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The Modeling of the History of Information

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ABSTRACT

In this paper, we will analyze the architectural relationships between intellect, politics, and labor in an historical context to understand the relationships, rules, and eventually laws that govern social development. Through such a structural understanding of the past, it may be possible to better predict the future. A by-product of this analysis should be understanding the historical background for the emerging new sciences of information management and communication in business.

INTRODUCTION

The aim of analyzing the role of information throughout history is to define the convergence between the cumulative evolution and revolution of labor, intellect (knowledge), and politics.

The architectural approach to history is a new layer over the quantitative history based on statistical data. In architectural history, we seek a "big picture" of "ages" and "revolutions" to develop some criteria-oriented views of the world and its future predictability.

PERIODIZATION OF MODERN TIMES

In this paper, we address the task of establishing some information-oriented relationships between the Intellectual Revolution, the Political Revolution, and the Labor Revolution of modern time, depicted in Figure 1.

This modern period of history begins with the Renaissance for a rebirth of learning following the darkness of the medieval period. The 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 - (some are still fleeing). Their learning spread rapidly with the development of printing. This boosted the questioning of established ideas regarding religion, art, and science.

The challenge of fresh ideas also gave impetus to explorers, who began to open up new lands and trade routes, and to the religious leaders who set in motion the Reformation.

The Age of Reason and The Era of Modernity. The first heroes of the *Age of Reason* were the printer-publishers who fed the inky stream where knowledge flowed from mind to mind, from generation to generation. The sciences advanced in logical progression through modern history: mathematics and physics in the seventeenth century, chemistry in the eighteenth century, biology in the nineteenth century, and psychology in the twentieth century.

The Age of Discoveries. Since 1500 A.D., the map of the civilized world has been transformed beyond all recognition. Prior to this time, it was composed of a belt of civilizations girdling the Old World from the Japanese Isles on the northeast to the British Isles on the northwest. The main line of communication was provided by the chain of steppes and deserts that cut across the belt of civilizations from the Sahara to Mongolia.

The Age of Technology and The Modern Era. In the 19th century, technology advanced not empirically, but through the application of science in business. The Industrial Revolution mechanized manufacturing and created factories that utilized water and steam power. Railroads eliminated wilderness and electricity lit homes and minds. The first computer "*calculating engine*," was developed by Charles Babbage in 1822 and improved in 1832, although it was premature and only useful in simplistic calculations. The telegraph was designed and facilitated long distance communication. Communication through publications was also a tool for the dissemination of knowledge.

The Modern Era of the 19th century glorified rationality. Western communities 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 on, this split in the *Information Age* would include the information-rich and the information-poor.

The Eras of Modernization and Post-Modernism
The Scientific Revolution

In the 20th century, atomic physics, modern medicine with secrets of heredity, transportation technology, military technology, microelectronics (transistors, integrated circuits), computers, telecommunications, information systems, high technology (smart devices and processes), marked the present level of science.

The Control Revolution began in the United States in the late 19th century, the basic communication technologies are still in use a century later: photography and telegraphy (1830s), rotary power printing (1840s), the typewriter (1860s), transatlantic cable (1866), telephone (1876), motion pictures (1894), wireless telegraphy (1895), radio (1906), and television (1926). This control technology emerged as a means of controlling the influence of the Industrial Revolution, which was experiencing capacity shortage and delays in production and transportation. The following developments in electronics, computers, information systems, and communications are part of the control revolution.

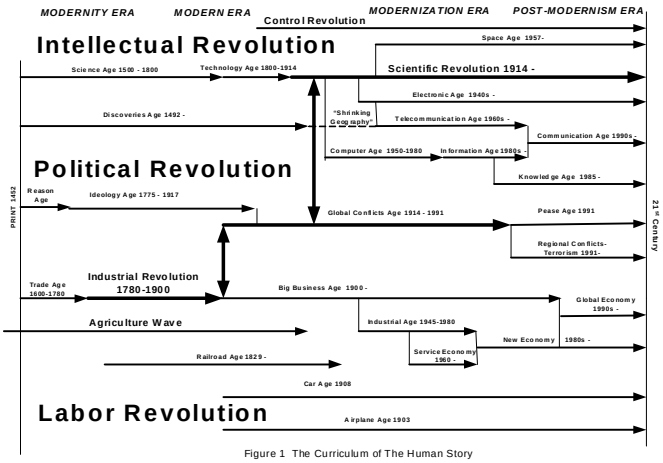

Figure 1 The Curriculum of The Human Story

The Modernization Era occurred when businesses and institutions invested in capital equipment to effectively compete in productivity, innovations, profitability, and market share. This trend gave the birth to Big Business, Service Economy and Global Economy.

Further analysis of civilization and culture will be limited to information technology.

The Age of Electronics and Microelectronics. Two major developments occurred independently during the late 1940s which triggered an enormous impetus to the modernization of civilization. One was the development of the programmable electronic computer (ENIAC 1946). The second was the invention of the transistor (1947). Subsequent improvements in solid physics led to the present-day silicon chip with its large-scale integrated circuits.

The Computer Age. In the year 2002, we celebrated 1000 years of using ZERO in Europe (transferred by Pope Sylvester II from the Arabic University in Spain). Thus, throughout the last millennium, man has long been developing computing technology. However, only in the last 50 years has the computer become available for practical applications. In the 1950s, computers automated scientific calculations. In the 1960s, computers were used in simple commercial and governmental applications (data processing). In the 1970s, computers were applied to large-scale systems of businesses (airline reservation systems), administration, and defense. In the 1980s, the quiet revolution of microcomputers led to the installation of 80 million units and 50 million terminals. Almost every professional or hobbyist became preoccupied with learning "IBM DOS" or a way to print a "file." The jargon of computer hardware and software entered the language of the average citizen. Today, we could not operate without computers.

The Information Age. In the 1980s and 1990s, information technology created an appetite for user-friendly computers and a need for customized relevant information and information services. At the corporate level, MIS is expanding into the Executive Information System (EIS) and other systems such as CIM (Computer Integrated Manufacturing), electronic mail, electronic publishing, and so forth. These systems increase the quality of targeted information and competition in time through inter-business horizontal telecommunication. In the home, entertainment is brought in through more TV channels, satellite receivers, and cable. Teleshopping, telebanking, and telecommuting have increasingly become more practical and effective. The list of information systems and services is almost endless. The Information Age has transformed and developed the industrial economy into an informed economy. This is evident because employment in the information sector now exceeds employment in traditional sectors.

The Knowledge Age. In the classic economy, the sources of wealth include 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, innovation, skills, and information, and it can be summarized in one word: knowledge. Knowledge creates 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.

There is a great lagoon of knowledge within our globe that can be commercialized. The following data illustrates this premise: there are growing numbers of research centers (about 2000 world class), 3.5 million scientists and engineers worldwide, universities (about 1000 world class), university teachers (about four million worldwide) (Kurian 1984), and 1000 multinational corporations, including about 50 stateless consortia.

The Telecommunications Age. Telecommunications is a rapidly growing and changing field. The most significant milestone in advanced telecommunications was the launch of Telstar in 1962. The launch was preceded by the invention of the telegraph by Samuel F. B. Morse in 1837, the telephone by Alexander Graham Bell in 1876, and later radio and television. Telstar began as a very small and simple communications satellite in a low Earth orbit, designed to relay television signals between the United States and Europe. The global satellite system INTELSTAL (Early Bird) was put into operation in 1965 with a maximum capacity of 240 two-way telephone circuits. Today's system capacity is 200 times larger with cost reductions of 90 percent. Over 100 nations take advantage of TELSTAL services. Other types of telecommunications systems are developing in areas such as mobile satellite communications (business and personal), global information systems, teleconferencing, business TV broadcasting, distance learning, home health care services, and the Global Positioning System (GPS). The geostationary orbit now houses more than 200 communications satellites, with the potential of telecommunications just being identified.

The Interactive Age. Multimedia machines, which combine video, images, sound, and data, are expected to create a new generation of electronics, combining the functions of personal computers, televisions, video cassette recorders, and game machines. Computer and consumer electronics companies have long hailed "multimedia" as an all-purpose product for work, play, and education.

The Communications Age. The value of communication for humankind has moved from the psychological cognition (Sigmund Freud, 19th century) to a sociological process of conflict resolution. The Knowledge Age and human understanding are rooted in the act of communication or, more precisely, in communicated data, information, concepts, knowledge, wisdom, and volition. When communicated choices define social action, successful business organization and lives result.

Communism was defeated in 1989-91 not by military force, but by life, the human spirit, conscience, and the resistance of man to manipulation. It was defeated by revolt against censorship and by better global communication. A generation ago, social theorist Marshall McLuhan (1968) proclaimed the advent of a "global village," a sort of borderless world in which communication media would transcend the boundaries of nations. "Time" has ceased, "space" has vanished.

The Communication Age is also driven by technology, which foresees the death of distance. The "death of distance," according to Cairncross (1997) will be the single most important economic force shaping all of society over the next half century.

TOWARDS THE ELECTRONIC GLOBAL VILLAGE

Figure 2 illustrates the birth architecture of the Electronic Global Village and the future utopia. The result of EGV, EGC, and telecities can be the Healthy World Human Family Utopia. This utopia can be perceived as a technique to manage the growing, educated, and aware population of conflict-less nations. Paradigms of revolutions and ages are provided in Table 1. The ultimate target of the Control Revolution is the development of the Electronic Global Village.

The consequence of EGV is the emergence of the Electronic Global Citizen (EGC), who can take advantage of the Global Information Infrastructure (GII). These citizens, who live in a telecity where local municipal area networks telecommunicate through a teleport will be able to use information services and participate in the Interactive Age.

As Fukuyama (1992) brilliantly argues, the economic logic of modern science together with the "struggle for recognition" leads to the eventual collapse of tyrannies, witnessed in both the West and the East.

THE PARADIGMS OF REVOLUTIONS AND AGES

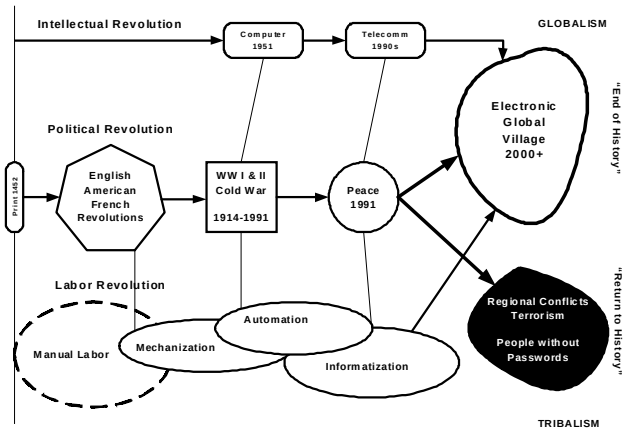

Figure 2 The Birth of the Electronic Global Village and the Future Utopia

Table 1 The Paradigms of the Revolutions and Ages

Revolution/Age	Paradigm	Shift From	Shift To
Reason Age 1452-1775	Rationality	Superstition	Objectivity
Science Age 1500-1800	Method	Belief	Theory
Technology Age 1800-1914	Model	Idea	Solution
Scientific Revolution 1914--	Truth	Views	Laws
Electronic Age 1940s--	Control	Mechanization	Automation
Computer Age 1950-1980	Processing	Facts	Data
Information Age 1980s--	Pro-acting	Measurement	Concept
Knowledge Age 1980s--	Awareness	Intuition	Rules
Telecommunications Age 1980s--	Reach-Out	Local	Global
Communications Age 1990s	Opportunities	Isolation	Connection
Interactive Age 1990s--	Involvement	Top-Down	Feed-Back
New Economy 1990s--	Maximizing opportunities	Capital	Networked knowledge
Global Economy Age 1990s--	Marketplace	Many	One
Electronic Global Village 2000--	Movement	Things	Thinking

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