threatens to increase taxes on a certain production plant, the multinational corporation may remind the Brazilian government that the company has an idle plant in Spain where the production can be quickly transferred, at the invitation of the Spanish government offering favorable terms. In effect, the multinational corporations can play off national governments in seeking favorable conditions, with the governments bidding against each other in order to solve their unemployment problems and, hence, ensure their own political survival.

Borders have become porous: The Italians find themselves trying to keep the Albanians from coming across the Adriatic after watching "la dolce vita" on Italian television. The French look with concern across the Mediterranean to North Africa, where masses threaten to quietly invade their shores. The United States struggles to stem the tide of people who would leave their prospects in Mexico, Central America, and the Caribbean for the opportunities they perceive to the north. Information is driving these tides. More and more people know what is going on in the world and how the rest of the world lives, and they have decided to vote with their feet.

The rise of international television news networks (such as CNN and BBC), fax machines, and global computer networks makes governments less able to control the dissemination of information, even though many have shown that they would if they could. Regimes that depended on information control to maintain their legitimacy are being swept away by the disenchantment of newly aware and mobilized polities. The very rapid, almost catalytic collapse of the Soviet bloc in 1989–1991 is testament to the inability of most totalitarian regimes to both retain their political control and become a part of the global economy.[19] Today, the information revolution permits "information control" regimes to survive only on the sidelines of the international system. Iraq, North Korea, and Cuba still maintain national policies of information control, but these states are relegated to the margins of the current world economy and may not outlive their current leaderships.

Nonstate actors both "above" and "below" the nation-state in geographical scope are now exercising influence on national governments. Many of the world's environmental and social problems have passed beyond the scope of the nation-state. The world increasingly looks to transnational or supranational organizations[20] to solve problems that have roots in the actions or failures of national governments. At the same time, the inability of most governments to control the dissemination of information means that subnational political groupings can use information "to exert power against their governments, societies, and institutions."[21] This power is reflected in the growing numbers of ethnic conflicts around the globe—some of which are attributed to the collapse of totalitarian regimes of the Cold War,[22] which themselves were victims of the information revolution.

Although it is common to project the future enemies and threats to the nation-states as other nation-states, the future could well be one in which the principal threats to the established nation-states are subnational and transnational groups that seek nation-state status (or at least substantial autonomy) for themselves. This is certainly the pattern evident in most of the current conflicts around the world—in the persistent violence of Kurdistan, Kashmir, Chechnya, and Bosnia.

It is not yet clear whether the supranational forces tending toward a more orderly world or the subnational forces tending toward a more chaotic world will be favored in the first half of the 21st century. There is some evidence that the process of diffusing power favors the subnationals. The supranationals are acquiring power from the nation-states only to the degree it is granted by them. The reluctance of the nation-states to grant power to the supranationals is evident in the bumpy roads to the formation of the European Economic Union and the military capabilities of the United Nations. On the other hand, subnational groups tend not to wait for the granting of such powers: Quebec or the Kurds will not; they would seize power for themselves at the expense of the nation-state.

TRANSFORMATION OF COMMERCIAL ORGANIZATIONS

The business world is perhaps the most transparent laboratory of the information revolution. Driven by the imperatives of economic

competitiveness rather than the preservation of political power, free from the paralysis of contending special interest groups, large corporations are reshaping themselves to take advantage of the opportunities presented by the growth in information technologies—even as those technologies threaten the power of hierarchical bureaucratic structures elsewhere.

Despite the devotion of many articles in current business journals to organizational changes attending the information revolution, change in U.S. corporate structures is not new and did not suddenly start in the 1970s. For a century, from about 1870 to 1970, U.S. business underwent a major transformation, typically from the family-owned single plant serving and dominating a local market to the stockholder-owned complex of plants and divisions serving, shaping, and competing for national markets. The constant during this century of change was the dominant corporate objective of controlling the market, first local, and later national. If markets could be controlled—created, shaped, or dominated—profits would follow. The natural organizational structure for this objective of control, proven by the military, was the hierarchy.[23]

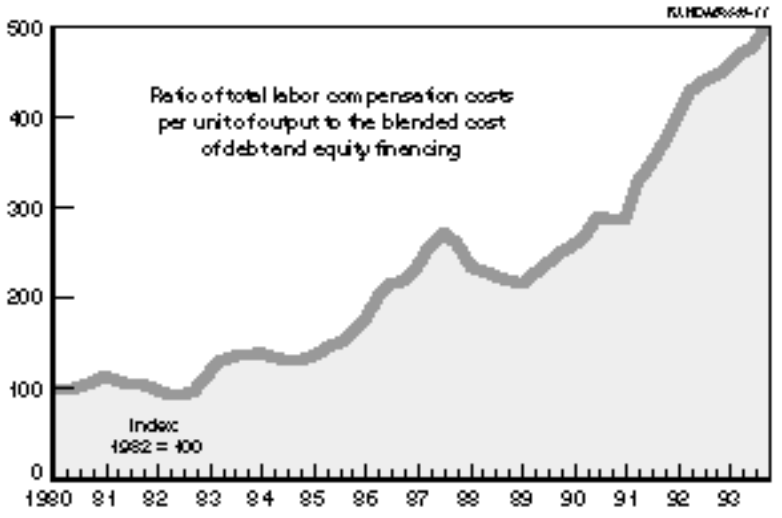
Throughout the century of change that preceded the information revolution, the hierarchical organization in U.S. business spread and deepened. As businesses and their markets grew in size and complexity, more specialized training and more detailed standard operating procedures (SOPs) were required for increasing levels of management. Hierarchical management structures became taller and required more SOPs, and corporations trained cadres of specialized professional managers. The result was an increasing number of middle managers who mostly controlled and processed the flows of information between production workers and senior executives. The earliest information technology, electronic data processing, became available in the 1950s and 1960s and was used mostly to expand the spans of control in the traditional corporate bureaucracies.

After the mid-1970s, most major U.S. corporations (as well as some foreign firms) began to view information technologies differently. The new business environment was largely defined or characterized by four developments:

- Global markets emerged that could not be controlled by a nationally oriented business. Increased international competition (especially from Japan) forced many large U.S. companies to look for innovations as a way of insuring their survival. The margin for error in markets like automobiles and semiconductors shrank substantially as international competition increased.
- The evolving social environments in many of the advanced countries of the Northern Hemisphere, with their increased tolerance for less capable and dependable workers (evidenced in drug use, crime, and a decline in the quality of public education), required business leaders to reconsider the nature and dependability of their labor pool.
- The increased accessibility of information technology through the workstation, microcomputer, and office automation offered new opportunities for reorganizing business processes and their use of labor.
- As shown in Figure 13.2, the relative cost of labor began to rise in comparison to the cost of capital.

In response to these new realities of the 1980s, Western commercial organizations began to rethink their mode of operations more deeply than they had since the late 19th century. Large firms have become more flexible and less layered, and they rely on smaller but more sophisticated blue-collar work forces. Layers of middle management have been eliminated, making firms less vertical in nature. In many companies, process has been placed ahead of function in corporate values. The main organizational unit in a traditional corporation used to be functional departments, e.g., finance or marketing. Today, innovative firms are restructuring their organizations around process, i.e., combining all of the functions required to produce a single product—design, development, production, and marketing. The structure of these firms is centered on multidisciplinary (multifunctional) product teams that handle all aspects of a single product, from product conception to closeout. Such teams are apparently responding more rapidly to market changes than are traditional hierarchical and functional corporate structures.

Before the full flowering of the information revolution and the globalization of markets, most U.S. corporations saw diversification as a



SOURCE: *Business Week*, "The Information Revolution 1994," May 19, 1994, p. 107. Data from Regional Financial Associates.

Figure 13.2—The Rising Cost of Labor

safety net for market uncertainties and changes as they sought to control their business environments. Healthy divisions in diversified firms could "carry" divisions with weak markets; divisions could provide crossover support to their siblings for needed expertise or commodities. So long as the objective was controlling national markets under national laws, diversification was worth its costs in coordination and excess capacity.

But global markets intensified competition and removed the rules that permitted control of markets. The result is a return to focused business practices, including the concept of core competencies. The shortened design and product cycles made possible by computer-aided design and automated production make it imperative for firms to master a few key areas. Fierce competition means there is no time to diffuse energy and human capital by trying to absorb new businesses on a regular basis. Many contemporary business consultants now argue that the most important function of modern managers is to identify and cultivate a firm's core competencies.

The role of the business manager has also been transformed by the information revolution. Managers used to, almost exclusively, tell workers what to do and how to do it. Management by directive was the norm, and the directive was usually based on established standard operating procedures. But the proliferation of advanced information systems, the reduction in product cycles, and increased competition have made management by directive unsuitable in many situations in many industries. Now, as workers become fewer, more specialized, and more sophisticated, the manager's role has come to include the frequent use of facilitation instead of directive. It is now often the case that the manager's most important duty is to ensure that workers have the tools, resources, and autonomy to do their jobs properly. Managers still need to exercise their authority by directive for certain purposes, such as ensuring compliance with new regulations or guidelines, but this model of management is no longer applicable in all contexts.

With all of these changes in markets, the availability of information, and the roles of managers and workers, it is not surprising that new organizational forms have come into vogue. Much experimentation is evident. The "flattening" of hierarchical management structures is only a reactive response; the search for a replacement for the hierarchy—in theory and practice—is a hotly debated business issue. New organizational concepts have sprouted, with flamboyant names like the "pizza pie" (clusters of units like pepperoni on a pizza), "shooting stars" (new product units flying off from the parent to their own destinies), and "shamrock" (for the leaf-like arrangement of contributing elements).[24]

One of these new concepts, the shamrock organization, whatever its merits may be in practice, is worthy of further discussion here (as it was during the workshop [a two-day RAND workshop conceived and sponsored by the Army's Training and Doctrine Command to explore the potential impacts of the rapidly expanding information technologies upon the future of land warfare]) because it vividly illustrates some of the fundamental changes in business, commerce, and society described above. The shamrock organization, shown in Figure 13.3, derives its name from the arrangement of its three major components like the leaves of the shamrock.[25] The center leaf is the relatively small core of permanent professional employees who

Figure 13.3—The Shamrock Organization

make the company what it is and will be. The right leaf is the contingent work force, who are temporary employees hired or contracted for production or other functions of the company, only as they may be needed. The left leaf is the contractor-suppliers, who have a long-standing, symbiotic, and intimate relationship with the company.

Today's information revolution has decreased the value of many types of employees to corporate leaders. Moreover, government regulations have increased the burdens of hiring, firing, and maintaining employees on the payroll. The shamrock organization seeks to create a leaner, more efficient corporation by removing many types of nonessential, unskilled, and seasonal jobs from the permanent payroll. The permanent workers—both blue- and white-collar employees—are those the company knows it will always want and will be able to employ productively, even as products and markets change.

Temporary workers become much more numerous as positions regarded as nonessential (e.g., routine maintenance or clerical work) or subject to fluctuation (production-related) are farmed out to "temps"

who must look elsewhere for their benefits and job security. If these benefits and security are not provided by other firms that supply the temporary employees, then that burden may fall upon the government. This arrangement also tends to cut the temporary employees off from access to career development and promotions within the company—the common path for many unskilled workers to the development of skills and to the achievement of middle class economic status. In this sense, the shamrock organization allows companies to shrug off the social burdens they had accepted before the information revolution and global markets—when they were controlling their national markets with the cooperation of national governments. This is a striking example of how globalization and information have broken a century-old bond between business and the state in U.S. commerce.

The wealth-generation activities of the corporation come to be performed by a small group of information managers and skilled production workers (the professional core). The contractors are those who enjoy a semipermanent relationship with the company in providing goods and services in ways that are most beneficial to the company's purposes—not necessarily at the lowest price. An example of the symbiotic relationship between company and contractors is provided by the supplier of batteries to a Japanese automobile manufacturer: The battery supplier may not supply batteries at the lowest price, but the supplier carries each battery on its own inventory costs until it is actually installed on a car on the production line—which means that batteries in the storage racks at the production plant are the property and inventory cost of the supplier. If production should halt, the inventory burden of the batteries is carried by the contractor-supplier.[26] Thus, the contractor shares in the production risks of the company and has every incentive to keep inventory costs to a minimum, while the company has an obligation to treat the contractor as a partner in the mutually beneficial sharing of information.

Although the shamrock organizational concept is only one of several ideas currently being advanced for the future of the corporation, its emphasis on reducing the permanent payroll of employees to a minimum skilled core in order to reduce fixed costs is not an anachronism. The information revolution has had the effect of enabling fewer workers to produce more and has also reduced the value

of many manual-labor positions.[27] The political, economic, and social consequences of this clear trend for large sections of the U.S. labor force are likely to be enormous and mostly unhappy.

NOTES

[1]Harlan Cleveland, "The Twilight of Hierarchy: Speculations on the Global Information Society," in Guile (ed.), *Information Technologies and Social Transformation*, pp. 56–59.

[2]See Peter Schwartz, *The Art of the Long View*, New York: Doubleday/Currency, 1991, pp. 47–60, for his story of the anticipation of a global oil market by Royal Dutch Shell. Shell realized, before the event, that dealing in a global oil market through information could be more profitable than extracting the oil. When the global market emerged and eroded the power of OPEC, Shell was ready with its trading plans and arrangements.

[3]The authors are indebted to RAND colleague David Ronfeldt for his insights into the relationships between different kinds of human organizations and the transactions at which they excel. The hierarchy has proven itself throughout human history to be the superior organizational form for the transaction of authority, power, and command and control. Tribes, markets, and networks excel at distinct kinds of transactions.

[4]See, for example, Tracy Kidder, *The Soul of a New Machine*, Boston: Little, Brown, 1981.

[5]For the United States, the industrial era began in the foundries and machine shops of New England in the 1850s and lasted until the middle of the 20th century, when rampant industrialism was foreclosed by labor, tax, and antitrust laws. On the European continent, the industrial era came somewhat earlier and lasted longer.

[6][Paul J.]Bracken briefing [on the responses of commercial organizations to rapidly changing communications and computational capabilities] to the workshop [a two-day RAND workshop conceived and sponsored by the Army's Training and Doctrine Command to explore the potential impacts of the rapidly expanding information technologies upon the future of land warfare] on December 7, 1993, and Michael Hammer and James Champy, *Reengineering the Corporation*: *A Manifesto for Business Revolution*, New York: Harper Business, 1993.

[7]See Alfred D. Chandler, Jr., and Herman Daems, *Managerial Hierarchies: Comparative Perspectives on the Rise of the Modern Industrial Enterprise*, Cambridge, MA: Harvard University Press, 1980, and Max Weber, *The Theory of Social and Economic Organization*, Talcott Parsons (ed.), A. M. Henderson and Talcott Parsons (trans.), New York: Oxford University Press, 1947.

[8]For an organization theory perspective on this issue, see James G. March and Herbert A. Simon, *Organizations*, New York: Wiley, 1958.

[9]Cleveland, "The Twilight of Hierarchy," p. 57.

[10]Ibid., pp. 55–79.

[11]Hammer and Champy, *Reengineering the Corporation*. Also see Robert G. Eccles and Richard L. Nolan, "A Framework for the Design of the Emerging Global Organizational Structure," in Stephen P. Bradley et al. (eds.), *Globalization, Technology, and Competition: The Fusion of Computers and Telecommunications in the 1990s*, Boston: Harvard Business School Press, 1992.

[12]For a discussion of how computers are creating new organizational possibilities, see James D. Berkley and Nitin Nohria, "The Virtual Organization: Bureaucracy, Technology, and the Implosion of Control," Harvard Business School Working Paper 92-033, 1992.

[13]See *Business Week*, "The Horizontal Corporation," December 20, 1993, pp. 76–81.

[14]The best example of this school of thought is found in Kenichi Ohmae, *The Borderless World: Power and Strategy in the Interlinked Economy*, New York: Harper Business, 1990.

[15]Gregory J. Millman, *The Vandals' Crown: How Rebel Currency Traders Overthrew the World's Central Banks*, New York: Free Press, 1995, p. xi.

[16]Ohmae, *The Borderless World*, pp. 114–136.

[17]Graham H. Turbiville, Jr., "Operations Other Than War: Organized Crime Dimension," *Military Review*, January 1994, pp. 35–47.

[18]Seymour M. Hersh, "The Wild East," *The Atlantic Monthly*, June 1994, pp. 35–47.

[19]Carl H. Builder and Steven C. Bankes, "Technology Propels European Political Change," *IEEE Technology and Society Magazine*, Vol. 11, No. 3, Fall 1992, pp. 10–17.

[20]As used here, a transnational organization is one that operates across and largely independent of nations; a supranational organization is one that derives its powers through and from a group of nations. By these definitions, Amnesty International is transnational, and the United Nations is supranational.

[21]Gladys D. Ganley, "Power to the People via Personal Electronic Media," *The Washington Quarterly*, Spring 1991.

[22]William A. Stofft and Gary L. Guertner, *Ethnic Conflict: Implications for the Army of the Future*, Carlisle Barracks, PA: U.S. Army War College, March 14, 1994.

[23]Bracken briefing to the workshop on December 7, 1993.

[24]See *Business Week*, "The Horizontal Corporation."

[25]The description of the shamrock organization provided here is derived from the Bracken briefing to the workshop on December 7, 1993.

[26]Another example of this practice is provided by the wily Henry Ford, who insisted that his battery supplier provide batteries in specifically dimensioned wooden crates. The supplier subsequently learned that Ford was knocking down the boxes and using the wood, without further cutting, as floorboards for his Model T automobiles.

[27]An example of the devaluing of labor by computers is provided by the use of handheld computers by car rental firms for returning vehicles: The parking lot monitor needs only to key in the car's mileage and the contract number; the computer provides the rest of the information and prints out the billing receipt. This is a case where the computer degrades the skills required of the parking lot monitor to a few hours of instruction and eliminates the need for a counter check-in attendant.