Chapter XIII
The Electronic Global Village

INTRODUCTION

The purpose of this chapter is to define the architecture of information-communication systems which play key roles in the development of the *Electronic Global Village (EGV)* as the metaphoric mechanism for the implementation of the Information Wave.

THE BIRTH OF THE ELECTRONIC GLOBAL VILLAGE

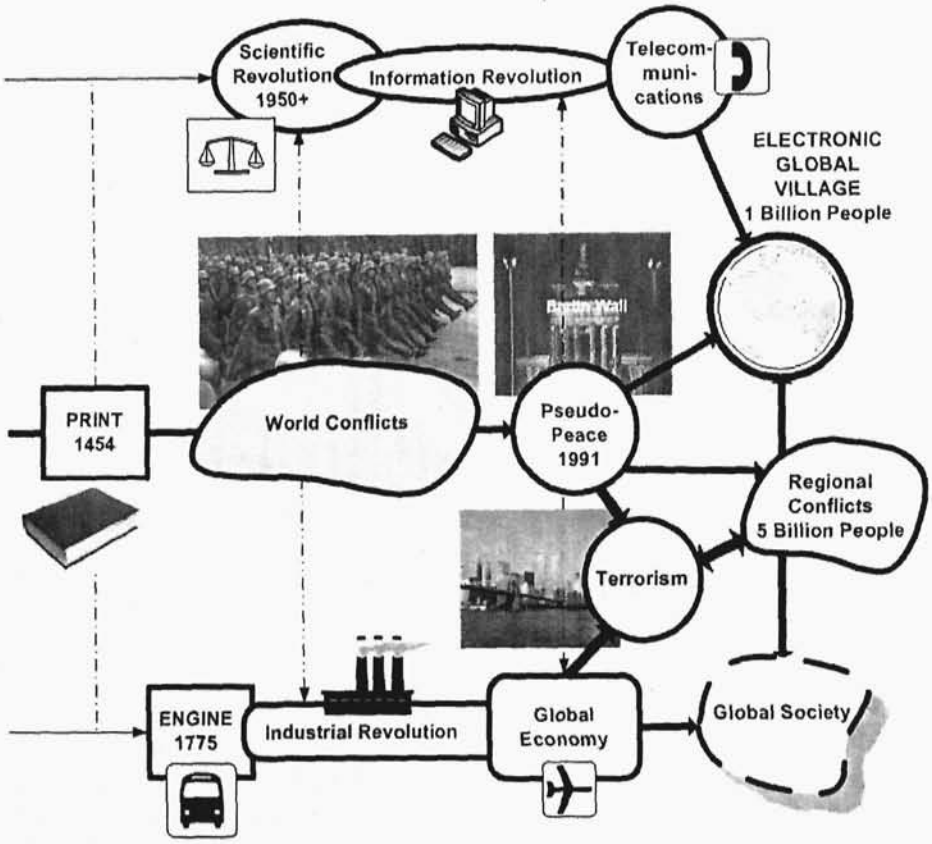
During the Communications Age (since the 1950s), the activities of business, organization, and everyday life begin with social action that is defined by communication-mediated choices. A generation ago, Marshall McLuhan proclaimed the advent of a "global village," a sort of borderless world in which communication media would transcend the boundaries of nations (McLuhan, 1968). "Time" has ceased; "space" has vanished. We now live in a simultaneous happening. The globe is linked by media and visual, icon-like messages. The messages spread out and cause instantaneous, proactive responses. Ever since, history has been driven by a "compressed" capsule of time. One of the mini bangs (the birth of humankind) expands through the communication of ideas. Logistics becomes secondary to symbols. Human minds and cognition are placed in charge of that mini bang's consequences.

The Global Economic Age (since the 1980s) is a product of liberal democracy and free-trade policy. Market participants are encouraged to compete globally. From these circumstances, we are experiencing a flexible movement of people and goods with less regard for national boundaries. A car made in America by Honda and Toyota is classified as a domestic product. It does not matter that "British" sneakers by Reebok were made in Korea, or that a French ski by Rossignol is made in Spain. What a consumer cares about is the product's quality, price, design, value, and appeal.

Figure 13-1 illustrates the process of the birth of the *Electronic Global Village* (*EGV*) (Targowski, 1990). The result of *EGV* is an *electronic global citizen* (*EGC*), as well as tele-cities, tele-nations, and information infrastructure and services. They may lead toward the healthy human family utopia. This utopia can be perceived as a technique to manage the growing, educated, and aware populations of conflict-less nations.

In 1989 (the rise of Solidarity in Poland) and 1991 (the Soviet Union's collapse), the world experienced a bifurcation into two paths:

Figure 13-1. The birth of the electronic global village



- A global path of peaceful development of the *EGV*, in which 1 billion people have a computer password
- A tribal path of national, racist, and religious conflicts, in which about 5.6 billion people do not have a computer password

The international perspective of the information civilization may be stressed by a metaphor: "Jihad versus McWorld" (Barber, 1992). According to Barber, there are two possible futures: tribalism and globalism. The former is a retribalization of large swaths of humankind by war and bloodshed, a threatened Lebanonization of national states in which culture is pitted against culture, people against people, and tribe against tribe.

The latter is being borne in on us by the onrush of economic and ecological forces that demand integration and uniformity and that mesmerize the world of fast music, fast computers, and fast food—MTV; Macintosh, and MacDonald's—pressing nations into one commercially homogenous global network: one McWorld tied together by technology, ecology, communications, and commerce.

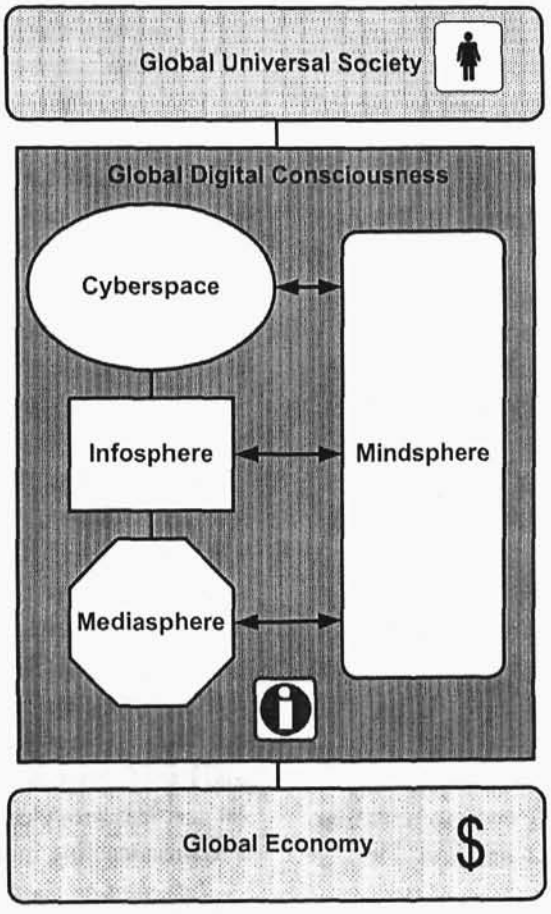
The globe is falling precipitously apart and coming reluctantly together at the very same moment. The forces of Jihad and McWorld operate with equal strength in opposite directions, one driven by parochial hatreds, the other by global markets.

THE GENERAL ARCHITECTURE OF EGV

The emerging *Global Digital Consciousness (GDC)*, the symbiosis of humans and machines, provides cognition and external memory systems that support the global civilization and vice versa. The GDC is composed of (Figure 13-2):

- Infosphere (computerized information-communication systems composed of databases, applications, and networks)
- Cyberspace (the Internet and Web technology)
- Mediasphere (radio, TV, cable)
- Mindsphere (global ideas generated by previous global spheres).

Figure 13-2. The general architecture of the electraonic global village



THE DEFINITION OF EGV

The EGV is the hybridization of facsimile, VCRs, answering machines, compact discs, cellular phones, video games, computers, telecommunications networks, and high-definition television (Targowski, 1990; Koelsch, 1995). Like most revolutions, this one has roots in economics. The alliance between computing and telecommunications technologies has been and is currently driving the service sector. Nearly 75% of U.S. workers in 1990 were employed in service, up from 55% in 1948 (Reich, 1992). In such an economy, most wealth is generated by information.

This type of wealth generation is a movement from "things to thinking." Information technology becomes "user friendly," which exploits natural forms of human expression: speech, gesture, and handwriting. Workers at Apple call this approach the *whole-person* paradigm.

Marshall McLuhan warned that "the more information one has to evaluate, the less one knows." The major problem is that our brain can only absorb about fifty bits per second. Technology will not change that and *EGV* is not going to re-engineer the human brain. However, the so-called knowbot program using artificial intelligence can prioritize a user's electronic mail, news, books, reviews, and selected relevant information according to each user's preference.

The system architecture of the EGV-2007+ is shown in Fig. 12-3. The systematization of *EGV* components is as follows:

1. Common elements:

- Information utility (telecommunication services, the Internet, computers, TV)
- Electronic money
- Electronic knowledge
- Information systems
- Information services
- Information-communication systems (e.g., e-commerce)
- Information policy
- Cyberspace

2. Electronic organizations, such as

- Virtual school and university
- Virtual enterprise
- Online government
- Electronic global citizens

3. Electronic social structures

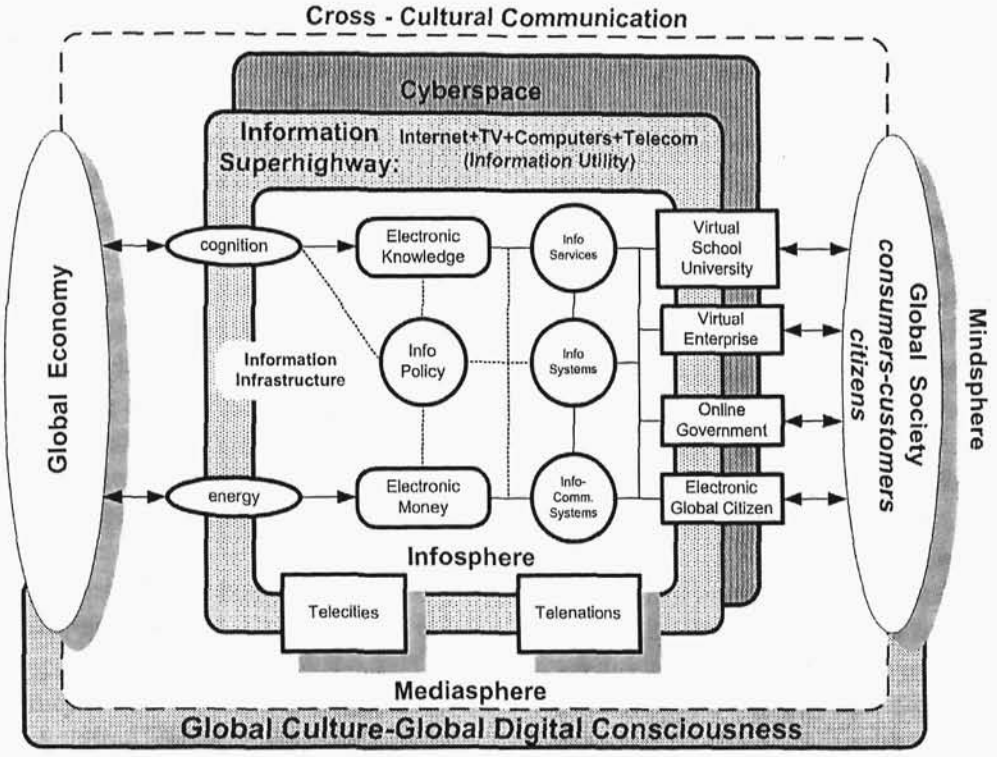
- Tele-cities
- Tele-nations

4. Global society
5. Global culture
6. Cross-culture communications

Information Utility (telecommunication services) or *Information Superhighway.* The first use of the term "information utility" appears to have been made by Martin Greenberger in 1964 (Greenberger, 1984). He stated, "Barring unforeseen obstacles, an on-line interactive computer service, provided commercially by an information utility, may be as commonplace by 2000 A.D. as telephone service is today." Information utility can be defined as a class of online real-time systems in which a large number of individual users from many different organizations share a central data processing and memory complex (U.S. Congress, 1974). Some examples of information utility are the post office, libraries, tax services, savings accounts, stock brokerages, and travel services. Information utility is based on services provided by the telecommunication and broadcasting industries.

Information Superhighway (*INFOSTRADA*) is a system of telecommunications pathways and connections that transmits and receives voice, video, and data. The pathways consist

Figure 13-3. The system architecture of the electronic global village 21st century



of copper wire, fiber-optic cable, coaxial cable, microwave line-of-sight signals, and satellite linkages. Individuals connect to these highways through hardware such as telephones, computers, and audio/video receivers. The United States currently possesses a basic information highway that provides virtual links for every individual through telephone and television. An information superhighway consists of broadband (high-capacity) telecommunications circuits, increasingly based on fiber-optic technology, which can carry much greater amounts of digitized information, such as high-resolution video, at faster speeds (Targowski, 1996).

The Internet is a globe-spanning public system of computer networks communicating through such protocols as the transmission control protocol (TCP) and the Internet protocol (IP). The most popular service of the Internet is based on the World Wide Web (WWW), which applies home pages programmed in hypertext markup language (HTML). This service allows for communication through hyperlinks among Web sites of organizations and people.

Electronic Money. This is a payment system applying, for example, *CyberCash* or the electronic fund transfer system (EFTS), in which the processing and communications necessary to effect economic exchanges for the production and distribution of services incidental or related to economic exchanges are dependent wholly or in large part on the use of electronics (U.S. Congress, 1974). The EFTS can be described as a growing array of financial services. Among these services are wire transfer of funds, direct deposit of income checks, periodic or authorized payments, check verification, and credit card authorizations. Point-of-sale (POS) systems, automated teller

machines (ATM), and automated clearing houses (ACH) represent more advanced forms of EFTS. These financial services rely on computers and have the potential to operate locally, regionally, nationally, or internationally. The emergence of both electronic money and a new financial order provides a strong foundation for the operations of an information civilization. It is a component of the information infrastructure, which acts as a "fuel" to energize the performance of individuals and organizations. Electronic money not only supports existing operations but also generates new added value through new information (particularly through associations and quick access) and opportunities.

Electronic Knowledge. With the increasing number of information-technology-driven projects in libraries, the impetus to automate and to include electronic information in depositories and to disseminate it is strong. Electronic knowledge is a product of the *electronic library*, which provides automated services and electronic easy access to holdings stored electronically. While these holdings may be stored locally, it will be more probable that more holdings will be stored elsewhere. A library gateway will transmit patrons' requests through LANs, MANs, WANs, and GANs to other electronic libraries. The *electronic library* will become a place in which a certain specialized type of information or service is available, perhaps locally oriented.

Information systems. Information systems have been developed in business, government, and institutions along with the applications of punched-card machines and computers since the beginning of the twentieth century. The state of the art of these systems includes enterprise-wide information management complexes of management information systems, product information systems, operations information systems, inter-organizational information systems, international information systems, and end-user computing. Information systems mostly are involved in internal data/information processing and accessing; however, the inter-organizational and international systems are more oriented toward external connections of the enterprise. They are passing through tele-cities' and tele-nations' cyberspaces in a mission to gather and provide more information and communications among different remote parts of the enterprise, and service both cooperative and competitive organizations and users.

Information services – have emerged together with the broader application of the Internet as an external information source. They are delivered free or on a pay basis through the Internet and intranet (as an enterprise information portal). Among the most popular information services are:

- Electronic Yellow pages
- General news
- Financial news
- Stock quotations
- Foreign exchange data
- U.S. government bond data
- Maps
- Search/navigation

Info-communication systems – are the Internet-driven systems which combine information content and communication capability. For example, e-commerce is an information-communication system.

Cyberspace is an infinite world in which humans navigate in information-based space, and it is the ultimate computer-human interface to nonmaterial reality and virtual reality triggering science fiction ideas (Gibson, 1984; Benedikt, 1993). Also, it can be defined as a prime location around the information superhighway highway.

Telecity is a set of community computers, MANs, teleports (a dish to communicate with satellites), information kiosks, video-conferencing facilities, tele-work centers, and specialized networks to allow for the delivery of integrated and shared local, national, and global informa-

tion on healthcare, education, business, government, and so forth. It is a miniature of the EGV; reduced to the local dimension and at the same time with an exit to the *telenation* and the EGV (Targowski, 1996).

Tele-nation is a set of tele-ities, national information superhighways allowing for the delivery of national information and telecommunication services and information and information-communication systems (Grossman, 1995). A *telenation* such as those in North America supports the following:

- The development of jobs, growth, and U .S. technological leadership
- The reduction of healthcare costs
- The delivery of higher-quality, lower-cost government services
- The preparation of our children for the fast-paced workplace of the twenty-first century
- The building of a more open and participatory democracy at all levels of government and the society

Information policy. Information policy is a set of rules, standards, and accepted practices that regulate the users' and service providers' behavior in cyberspace. Information infrastructure as a physical system provides the base for the delivery of consumer and business-oriented services over and derived from telecommunications networks. These allow for the access to such information resources as electronic money and electronic knowledge.

INFORMATIVE ORGANIZATIONS

Virtual schools and universities are telematic-oriented learning environments such as a distance learning school, a telematic school, a teacher-parent link, an electronic global university, a global lecture hall, even an electronic university. A distance learning school is the provision of education and training opportunities from one site to multiple sites simultaneously, or any educational experience in which the learner and the educator are interacting across space. Technology links can be chosen from among the following solutions: fiber optics, satellite, instructional television fixed service (IFFS), microwave, and coaxial cable. A telematic super-school is a set of applications such as administrative offices, distance learning classrooms, home learning centers, library/learning resource centers, and advanced-studies centers. The pipelines of communication technology are expanding the walls of the traditional classroom, taking children across the country. In a telematic super-school, for example, students use this pipeline to:

- Take a computer voyage through the chambers of a dog's heart
- Create a thunderstorm in a computer-generated weather lab
- Share a face-to-face language lesson with students in Montreal, and much, much more

By 1996 or shortly thereafter, with the spread of "smart phones," which are already becoming available in the corporate environment, parents will be able to dial up assignments, class schedules, school menus, notices of meetings, and other information displayed onscreen. More widespread use of voice messaging services will also support voicemail conversations, which can allow parents and teachers to communicate without the usual difficulties of arranging "live" conversation during working hours. The *electronic global university's* (*EGU*) purpose is to:

- Provide affordable education in those countries and national locations that are far away from academic centers (Becker, 1989)
- Provide telematic access to advanced, competitive education in those countries and

national locations that are looking for such solutions
- Offer to many people the chance of updating their education with refresher courses that could be taken without having to drop out of the workforce

The global lecture hall is a pilot project initiated in 1972 by Takeshi Utsumi, chairman of Global Systems Analysis and Simulation Association (GLOSAS). If effect, GLOSAS developed a concept of the global lecture hall and implemented several global teleconferences. The demonstrations encompassed more than two dozen universities linked together, from the East Coast of North America to Japan, the Republic of Korea, Spain, Guam, Alaska, Venezuela, and Australia, to Western and Eastern Europe, and to Mediterranean countries. These demonstrations helped GLOSAS discover and compensate for the technical, regulatory, economic, and marketing impediments to the creation of an electronic global university. The *EGU* is conceived as a worldwide educational network and a permanent organization of international education exchange via various telematic media. Its goals are:

- To globalize educational opportunities
- To support research in the scope of global problems
- To use global-scale tools to simulate and meet on problems of an interdependent world

The electronic university is referred to as the campus of the future, in which there will be TV consoles that could beam up taped lectures by any professor on campus or even let students monitor courses from other schools. Built-in computer terminals will tap into the card catalogs of most of the college libraries in the country, call up encyclopedia articles, or scan daily papers. During the great expansion that took place after World War II, American colleges and universities sought to be all things to all people. In the new age of austerity (the 1990s and beyond), schools are being forced to rethink their mission, decide what they can do best, and—in a form of academic triage—abandon certain fields of learning to other institutions. As a result of this strategy, a *virtual university* emerges. The virtual university is a temporary network of independent education centers/courses, providers, students, instructors, even erstwhile rivals, linked by information and telecommunication technology to share knowledge, skills, laboratories, costs, and access to other programs. It will have neither a central office nor an organization chart. It will have no hierarchy and no vertical integration.

Virtual enterprise is based on enterprise-wide computing, which is the ability to link different facilities at different locations around the world through information systems and communications networks to facilitate cooperative research and development with other firms, concurrent engineering by trusted and organized alliances of suppliers and manufacturers, or the distribution of manufacturing to far locations. These enterprise functions are integrated by such information systems as computer-aided design (CAD), computer-aided process planning (CAPP), computer-aided manufacturing (CAM), office automation systems, and management information system (MIS), as well as communications networking such as LANs, WANs, and GANs. If the information architecture leads only to information transport, it is computer networking; however, if that network is based on a multimedia communications architecture to support the integration of enterprise-wide systems, including telepower applications (such as telepresence in the virtual mode) throughout the enterprise, then it is enterprise-wide computing. The information and communications architectures determine the corporate electronic infrastructure as an evolving solution, an intermediate solution (corporate network computing), or an ultimate solution

(enterprise networking). A key success factor to enterprise-wide computing is the architectural planning of telematic technology components as tools supporting a business strategy. Architectures of information and communications across multiple tiers of the enterprise are vital. These architectures should provide information and communication across the enterprise, much as a utility provides electricity.

Online government is the empowerment of citizens in participatory governing of public affairs. A strong internetworking among citizens and electronic public records is based on a graphic user interface (GUI), which supports a menu-driven, user-friendly interactive access. Government workers and officials have to learn and exercise power sharing in order to democratize equal access to power and seek service satisfaction by customers. Electronic town meetings can be one example of online government; this is an introduction of customer online scope-feedback into the governmental modus operandi. In this type of government, the citizens have easy, interactive, online access to governmental units and services. The supportive information systems are in electronic format. The electronic global citizen is a person who has telematic skills to work in/with virtual enterprise, online government, and virtual schools/universities. This person may telecommute to work or school and still be a productive worker or student. People are EGCs when as consumers they have mediated access to information about goods, services, and processes (e.g., working, learning, governing) from around the world.

All those organizations and systems are supported by information infrastructures.

INFORMATION INFRASTRUCTURE

The information infrastructure is the second-generation civilization infrastructure. The first generation of the civilization infrastructure is the set of core, foundational and integrational infrastructures as it is shown in Figure 13-4. As the latter deteriorates through the processes of the material civilization, the soft information infrastructure compensates for the losses of the urban, rural, and transportation infrastructures.

The basic components of civilization information infrastructure are being developed in the following layers (Figure 13-4):

1. Telecommunication Layer – provides services in the scope of:

- Access and transmission technology via telephony, cable TV, satellites, and wireless
- Switching and networking technology via local (LATA) and long-distance transmissions (IXC, e.g., ATT, Sprint, WorldCom) as narrow or broad-band service sending information through packet- or circuit-switching networks

2. Computer Networks Layer – contains end-users and organizational networks such as HAN (Home Area Network), LAN (Local Area Network), MAN (Metropolitan Area Network), RAN (Rural Area Network), WAN (Wide Area Network), GAN (Global Area Network), which are implemented on the telecommunication networks, with the exceptions of HAN and LAN
3. Internet Layer – provides global services of information-communication systems
4. Computing Layer – contains computer servers, computer terminals, operating systems, utility software, database management software, programming languages, computer-aided software engineering (CASE), and so forth
5. Communication Layer – secures such services as e-mail, EDI (electronic data interexchange) e-conferencing, teleconferencing, telecommuting, groupware for team