Section III
The Information Ecology of Civilization

Chapter IX
The Information Wave of Civilization

INTRODUCTION

This chapter will attempt to analyze the cumulative evolution of labor, intellect (information & knowledge), and politics. In pursuit of this aim, it will analyze the role of information throughout civilization history. Whereas historians reveal the myriad dimensions of social order that remained uncontrollable in the past, modern analysts consciously initiate designs that are not a product of chance—but do so in webs of dispute, ambivalence, and fuzziness of language. There are questions concerning the relevance of history (Henry Ford's famous aphorism was that history is "bunk") and the objectivity of information (to the postmodernist philosophers, there is no such thing). These cast doubt on the use of historical data for predicting the future, and also suggest its limitations.

In this section, we shall analyze the architectural relationships between intellect, politics, and labor in a historical context, in order to understand the relationships, rules, and eventually laws that govern civilization development. Through such a structural understanding of the past, it may be possible to better predict the future of civilization. Even though this may not be optimal, it is at the very least a satisfactory place and role for historians and our institutions.

The architectural approach to a history of civilization is a new layer over quantitative history based on statistical data. In an architectural history of civilization, we seek a "big picture" of "civilization ages and revolutions" to develop some criteria-oriented views of the world and its future predictability. To understand how crises and conflicts of civilization have been driven by technology in recent centuries, such analysis must be undertaken with some optimism about human proactive adaptation, survival, and development. This approach to civilization development should allow humans eventually to "reinvent the future" in a continuous manner. In due course, we should be able to predict the "rate of change" and provide "civilization-bridging solutions" based on original thinking.

In the last several centuries, civilization has been driven by its infrastructures (such as bureaucracy, electrical power, vehicle engines). Therefore, we shall look more at the role of information infrastructure, which secures the vitality of the information ecology. The information ecology (environment) is a holistic, human-centered management of information to control development and operations of info-materiel-energy-oriented processes. The first who applied this term are Bruce W. Hasenyager (1996) and Thomas H.

Davenport (1997), who emphasize people over machines in the role of handling information.

INFORMATION AND CIVILIZATION HISTORY

The history of our Universe has evolved through 13.5 billion years from its beginning. About 4.6 billion years ago, the Earth was formed and shortly afterward started to cool. About 3.8 to 3.5 billion years ago, surface conditions allowed the permanent establishment of life on this planet. The earliest possible signs of life date to roughly 3.85 billion years ago, but establishment are usually held to be marked by the coming of the stromatolites, structures of rock and algae still found in such odd places as Hamelin Pool on the western coast of Australia. Hominids had diverged from apes some ten to six million years ago (*instinct*-driven information-communication); the first humans (two-legged, with large brain and tools and *sound*-driven information-communication), took form around 6-2.5 million years ago in Southeast Africa. *Homo verbalis,* who used language, appeared about 60,000 years ago. This time can mark the beginning of first information-communication systems.

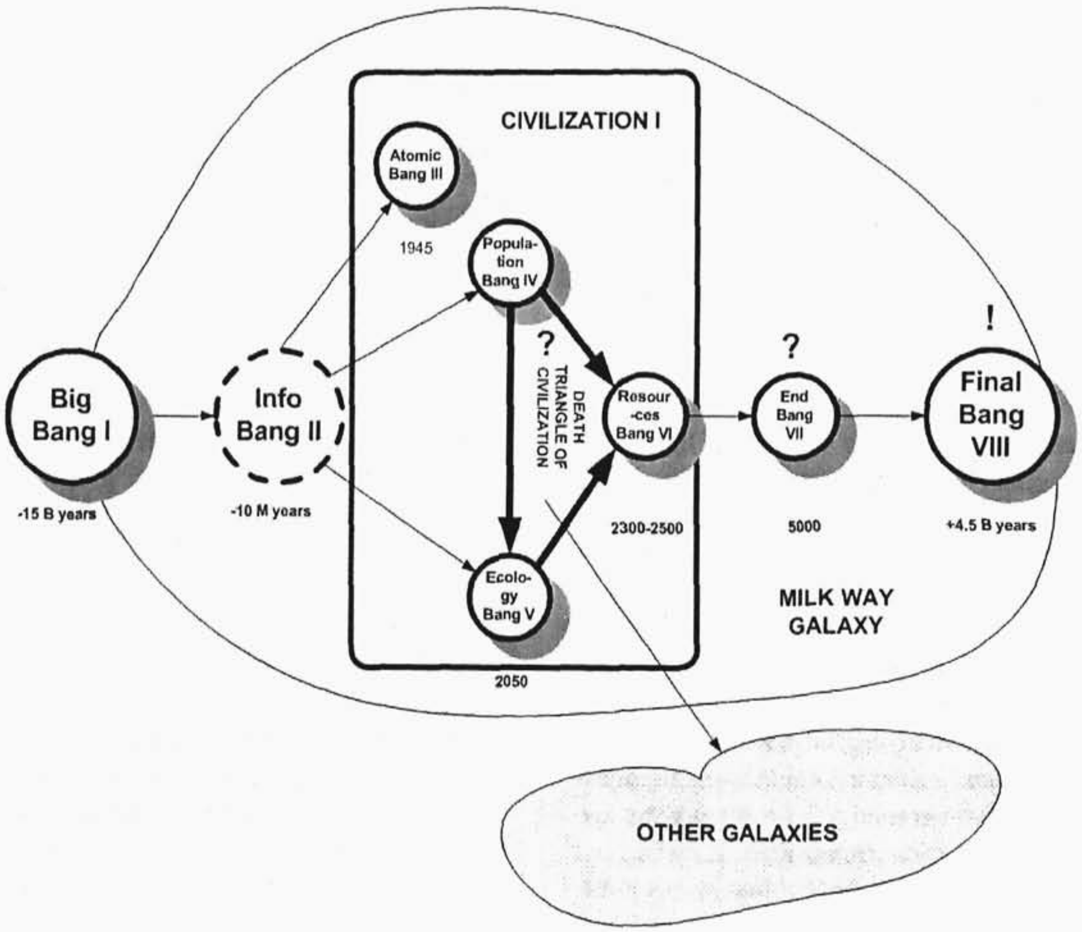
Physicists are obsessed with finding the complete theory of everything, explaining how, why, and where the world was developed (in fact limiting "everything" to the unification of the two present basic approaches to physics, quantum mechanics and general relativity), and information specialists should contribute to this quest too. If not, the complete theory will remain incomplete. Hawking (1988) has accused philosophers of not keeping up with the advance of scientific theories. The same accusation is true for physicists who limit their complete theory to energy only because energy itself is steered by communication and information (however, their true nature is still a puzzle) and vice-versa.

The Death Triangle of Civilization perhaps will be triggered by the Population-Bang IV and Ecology-Bang V in about 2050, and Resources-Bang VI will give problems around 2300-2500. By the year 5,000 A.D., all potential reserves of strategic resources will likely be depleted and it will be the end of the Civilization I, marking the End-Bang VI. Continuing this pessimistic prediction, one event is sure, that within about 4.5 billion years the Sun will stop serving us, and it will be the Final-Bang VII of civilization, as it is illustrated in Figure 9-1.

Man has survived longer than stronger animals because he has had an important advantage: a brain that can process information and communication as more than simple stimulus and response. With a brain, mankind has been able to learn, communicate, and develop a structure of consciousness. At first, probably the *eyes* and *nose* was the most important organ for the archaic, nomadic hunters. Then, about 200,000 years ago, the human information system began "upgrading" human consciousness through emotions and rituals and the *ear* became the most important organ for those hunters. Their ears developed an appreciation for music and dance. That was the first advanced pattern of human cultural behavior.

About 10,000 years ago, consciousness became mythical and two-dimensional, with some appreciation for the natural tempo of events. Mankind started farming, dreaming of a better social order for its members, and creating myth through symbolic imagination and language-driven communication. At this time, the mouth became the most important organ. Around 5,000 B.C., the Egyptian calendar, regulated by the Sun and Moon into 360 days (12 months of 30 days each), became the first organized information system (IS) device that supported man's survival and development. About 2,000 years later, the Sumerians developed writing and organizational patterns for "civilized" cities. About 2,500 B.C., the structure of consciousness became mental and three-dimensional, with a sense of abstract time,

Figure 9-1. Big bangs through the history of time



cultural curiosity for science and art, dogma, rules, and laws. The first knowledge centers appeared in Egypt, where written literature lamented on the meaning of life. Egyptians wrote these thoughts on papyri and collected them into the famous Library in Alexandria. The manufacture of objects and the production of food (bread, beer) took place. Thus, the eye again became the most important organ for the awakened man with volition and reflection about himself and the world (Simpson, 1991).

For extended periods of time, the evolution of the Earth was understood as being regulated by a relationship between nature's internal forces such as gravity, quantum mechanics, time, and general relativity. Today, the problem of life on Earth has become a puzzle based upon relationships (information-communication) among people and their level of *cognition*, and reflecting it through *information-knowledge* systems. The first approach is about the physical basis of life, the second one is largely social. There is a lack of a "bridge" between these two realms, which we can call *neural electro-chemical mechanics*.

The tool in achieving this role is *knowledge*, disseminated first by books and now by computers and their networks. Mediated communication has a long story. The invention of the printing press by Johann Gutenberg in 1454 boosted the spread of knowledge. This has become the most significant invention to separate to separate the written from the spoken word. Printing soon became a means of disseminating and intensifying intellectual endeavors. Before Gutenberg, each volume was handwritten, often by monks. In the 15th century, a book was as costly and as rare as jewels.

Before the printing press, scientists would take long trips merely to familiarize themselves with the content of a certain book. The enlightened ruler Charles IV of Luxembourg collected 114 volumes, while the French king Charles V, amassed as many as 900. Then, printing houses began to print hundreds of books. By the year 1500, within 50 years of invention of the German press[1], 30,000 reasonably priced books were in circulation. The satire of Erasmus of Rotterdam appeared during his lifetime in 27 editions. Print was steering thoughts and ideas in millions of people, inspiring them to speed, simplify and strengthen the work of the mind.

The printed alphabet in book form, which was the first "computer terminal," became an absorber and transformer of civilization. New media such as letters and printed books altered the relation between our senses and changed the mental (information processing) process. The print-made split between logic and emotion had become a trauma, which has affected Western civilization ever since (McLuhan, 1962). It created government regulations but it also inspired individualism and opposition to ideology, science, and art. Science and technology began to develop at an accelerated pace. Airplanes, cars, telegraphs, telephones, typewriters, phonographs, movies, radios, televisions, weapons, computers, automation, and telecommunications modernized human life and its story. Human consciousness has become integral and free of the constraint of a need for personal contact, allowing us to enjoy learning, loving, wholeness, and wisdom for the community and ourselves. The consciousness-driven intellect system has now become the most crucial organ, developing a meta-sense. We are better at understanding than at explaining the purpose and rules of our existence through education and research.

American physicist John Wheeler has formulated the Theory of the Participatory Universe (Wheeler, Buckley, Peat, 1997). In this theory, observers are central to the nature of physical reality and matter is ultimately relegated to the mind. Wheeler sees the Universe as a gigantic "information processing" system with a yet undetermined output, and he has coined the phrase "IT from BIT," meaning every "thing"—a particle, a field of force, or even space-time itself—all is ultimately manifested to us through "bits" of information. John Wheeler has expressed this new approach in particularly graphic terms:

We had this old idea, that there was a universe out there, and here is man, the observer, safely protected from the universe by a six-inch slab of plate glass. Now we learn from the quantum world that even to observe so miniscule an object as an electron we have to shatter that plate glass; we have to reach in there ... So the old word observer simply has to be crossed off the books, and we must put in the new word participator. In this way we've come to realize that the universe is a participatory universe.

The curriculum of the human story, driven by science, technology and informations-communication, is illustrated in Figure 9-2. This model tries to establish some relationships between the political, labor, and intellectual perspectives of the modern history of civilization. This period begins with the Renaissance, so-called for a rebirth of learning following the supposed darkness of the medieval period. Modern times started in 1453 when Constantinople fell to the Ottoman Turks. Many scholars who fled from the Byzantine Empire were fleeing westward for safety. By happenstance, this coincided with the development of printing in Europe (1454), allowing the new ideas to spread rapidly. This boosted the questioning

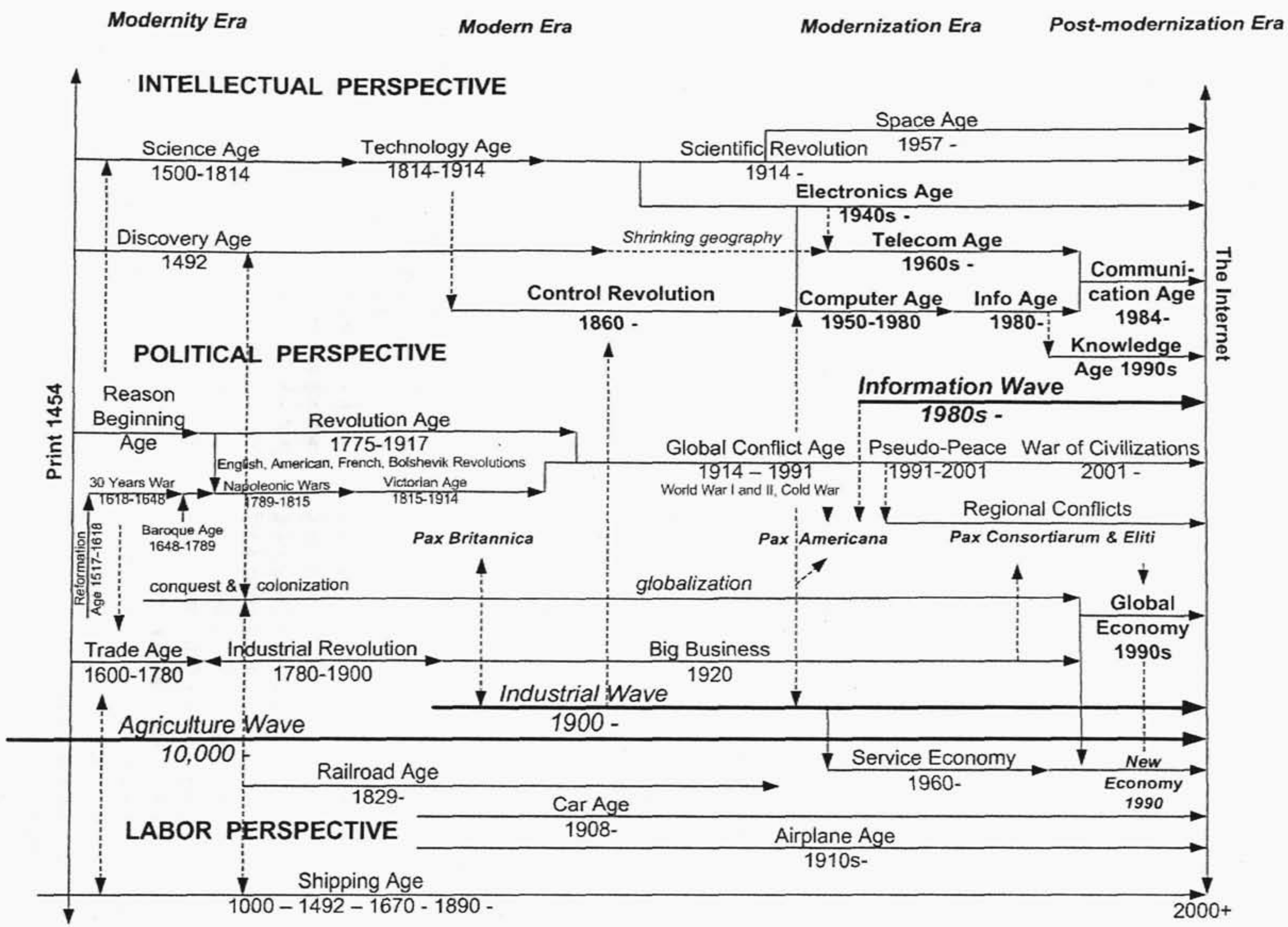


Figure 9-2. The civilization of the human project-driven by science, technology, and info-communication (bold-faced tiles)

of established ideas regarding religion, art, and science. When scholarship began to develop independently of the church, the human rather than the divine in life and art was emphasized. The well rounded, informed individual (e.g., Leonardo da Vinci) become the ideal. Certain "ages" which influenced the role of information (and vice-versa) will be characterized as follows. Some "Ages" and "Eras" may overlap, since they are not exclusive.

The Modernity Era (1454-1814)

In this era, the transition took place from the Middle Ages to early modernization, which set up the spirit for further acceleration in civilization development. It is important to notice that people born in the 10th to 15th centuries had at their births a life expectancy of 24, provided that they were not among the roughly one in five infants who did not even survive being born (Maddison, 2001). Nowadays in Europe, these figures include a 77-year life expectancy and 7% infant mortality (World Development Report, 2003). This advance was achieved due to the development of the technology of power (beginning about 1000), supporting the organized monopoly of violence pursued by secular and papal governments, as well as administrative innovations sparked by the spread of literacy (by printing), professional competence and bureaucratic routine based on statistics (Levin, 2001). This era led to the creation of the modern states of France (1461), Spain (1479), and England (1485), with institutions based on Europe's ocean transports and favorable to merchant capitalism. The latter also led to the European conquest and colonization of the Far East and America, which can be considered as the first wave of globalization, whose needs triggered the Industrial Revolution (Raudzens, 1999).

The Reason Beginning Age (1558-1775) surveys the turbulent centuries of religious strife and scientific progress from the accession of Elizabeth I of England to the Age of Ideology, and began the American War for Independence (1775). The Age is also called the Enlightenment of Europe. Here, the first heroes were the publishers, printers, and booksellers who fed the inky stream through which knowledge flowed from mind to mind and from generation to generation. The sciences advanced in logical progression through modern history, mathematics and physics in the 17th century to chemistry in the 18th century, biology in the 19th century, and psychology in the 20th century. The first electronic computers were developed during World War II and applied in reading coded messages, then improved in the next decade for scientific computations. It means that The Age of Reason continues ever since to nowadays and beyond.

The Science Age (1500-1800) begins with the strong improvements in maritime technology in ship design, navigation by compass, the sandglass for measuring time at sea, reliable chronometers, and nautical almanacs. By the end of the 18th century, ships could carry ten times the cargo of a 14th-century Venetian galley. Until the 15th century, European progress in many fields was dependent on transfers of technology from Asia (China) or the Arab world (mathematics), but by the end of the 17th century the technological leadership of Europe in shipping and armaments was apparent. The rise of universities and of such scientists as Copernicus, Erasmus, Bacon, Galileo, Hobbes, Descartes, Petty, Pascal (mechanical, sequential calculator), Leibniz (mechanical, parallel calculator), Huygens, Halley, and Newton led to the creation of intellectual societies. In public life there were improvements in banking, finance, accounting, fiscal management, and corporate governance. The first modern information system for bookkeeping, the double-entry principles of debit-credit, was developed by Leonardo da Vinci's friend Luca Pacioli in the 1480s, later published in (Pacioli, 1494) in Venice to support a growing interstate trade. The system he published included most of the accounting cycle as we know it today. He described the use of journals and ledgers, and warned that a person should not go to sleep at night until the debits equaled the credits! His ledger had accounts for assets (including receivables and inventories), liabilities, capital, income, and expenses—the account categories that are reported on an organization's balance sheet and income statement, respectively. He demonstrated year-end closing entries and proposed that a trial balance be used to prove a balanced ledger. Also, his treatise touches on a wide range of related topics from accounting ethics to cost accounting.

The Revolution Age (1685-1917). The English (1688), American (1775), French Revolutions (1789), and Bolsheviks (1917) were triggered in the Modern Era to expand popular control in society, though, particularly in 17th-century England, the recognized "populace" was still quite a limited group. They were based on an ideology of social progress in the scope of government, ownership, national independence, civil rights, justice for and freedom of an individual, religion, and so forth. These were possible due to contributions provided by the French and American philosophers exercising political and social *knowledge*, which by power of reason contested the status quo of royal absolutism. For the first time in humankind's history, *information* led to a dramatic shift in the well-being of people, who now could be referred to as an *informed citizenry*. Needless to say, the Post Office was created in North America in 1772 to support the delivery of information among citizens. In the American Revolution, 13 of Britain's North American colonies broke away from rule by the mother-country. The third revolution was the French Revolution, which overturned the dictatorship of the French kings and put forward the ideals of "Liberty, Equality, and Fraternity" though the revolutionaries did not keep to them. But ideals remained influential throughout the next century and beyond. The movement of ideas and belief which had been dominant until this time, the Enlightenment, with its emphasis on reason and natural law, gave place in the social ferment to the Romantic Movement in the arts which favored emotions before reason, and free and individual expression. Romanticism popularized the ideals of the French revolution. The fourth revolution was the Bolsheviks Revolution, which declared the peoples' right to "self-determination." This revolution in fact was the counter-French Revolution, claiming rights for "oppressed." All these revolutions gave the intellectual and practical input to emerging political ideologies.

The Modern Era (1814-1914)
("Mindset" established by the Modernity Era)
During the tumultuous 100 years 1814-1914, Europe spread the Industrial Revolution, which was triggered by invention of the steam engine (1782), the railroad, a factory system, and such new technologies as the telegraph, telephone, and energy based on oil and electricity. It was a "new" age, relatively peaceful with the exceptions of the final consolidations of most of the European nations and small local wars of positioning among colonial powers. The mechanization of human effort led to more free time, which was consumed by growing education and engineering and more leisurely life styles. Eventually, it led to strong scientific progress in the next century. Roads eliminated wilderness and electricity lit homes and minds. The first mechanical *computer* was developed by Charles Babbage in 1832, although it was premature and useful only in simplistic calculations.

The Modern Era of Western civilization in the 19th century glorified rationality. Western societies became modern just as soon as they had succeeded in producing a bourgeoisie that was both numerous and competent enough to become the predominant element in society (Toynbee, 1954). In this era an industrial urban working class arose. A split between rich and poor began to play a significant role in the development of social dynamics. Later, in the 21st century, a similar split in the Information Wave would produce the information-rich and information-poor (*Digital Divide*).

The Control Revolution began in the 19th century, since the factory system was experiencing astonishing increases in capacity but also delays in production and transportation. Therefore, *information-communication technology* was applied to eliminate the bottleneck situations (Shapiro, 1999). Among such technologies one can mention the telegraph (1830s), punch cards (1850s), typewriter (1860s), transatlantic cable (1866), telephone (1876), cash registers (1892), adding machines (1890s), motion pictures (1894), wireless telegraphy (1895), and radio (1905). This revolution provided the foundation for the development of television (1925), computers (1950s), and their networks (1960s), and the Internet (1990s), which triggered the Information Wave.

The Modernization Era (1914-1990s)
(Wide applications of the Modern Era's solutions)
Vast technological innovations of the 19th century were applied on a large scale. It occurred when businesses and institutions invested in capital equipment to compete effectively in productivity, innovations, profitability, and market share. Germany wanted to replace *Pax Britannica* by *Pax Germanica* twice in the 20th century, waging two world wars (1914-1918 and 1939-1945), which killed at least 30 million people in Europe alone. These wars gave a strong boost to civilization development at least in technology and infrastructure. In terms of values, the period was a tragic regression.

The Electronics Age (1940s-). Two major developments occurred, triggered independently during the late 1940s. One was the development of the programmable electronic computer (ENIAC) in the U.S. in 1946. The second was the invention of the transistor in 1947. Subsequent improvements in solid-state physics led to the present-day silicon chip with its large-scale integrated circuits. A whole variety of products incorporating microprocessors are now widely available. There are chip-controlled automatic machine tools for industry and many types of new office equipment, such as sophisticated photocopiers, which have computer chips inside. Among better known microprocessor-based consumer goods one can mention electronic calculators, digital watches, electronic toys, TV games, larger consumer durables like TV itself, washing machines, music centers, and video-cassette recorders containing computer chips. There are chip-based thermometers and weighing machines, chip-controlled warehouses, multi-story car parks, even an "electronic waiter" for direct-dialing one's order to a restaurant's kitchen. Computer chips have already invaded the supermarkets in the form of "point-of-sale" terminals and the Universal Product Code. They have invaded labor-intensive banks (Electronic Fund Transfer), people's homes (home computers), and the family car (electronic ignition, timing, and dashboard navigation instrumentation). There are even plans to invade the female bra—a chip will predict a woman's "safe" and "unsafe" periods by monitoring temperature variations from its strategic position inside the bra.

The Computer Age (1950s-1980s). In the 1950s, the first commercially available computers (Univac I and IBM 650, 701, 7000) were applied in data processing and scientific computing. Within the next three decades, mainframe computers got some new competition in the form of so-called minicomputers (PDP 8-1963) and microcomputers (Apple II-1977 and IBM PC-1981), each of which became an instant success in computing by the general public. When the World Wide Web was born in 1990 (designed by Tim Bernes-Lee at the CERN, the high-energy physics laboratory in Geneva, Switzerland), the Internet became more useful for public computing, which took off after the very user-friendly browsers MOSAIC and

Netscape (designed by Marc Anderseen and Eric Bina) were developed by the end of the 1990s. The investment in information technology reached about 3 trillion dollars in the 1990s, radically improving productivity in offices and shop-floors. However, at this age, most users learned "how to compute" rather than "what to compute" and were struggling to apply "DOS" or "Windows" to operate those computers.

The Information Age (1980s-). In the 1980s-1990s, information technology created an appetite for user-friendly computers and a need for customized, relevant information and information services. At the corporate level in the 2000s, a Management Information System (MIS) is expanding into an Executive Information System (EIS), and legacy applications are reengineered into Enterprise-wide Systems, integrating business, engineering, operations and inter-company information systems. E-commerce is taking off in the 2000s, along with e-banking and telecommuting to work. Logging into a computer no longer poses any great challenge for most users. Rather, the challenge that is replacing "how to compute?" is the challenge of "what to compute?" Users and managers want to get the right information at the right time, so as to be informed members rather than merely "clients" or "victims" of the surrounding information infrastructure. Such users look for competitive advantages, benefits, or negative impacts upon underlined processes or issues.

The Knowledge Age (1990s-). In the classic economy, the sources of wealth included land, labor, and capital. For 200 years, manufacturing facilities have brought prosperity to firms and their shareholders. Now, another engine of wealth is at work. It is science, technology, creativity, innovations, skills, and information, and it can be summarized in one word: knowledge. Knowledge creates an awareness based on scientific facts, rules, laws, coherent inferences, and well-defined methods. Knowledge provides a point of reference, a standard for our way of analyzing data, information, and concepts. Knowledge serves as a filter for making wise choices. In industries and services, most companies triumph by developing, redefining, appreciating, and rediscovering knowledge. Knowledge is a unifying process of civilization and has a global dimension.

There is a great pool of knowledge within our civilization that can be utilized. There are about 2,000 world-class research centers, 3.5 million scientists and engineers worldwide, about 1,000 world-class universities, about 4 million teachers (Kurian, 1984) and 1,000 multinational corporations, including about 100 stateless corporations. This knowledge pool is filled with a large number of international contributors, offering unexpected solutions to problems (e.g., a biological chip inserted into a fish to monitor its freshness). Contemporary knowledge is migratory and does not know or accept borders.

Why has the knowledge pool expanded? This is answered by the Computer Age and Information Age. Here, data is pre-processed into information in such a manner that new concepts, theories, and solutions can be formulated much more easily than in the past. Even the automation of inference can be offered through computer-based expert systems. These systems are based on scientific facts and rules (knowledge). New products such as smart cars with embedded knowledge are easier to drive and last longer.

The computer-supported creation of knowledge is needed by civilization in order to optimize and prolong its existence.

The Telecommunication Age (1960s). On May 24, 1844, Samuel Morse sent his first public message over a telegraph line between Washington and Baltimore, and through that simple act, ushered in the Telecommunication Age. Barely ten years later, telegraphy was available as a service to the general public. In those days, however, telegraph lines did not cross national borders. Because each country used a different system, messages had to be transcribed, translated and handed over at frontiers, then re-transmitted over the telegraph network of the neighboring country. Following the patenting of the telephone in 1876 and the subsequent expansion of telephony, the International Telegraph Union began in 1885 to draw up international legislation governing telephony.

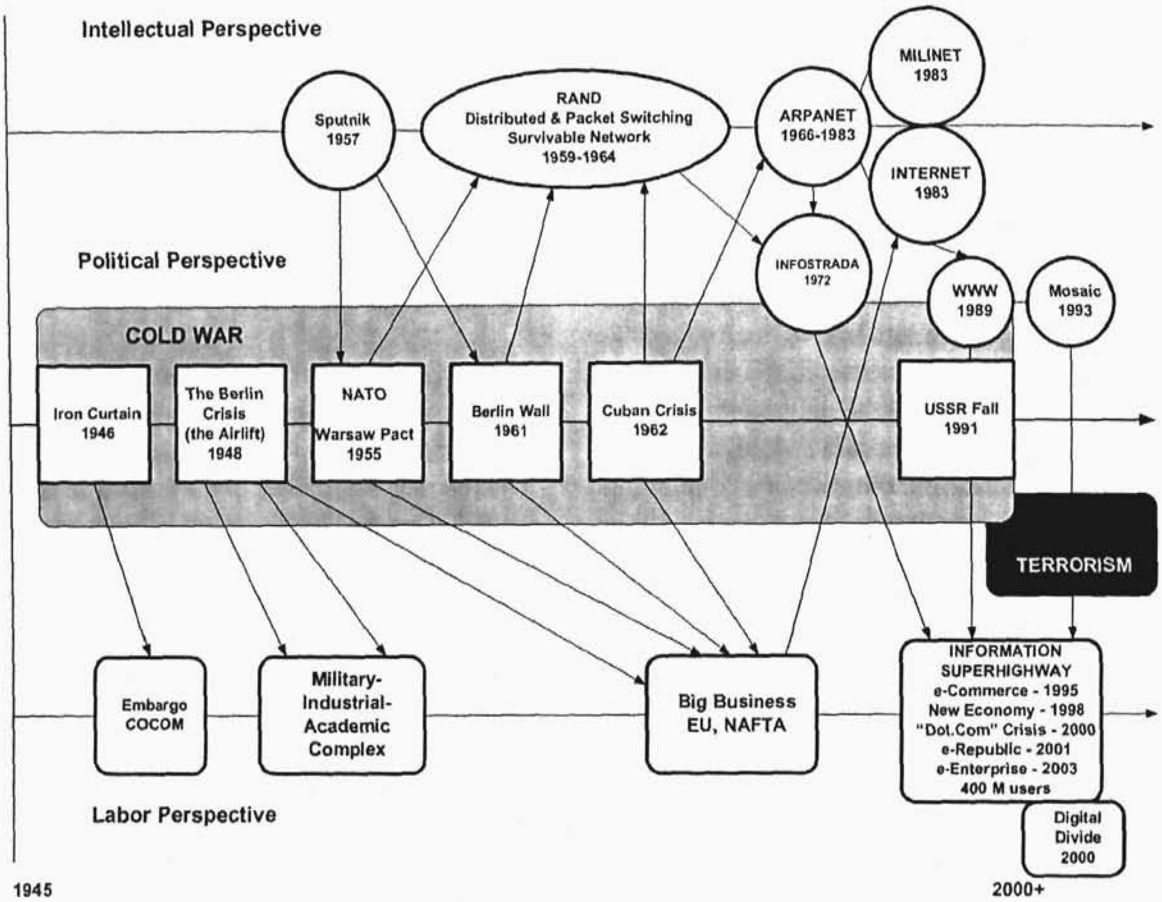
In 1957, Sputnik-1 was launched by the Soviets, beginning the Space Age. In 1963, the first geostationary communications satellite (Syncom-1) was put into orbit following the suggestion, made by the writer Arthur C. Clarke in 1945, that satellites could be used for the transmission of information. Ever since, thousands of satellites have been launched and we now share the global economy, global shocks, global tragedies, global responses, and global parties that have transformed us into the Electronic Global Village. Whole clusters of people that have been neglected can be included in the mainstream of civilization. This, no doubt, is a positive and promising side of telecommunications. When AT&T was deregulated in 1984, telecommunication services began to be less expensive and more affordable. This led to the formation of many telecom companies and inventions, including e-mail and fax (1980) and mobile phones (1990), and of course the unlimited use of the Internet via either fiber optic or wireless lines. As a result of it, "distance is dead" (Cairncross, 1997) within network nations and net-citizens.

The Communication Age (1984). In this age all users are connected by computer networks and are "power users," since they have great opportunities for contacts and businesses. They can maximize individual choices; create more cooperation and win-win outcomes in human interactions. Some authors think that in the future an amalgam of ad hoc partnership with people combining their experiences to govern themselves as equals will be developed. They even predict that these private partnerships will eventually replace the nation-state (Mann, 1998). The author thinks that this may happen, but questions the rationality of such a move. The more impressive side of this age is that persons begin sending information literally at the speed of light. The content of such information transfers may or may not be more enriched, but its delivery is revolutionary. Consequently, the lead time of decision-making and action becomes instant, at the same time removing intermediaries, and makes the "distance" shorter.

The Internet (1972-). The development of a universal telecommunication network is of great importance for politics and civilization. The Internet is a product of the Cold War, when in 1972 it reached its first phase of development, connecting 15 centers within the pilot system of the ARPANET (Figure 9-3). At the same time, behind the Iron Curtain, the concept of the INFOSTRADA was launched, a spin on the Italian word *La Strada*, meaning highway. The Polish INFOSTRADA was planned to transform the Polish uninformed into an informed society within the Communistic regime. Already in 1973, three nodes Gdansk–Warsaw–Katowice had been interconnected via Singer ten computers within a "packet switching" network[2]. However, while ARPANET was designed to connect the super-computers of scientific centers, INFOSTRADA was planned to support a flow of economic-social information among main organizations and citizens. Within a short period of time, the Communistic authority determined that INFOSTRADA would lead to an uncontrollable flow of information, and so closed the project and ostracized its leaders, including the author.

Of course, the INFOSTRADA project was not unknown to the American intelligence community, since it was widely publicized in the Polish press. At that time, a young congressman, Albert Gore, a member of the Congressional Intelligence Committee, was informed about the Polish project. When he became the American vice-president, he admitted in the December 1995 issue of WIRED

Figure 9-3. Relationships among civilization perspectives in respect to the Internet development

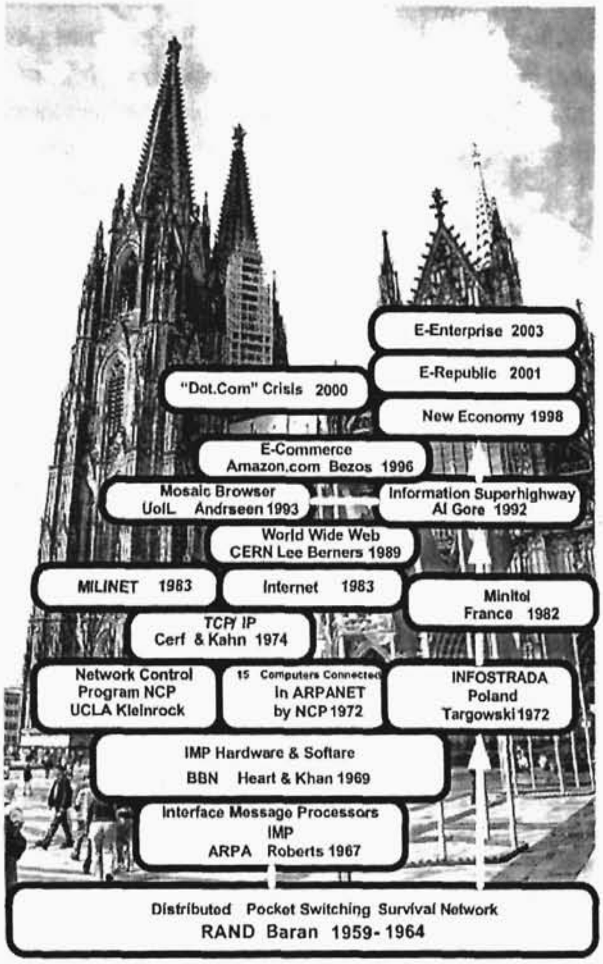


magazine that his idea of the Information Superhighway was "stolen" from "somewhere" (Hellman, 1995). This idea soon became the leading concept for the development of all sorts of information infrastructures, triggering the emergence of the so-called New Economy both in the U.S. and in the "new" global world.

The Internet, at the global scale, supports the free flow of information-communication and is positive for the spread of democracy and negative for political or theocratic dictatorships. These types of dictatorships filter the information-communication flow on their servers. Such attempts are reminiscent of the Pony Express's strategy of introducing faster horses in response to the emergence of the telegraph. (It did not work.) Of course, the Internet also enables the dissemination of criminal information-communications, including those among terrorists. The issue of practical application of Internet ethics is a hot topic among many societies. For example, in Russia, e-commerce cannot be applied due to dishonest practices among all involved parties, including organized crime.

Figure 9-3 illustrates the relationships among intellectual, political and labor revolutions. This model proves how these relationships are important for each type of revolution development.

Figure 9-4. The Internet cathedral



The civilization consequences of the Internet are important, since the use of the Internet requires access to a computer and an Internet Service Provider (ISP), which can only be afforded by people with resources. Hence, the digital divide issue takes place not only in underdeveloped countries but in developed ones too. Nowadays, there are 1 billion people in the world with a password to a computer net and five billion deprived, without such a password. This leads towards a bifurcation of civilization and all of the negative consequences and externalities of yet another set of haves and have-nots. One can say that the Internet accelerates the development of developed nations and relatively slows down the development of underdeveloped nations, notwithstanding that many civilization positives such as education and training can be accelerated by the Internet in those less favored nations.

Systems of the Internet's type are the outcomes of many peoples' effort, similar to a multi-century construction of a cathedral as every new builder adds a new brick and says: "I built the cathedral" (Hughes, 1998, p. 274). The Internet cathedral is shown in Figure 9-4.

New Economy. After World War II, the introduction of innovations through mass production and consumption has changed industrial production and marketing systems. In the new economy innovations are introduced through mass customization and marketing systems that create demand rather than respond to it. This emerging new economy has the following characteristics:

1. Intangible products and services – are "soft" rather than "hard." They are composed of information, knowledge, copyrights, relationships, telecommunications, computers, software, entertainment, securities, security systems, and so forth.
2. Networking and communicating – Communication is the foundation of a society, but more than that, it is the basic factor in the evolution of mankind. Mediated communication networks have developed an economic sector that is transforming other sectors to be more viable, flexible, and responsive.
3. Global reach – Businesses are becoming increasingly global. Yet nations and trading blocks seem to be polarizing.

Three-quarters of the American workforce are now employed in service-related fields, including those services mostly oriented toward information creation and handling. For example, *Wired* magazine, the mouthpiece of the Information Revolution, is located in the middle of an old-fashioned downtown city, and in one year turns 8 million pounds of dried tree pulp (this is enough to fill 48 railway cars) and 330,000 pounds of brightly colored ink into hard copies of the magazine.

The advantages of a new economy speak to those individuals and organizations, which are able to leverage capabilities of new information-communication technologies to transform businesses and invent business practices, not merrily rearrange old ones. A new economy brings also new problems, particularly in the sphere of employment and pay. Three-quarters of the American workforce is now employed in service but a substantial portion of these are in low-paying, dead-end jobs. "Competitiveness" is the tune of this new economy without borders, and the winning strategies involve "downsizing" and "outsourcing" of both production and services (desk help and other). About one-third of the jobs in the United States are at risk to the growing productivity of low-wage workers in China, India, Mexico, Indonesia, Russia and elsewhere, who are electronically connected with management and distribution centers in developed countries.

One can argue that the capitalistic journey, which began with the commodification of goods and the ownership of property, is ending with the commodification of human time and experience. In the future, we will purchase enlightenment and play, grooming and grace, and everything in between. The business of business, therefore, is no longer about exchanging property but rather about buying access to one's very existence in small commercial time segments. In the Age of Communication (Access), Rifkin (2000) asks, "will any time be left for relationships of a noncommercial nature?" And "Can civilization survive when only the commercial sphere remains as the primary arbiter of human life?"

The Postmodernization Era (1990-).

Modernization of civilization, particularly of Western civilization in the 20th century, led through three World Wars (I, II, Cold War) and the Great Depression, which required enormous progress in technology and infrastructure. Eventually, at least Western civilization has been modernized and some other particular civilizations have been partially or fully "westernized," according to their will and resources. Modernization was led by such values as rationality, authority, technology, and science, which are characteristic for the Industrial Wave. As a result, Western civilization achieved a point of saturation (Targowski, 2004) and expanded both externally (Afghanistan, Iraq) and internally by rejection of over-reaching westernization and proclaiming post-modernism. The latter is seen as a product of the Information

Wave, which creates new values and life styles with greater tolerance for ethics, cultural and sexual diversity, and individual choices concerning the kind of life one wants to lead (Inglehart, 1997). Habermas (1984; 1987) also is not satisfied with modernization's effects and thinks that it is an unfinished project. Although Western-oriented industrialization is responsible for packed highways and banal TV sitcoms, it has also been the root of an extended life span and an increased focus on the well-being of humans. The transformation from modernization to post-modernization means shifts, from maximizing economic growth to maximizing subjective well-being, from achievement motivation to post-materialism, and from rational-legal authority to a de-emphasis of both legal and religious authority (Inglehart, 1997).

These shifts are results of huge improvements caused by the influence of Western civilization, which can afford such advances of life sense. Certainly, other developing civilizations still look for the maximization of economic growth. Perhaps even the mainstream of Western civilization, whose middle class is in decline at the dawn of the 21st century due to offshore outsourcing of jobs, may not like new values. Needless to say, these new values are mostly liked by better off and better *informed* citizens, who may count for 5%-10% of Western population, certainly coming from the elite and academic circles. Furthermore, the de-emphasis of legal and religious authority values is caused by the fact that people possess better *knowledge*, which opens their eyes to some sorts of manipulations by those authorities.

THE CONTROL REVOLUTION IN THE 19TH AND 20TH CENTURIES

To say that the advanced, industrial world is rapidly becoming an information society may already be a cliché. In the United States, Canada, Western Europe, and Japan, the majority of the labor force now works in the information sector and wealth comes increasingly from information goods such as computers, software, telecommunication services. For the economies of developed countries, the processing and handling of information has begun to overshadow the processing of matter and energy.

Until the Information Wave, the processing of information ran literally at a human pace within a bureaucratic system. Since the purpose of the Industrial Wave was to speed up society's entire materiel-processing factory system, it was necessary in order to do so to apply an effective control system, either manual or mechanized by office and punch-card machines.

The Information Society, as Beniger (1986) concluded, is not so much the result of any recent social change as of increases which began more than a century ago in the speed of materiel and energy processing. Microprocessors and information-communication technologies, contrary to currently fashionable opinion, are not new forces only recently unleashed upon an unprepared society. They are merely the latest installment in the continuing development of the Control Revolution. This explains why the first examples of information technology, such as Babbage's Analytical Engine (1832), the telegraph (1844), the typewriter (1860s), the transatlantic cable for a telegraph (1866), the telephone (1876), wireless telegraphy (1895), and the magnetic tape recording (1899) were developed beginning with the first signs of a control crisis in the middle 19th century.

The transformation of an economic system from extraction and agriculture (Agricultural Wave) into production, distribution and consumption (Industrial Wave) was achieved through the advancements in control systems. They were needed since the speed and volume of demanded goods exceeded the current capacity of the existing infrastructure. The signs of this crisis are presented in Table 9-1.

It is interesting to mention that one of the richest men of this era was the industrialist Andrew