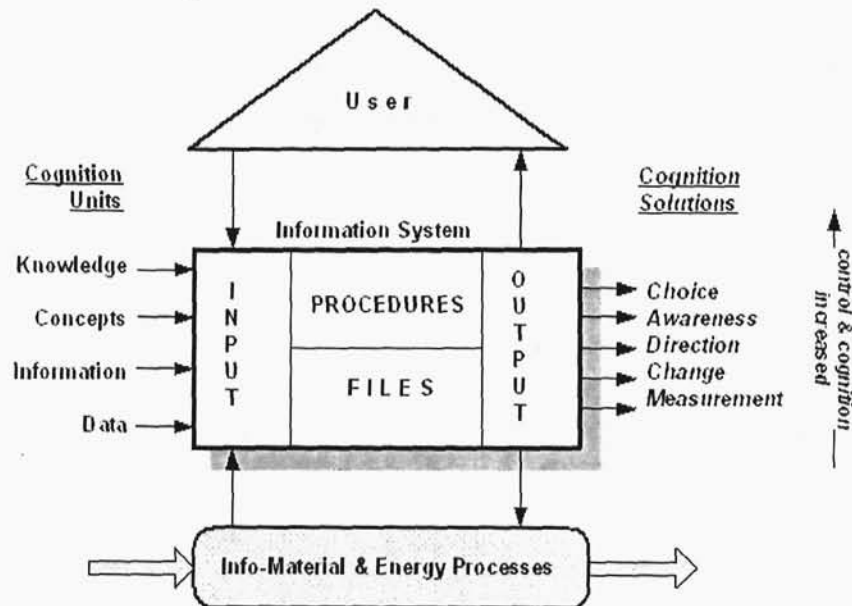


Figure 10-8. Information as an information source



the message is of greatest importance but is very difficult to automate. At the top of the pyramid are action-oriented messages such as face-to-face communication, telephone and fax, memoranda, and letters. This type of message format is the richest in content and it will soon be a luxury to practice some of them.

The hierarchy of message formats driven by applied media reflects a concept of information richness, defined by Daft and Lengel (1986) as the potential of the information to carrying capacity of data. In this study, richness is defined as the ability to communicate a message in the most meaningful and effective manner³.

THE IMAGES OF INFORMATION

The Image of Information as a Resource

The wide applications of computers since the 1960s first in data processing and later in complex

enterprise-wide applications turned our attention toward the reliability of data files and databases. The latter approach led toward better integration of information about all resources of an enterprise, such as manpower, money, machines, material, management, market (6M) and eventually data as a new resource.

Data is a meta-resource which measures the values of 6M other resources. These data are organized in information systems that are processed by computers or manually. As a result, information, concept, knowledge, and wisdom are generated to influence or direct further *control* and *cognition* in a given action/circumstances. It is interesting to notice that without the 6M, "data" has no meaning and is useless in such a case.

Figure 10-7 depicts the role of data-information as an organization's reservoir of cognition and memory. Data-information properly gathered and processed can become a product, which can be packaged, sent and sold as a "soft commodity." Commercial databases are one such product. Another example is computer software, such as

MS Office, which is de facto organized information and sold as a product.

An early definition of the information society was based on the fact that information is an economic resource, skillfully managed by control or profit seekers.

The Image of Information as a System

Information is usually perceived as a system which integrates and controls other systems of an enterprise, such as business, engineering, production, and logistics, as a single dynamic complex system. At the end of the 20th century, a set of such enterprise information systems is managed by a chief information officer, who in general oversees the new business function of *information management*.

Figure 10-8 illustrates the architecture of an information system controlling underlying information-material and energy processes. An information system has the goal of controlling subordinated processes to produce solutions outside the system.

Among inputs can be transactions, data, information, concepts, and knowledge, and among outputs one can expect process measurements, change, awareness, choices based on wisdom leading to better decisions and cognition about those processes and their circumstances.

The way IS are designed and programmed determines information quality, which is characterized by information relevance, timeliness, exclusiveness, accessibility, accuracy, price and format.

Needless to say, IS are a main tool of civilization, beginning with language, writing, papyrus, books, accounting, publishing, and now moving into computers, networks, and artificial intelligence. Each new information tool brings a change or even a shift of civilization. Therefore, each new version of this kind of system should

be carefully analyzed for its possible support or dangerous impact.

The Image of Information as a Mind

Information is the main factor in civilization development, which is associated with a human brain's ability to process information. In fact, this is what differentiates us from animals. Civilization is full of puzzles on how humans evolved due to their brain potential. For example, the Neanderthals had brains 20% bigger than ours, but they did not survive till nowadays, since they, despite larger memories, had some problems in processing new facts. Therefore, a human brain still has huge complexity which is not yet fully known in its dynamics.

The image of information as a mind, which controls a brain, can be seen as analog versus digital information processing, as modeled (with of course reduced complexity) in Figure 10-9. An analog signal guides the performance of specific electrochemical processes that are triggered within the brain structure. But these processes carry information and have a particular meaning. In other words, they may also play the part of active information for other neural processes. In this way, a series of interlocking levels of meaning, information, and electrochemical processes result.

A formative mental process manifests itself not only as an electromechanical procedure, but also as a more subtle action within the brain. Signals in a brain can be categorized as either analog or digital. An analog signal flows between bio-devices (sensors, receptors, memories, conductors, and transducers) within the cognitive and life processes (transduction-motor, behavior, communication, decision-making, and info-steering) as neural signals. This signal is a neural current in a single fiber or a bundle of redundant fibers, which has a magnitude related to the magnitudes of some set of primary sensory-nerve stimulation. In analog information processing, message representation

and information reflection is continuous. According to Powers (1973), analog processing produces perceptions of intensity (light, heat, mechanical deformations), sensations (taste, temperatures, and smells), and configuration of kinesthetic reactions. In contrast, more advanced levels of human behavior are based on semantic reaction, which is controlled digitally through routines stored in memories. According to the same author, the

following levels of control, such as: a) perception of change (e.g., rising or falling tone of a voice), b) control of sequence, c) control of relationships among events, d) control of strategy, e) control of principles, f) control of systems—are all based on digital signal processing.

The functional architecture of a human brain and mind (Figure 10-9) defines the brain as a system of bio-devices and hybrid operational

Figure 10-9. Information as a mind

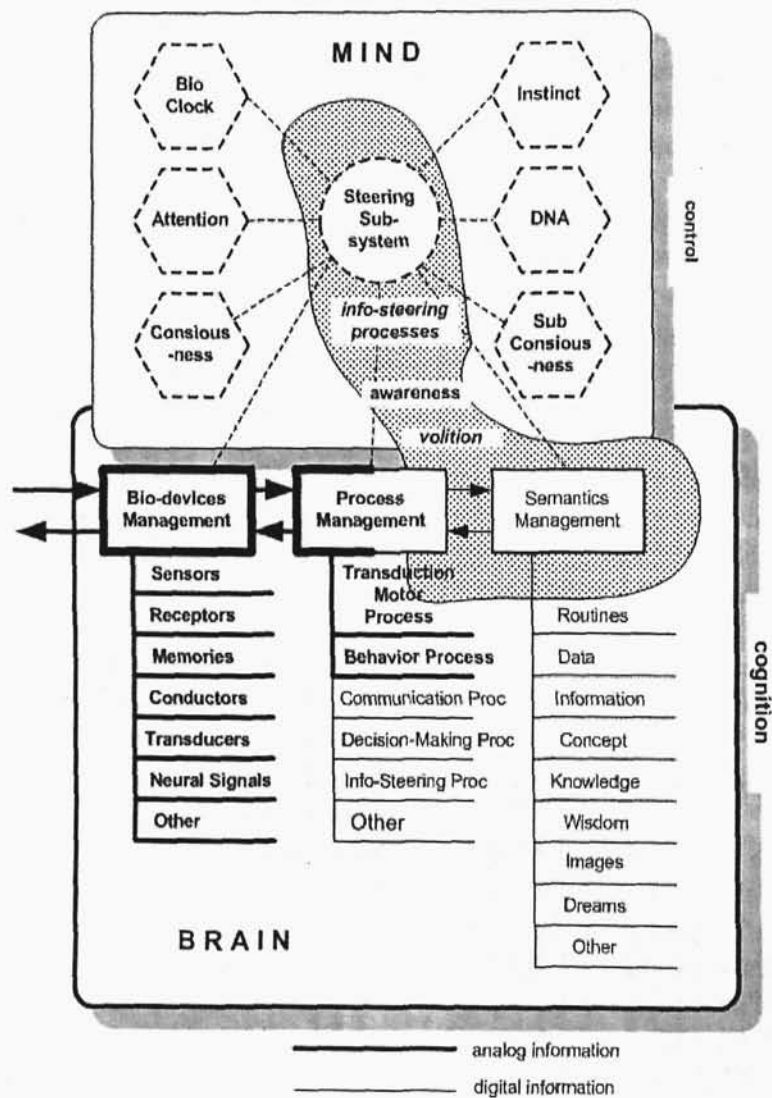
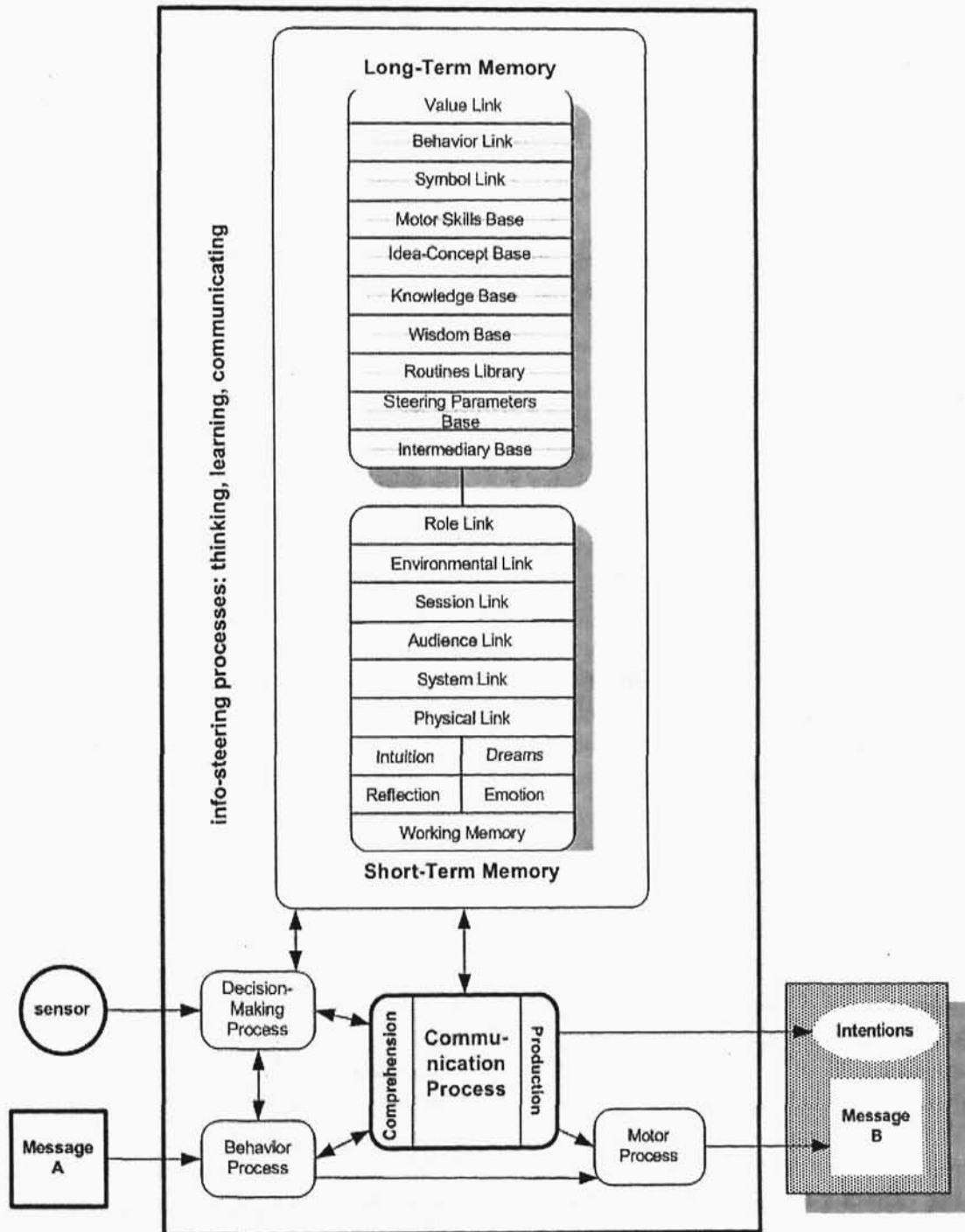


Figure 10-10. Information as human communication



processes. The contents of a brain constitute a mind, which exchanges semantics with the hybrid processes. The mind is composed of routines (programs), data, information, concepts, knowledge, wisdom, intuition and dreams. These semantic entities are processed and handled by the decision-making process, behavior process, and communication process, all supervised by the info-steering process (Figure 10-10).

The info-steering process can assemble the mentioned procedures into the following actions:

- Thinking process
- Learning process
- Communicational-reactional-sensorial process
- Communicational- reactional-perceptual process

Bohm and Peat (1987) argue that the whole area of perception and communication in a brain and mind must be considered as an indivisible whole. Perhaps it is true, since our scientific knowledge is very recent, that the presented information model of a brain and mind suggest that the information approach to this "device" can be helpful.

The Image of Information as Communication

Communication is a channel for sending information from a sender to a receiver. Communication without information is idle and uncommunicated information is "dead." The example of the *Neanderthal* people indicates that since they had problems with information processing their communication skills were limited to unarticulated sounds. Therefore, they lost to the *Cro-Magnon* people who could use language and speak, which let them be better socially organized.

Continuing analysis of the information-communication-oriented brain, let us take a look again at the model in Figure 10-9, where symbol-oriented

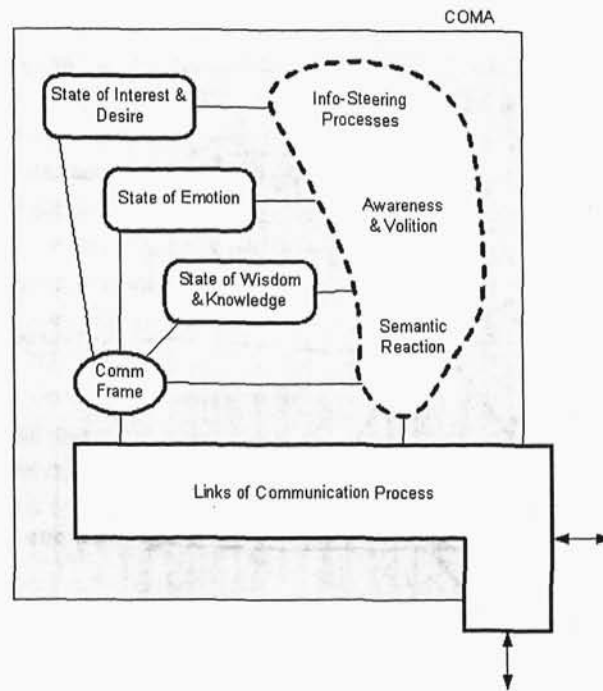
sensors trigger the communicational-reactional-sensor process. In the communicational-reactional-perceptual process, only analog-based receptors initiate communication. The info-steering process creates a semantic reaction of awareness and volition. In other words, it contains the origin/destination of a message and intentions, which produces meaning and action.

In the reactional-sensorial process, only data-oriented sensors initiate communication. In the communication-perceptual process, only analog-based receptors initiate communication. These last two types of communication processes do not involve the decision-making process. They identify cases when communication processes are not entirely based on full involvement of cognitive process. The info-steering process creates a semantic reaction of awareness and volition. In other words, it contains the origin/destination of a message and intentions which produce meaning and action. Pursuing the idea that all links are partly or completely a matter of storage and retrieval routines, one can expand the previous model of a mind into the next model of information as communication in Figure 10-10. In order to isolate the communication process for further analysis, its place and role in the whole cognitive system must be defined. Since the communication paradigm is "link and meaning," the best-suited model for communication identification should involve an information-processing approach.

In modeling a communication process or system, it is necessary to reduce the enormous complexity of human communication to manageable sets of independent important variables. Therefore, it is possible to incorporate the postulated categories into the general model not as "links" but as states of the communication operation management apparatus (COMA) (Targowski, 1990), as shown in Figure 10-11.

The new set of communication process variables combines the operational states (interest, desire, emotion, knowledge) of a communicator with the strategic levels of his/her value link, be-

Figure 10-11. The architecture of communication operation management apparatus (COMA) (The Targowski-van Hoorde Model)



havior link, and tactical level of storage retrieval link that filters a given communication process (Targowski & Bowman, 1988).

The Image of Information as Synchronism

The concept of an info-steering process can be applied in almost every facet of the Information Wave. Let us examine the dynamics of a management process as it is defined in Figure 10-12. This process produces the following outcomes:

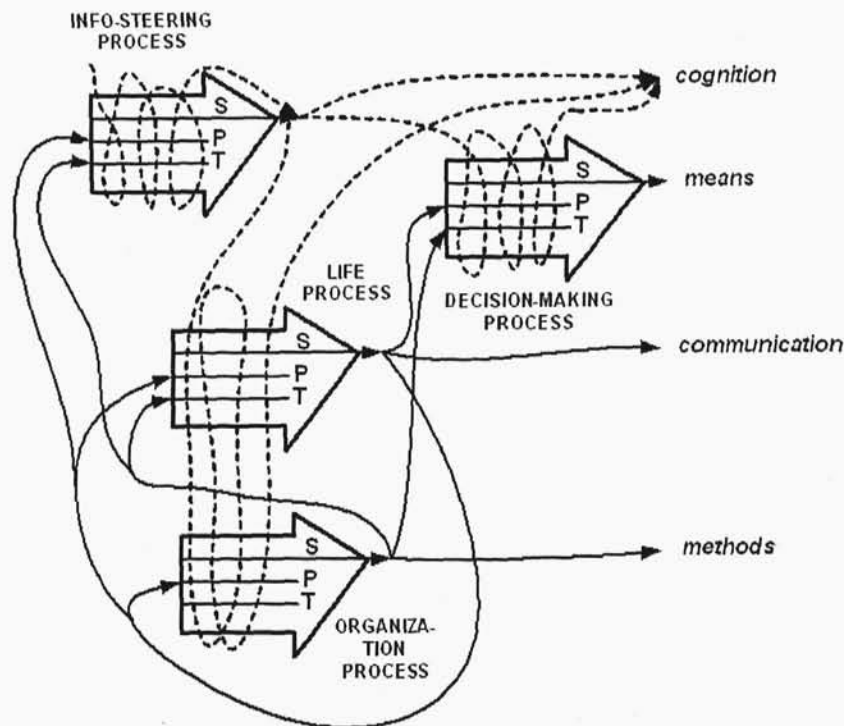
- Means (resources allocation)
- Cognition (data, information, concepts, knowledge, wisdom)
- Communication (message and intention)
- Methods ("tools")

These outcomes are possible, since the info-steering process coordinates other managerial processes, such as life process (a person who manages), human-organization behavior process, and the decision-making process. As Chaitman (1973) defined in his production theory, each of these processes takes place because a substance, performers, and tools exist. The synchronized role of the info-steering process is explicitly shown in Figure 10-12.

The life process of a real person's substance is his/her behavior. A performer is that person, and his/her tools are food and other necessities for sustenance. This process provides support for performers of other managerial processes.

The organization process generates methods that are appropriate for another related process in a given time period. For example, it can be a

Figure 10-12 The information-oriented architecture of management process: *S*-Substance, *P*-Performers, *T*-Tools (The Chajtman-Targowski Model)



computer information system, a management by objectives (MBO), e-mail, mobile communication, or so forth.

The decision-making process operates on means (money, manpower, material, machines, time, information, etc.) and allocates them under a form of a chosen decision. A performer/decision-maker applies decisional tools (information systems, optimization techniques, services, infrastructure, etc.) in making decisions.

The info-steering process produces informed synchronization of all other processes' components. It also produces units of cognition; data, information, concepts, knowledge, and wisdom.

The image of information as a synchronizing process of the managerial processes enters into Bohm and Peat's (1987) vision of matter and mind. The information synchronism is in fact a

force of a manager's (politician's, sociologist's, historian's as well) sensitivity to harmony and the invisibility of consciousness, humanity, and technology. The fragmentation of the management theory (as well as the social theory) is not able to explain the major issues and their nuances that face individuals, organizations, nations, and the world without looking at them from the information-oriented synchronism point of view.

The Image of Information as a Superhighway

Today, *information* is the wellspring of great fortunes, much as land was a century ago. Nowadays, *information* of any kind—words, images, voice, video—can race along electronic "*information superhighways*" or "*highways of minds*" at the

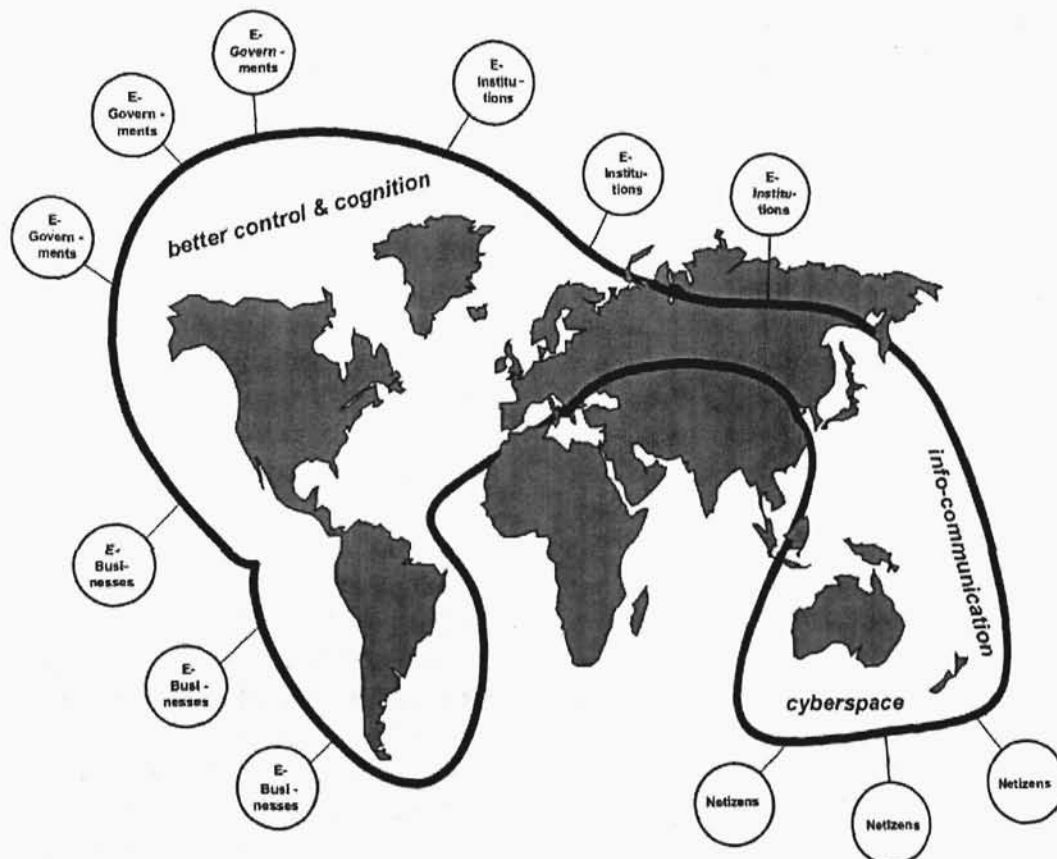
speed of light. The big telephone companies are allies in building the new fiber-optic infrastructure around the globe. In the 1990s, the biggest story in the world has been the creation of an integrated telecommunication industry—a convergence of telephones, television, computers, and an array of data banks, including newspapers, libraries, and even Hollywood studios. That convergence means that traditional categories are losing their boundaries. Telephone companies are going into the cable business, cable companies provide telephone services, and very soon it will be impossible to make a distinction between the two.

Albert Gore (1991) writes that a network of “*information superhighways*” will help turn the mounting load of unused data into knowledge for problem solving. He created a new word “ex-

formation,” information that exists outside the conscious awareness of any living being, but that exists in such enormous quantities that it sloshes around and changes the context and the weight of any problem one addresses. The goal of the “*information superhighway*” is to convert “ex-formation” into *information* and then to convert it into shared-communicated concepts, knowledge, and wisdom.

Tomorrow that kind of system will send data millions of times faster than can be done today. One fiber-optic cable is capable of transmitting the entire Library of Congress—all 110 million volumes—in less than five minutes. That is more than we want to read most evenings. But it is an example of what the “national information

Figure 10-13. Information as a superhighway



superhighway" may one day make available in nearly every home.

The "*information superhighway*" connecting schools, universities, hospitals, businesses, governments, and net-citizens will help create high-quality education in the smallest and most remote schools, or start a society-wide revolution as important as the invention of printing in 1454. Conversely, if access to the I-way is restricted to those who already have money, power, and information, then this highway becomes nothing more than a classic case of economic imperialism, taxation without communication, that one critic has dubbed "toll roads between castles" (Karraker, 1991).

As a model of the "information superhighway" shows in Figure 10-13, it covers mostly developed countries or about 1 billion people with a password, while the remaining 5 billion people are kept in information darkness. Perhaps the great payoff of the I-way will appear within one to two generations (about 2020-2050). The railroad, the electric motor, the car, and the telephone, new products developed by corporations for profit were similarly anemic when they were in their youth. However, access to the Internet is essentially free; one pays for the facilitation of this access by providing a browser, problem-solving help, additional storage, and so forth. This I-way is like a public library but organized electronically to assure easy storage and retrieval as well as downloading.

In general, the I-way is a strong element of the Information Wave and will stay and be constantly improved in such a way that what was once science fiction is on the verge of becoming civilization reality.

The Image of Information as Power

Information, knowledge, and wisdom are the sources of power for a leader who is skillful enough to apply them in practice. The leader's cognition conceptualizes the situation and directs him/her

toward defensive or active power. The former is the capability to prevent unwanted change and the latter is the capability to produce wanted change (Boulder, 1989).

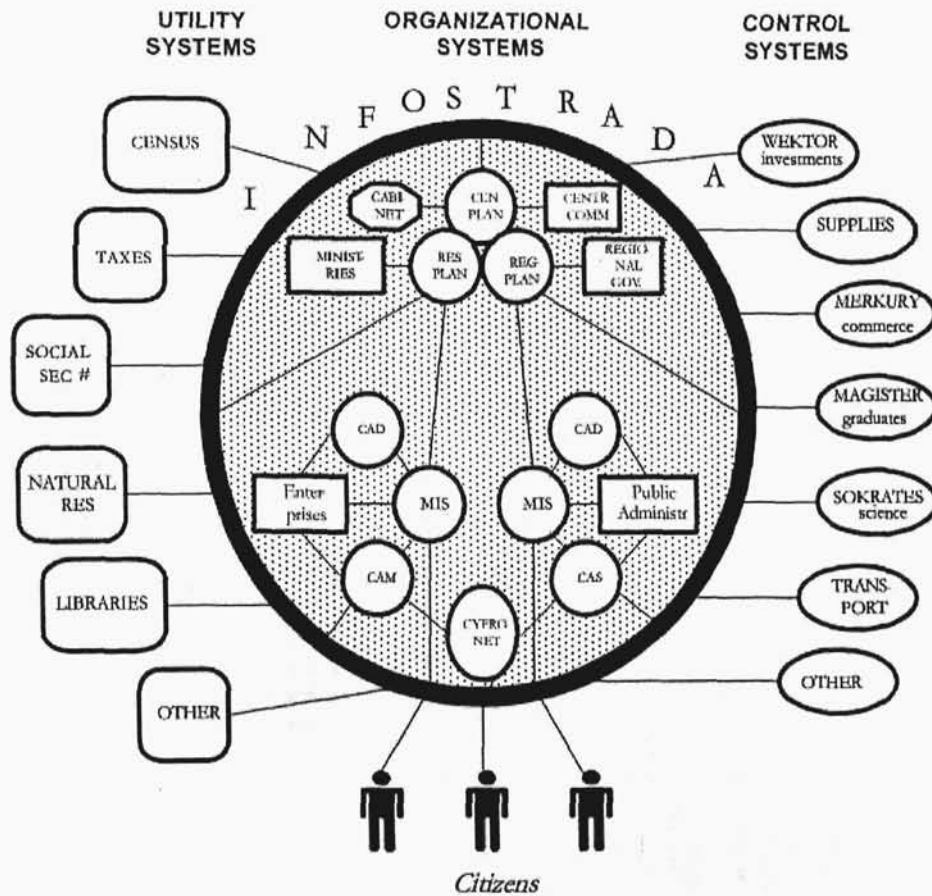
Access to and the art of using information are two of the most important factors of power. Relevant information and access to it on time may trigger correct decisions about incoming change. The prevention or reinforcement of this change is a sign of strong power. Power based on understanding is very often more significant than power based on economic or military might. It is power of conscience, since, for example, Jesus, Muhammad, and the Buddha, gained long-term influence over their followers than did Caesar, Napoleon, Hitler, and Stalin, or even the Morgans, Rockefellers, Carnegie, and Gates in business.

Information may play two roles in maintaining power. In democracy, free flow of information prevents unwanted dictatorship. In totalitarian societies, limits on the flow of information protect power. The fewer citizens are "in the know," the easier it is to keep power. In democratic societies, networking via I-way improves their control and cognition and is welcomed. On the other hand, networking is seen in totalitarian societies as a threat to the regime. The dictatorial regimes keep citizens in informational slavery. Therefore, the National Information System with its INFOSTRADA (information superhighway) which was initiated in Poland in 1972, was stopped and destroyed (Targowski, 1991) by a threatened regime.

The Image of Information as Art

Art is information which cannot be falsified. The history of art is the history of viewing the world and reality in a language of beauty (with exceptions of Stalin's socialist reality and Hitler's "Beautiful German"). Until the 18th century, art was mostly exact (of course with exceptions, for example, such ones as Byzantine art or Asian art), "photographic" registration of events and

Figure 10-14. National information system (CAS-Computer Aided Service, CAD-Computer-Aided Design, CAM-Computer-Aided Manufacturing) (The Targowski Model 1972)



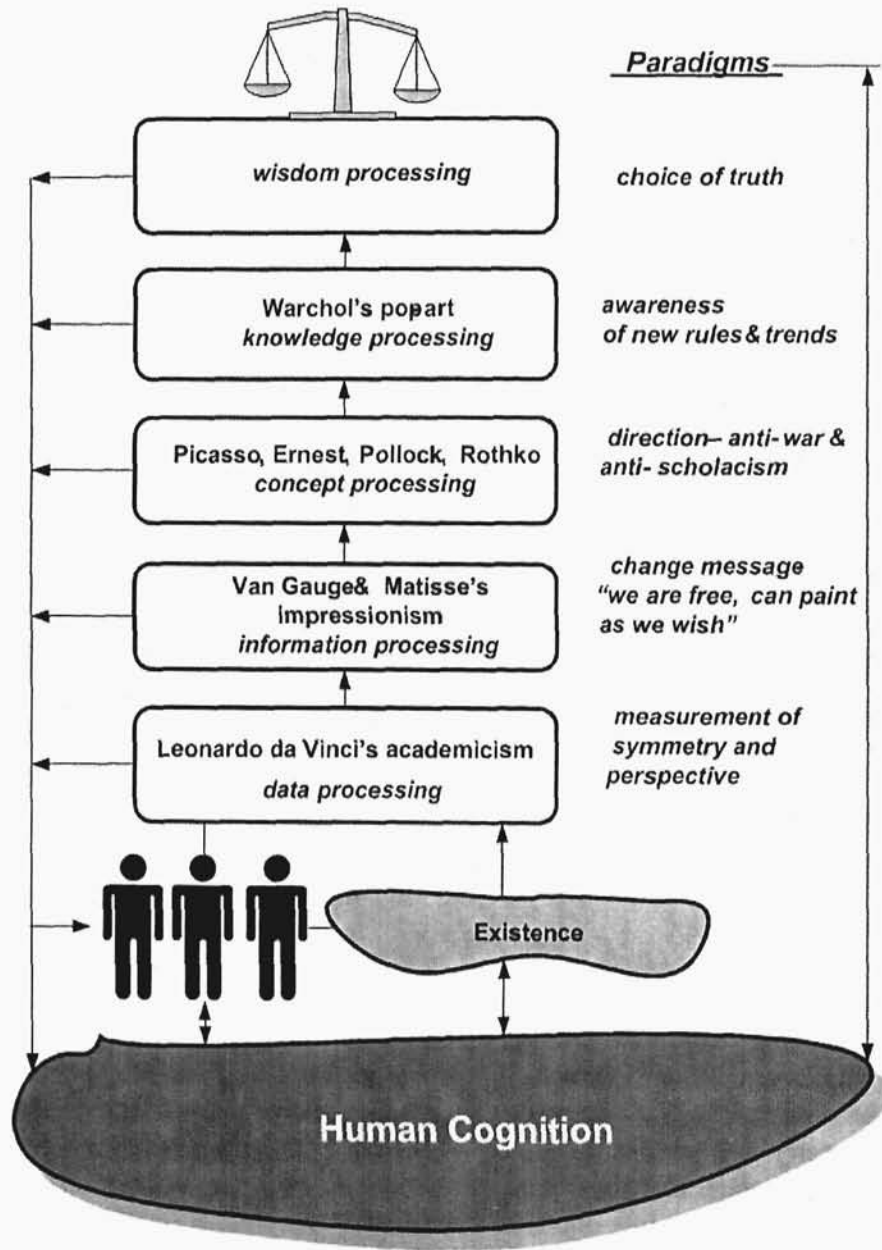
figures playing important roles in the society. It was a time of Leonardo da Vinci's academicism, emphasizing symmetry and perspective (*data processing*). Art, was in those times, a rhetoric of power. Its mission was to glorify a ruler and his court.

After the French Revolution, artists abandoned their sponsors; they become poorer, but free to do what they wanted to do. In the 19th century, romanticism in music and literature, as well impressionism in painting, liberated artists. They left their studios and entered the real world of the beauty of nature. Van Gogh, Matisse, and Gauguin went to the countryside and painted sun, flowers,

and good mood, supported by good company and good wine. Ever since, artists have tried to define their own concepts of reality, and they often saw it as a processed actuality, with a message for change: "We are free and can paint as we wish" (*information processing*) (Figure 10-15).

Academicism in art, based on Leonardo da Vinci's (and Piero Della) rules of symmetry and perspective, was replaced in the 20th century by an anarchy making anything possible in art. It was the manifesto of post-impressionism, which Paul Gauguin proclaimed in 1901. The artists broke with any strategy of *how* to paint, and looked for a new strategy of *what* to paint. Now art and sci-

Figure 10-15. Information as art



ence seek the same clue, which is *truth*. The 20th century in art is a century of permanent search by the avant-garde for a perception and synthesis of times (*concept processing*).

Pollock's action painting is an art without beginning and end. It is a reflection of reality in life, science, and politics. Art wants to optimize our perception and feelings. First Picasso's cubism, then futurism, the Bauhaus's holism, Dada, Dali's surrealism—these art schools are manifestos of change and engagement in a social process, which can be illustrated by Picasso's *Guernica* (1937), *Pigeon of Peace* (1948), and *Massacre in Korea* (1951). He is followed by Pollock and Rothko in New York and by others in Europe (*concept processing*), by Andy Warhol's pop-art, New York's happenings, Italian transavanguardia, and superrealism. All these schools quest for a message through new rules and patterns. Marshall McLuhan even proclaimed "the medium is the message." Information "converts itself" into energy and matter, a secret of life and its chance of survival (*knowledge processing*).

Whether art will reach a level of wisdom processing is a question. Jean Dubuffet, who is considered by many equal to Picasso, says: "The wise art? What a crazy question! Art is nothing more than a product of happiness and craziness. A man without bread dies; without art, the man dies from boredom." It is one artist's opinion.

The Polish artist Stanislaw Witkiewicz said in 1919: "Art is such a discipline where a lie never leads to positive results." The Witkiewicz rule can be tested in the Soviet Union and Nazi Germany. In the former, after the Bolshevik Revolution in 1917, the new order accepted only socialist realism in art. The artists could only glorify work in the fields and on the shop-floors. Such artists as the great poet Osip Mandelstam, who did not follow this directive, were sent to the general administration of the camps, (Gulag) or convicted as parasites. Joseph Brodsky, a future Nobel laureate, did not obtain a government license to be a poet! Vladimir Mayakovsky, a poet of the Revolution,

committed suicide in protest against this official cultural policy. Boris Pasternak, who received the Nobel Prize for *Doctor Zhivago*, could not accept the prize because the Soviet first secretary of the Communist Party, Nikita Khrushchev, did not like the book. At the beginning of the 1980s under the Brezhnev regime, the avant-garde exhibition in Moscow was demolished by government bulldozers. Needless to say, in those 70 years, Soviet official art lied. However, it lost control of its artists in 1991 when the Soviet Union was dissolved.

In the period between the two World Wars, Berlin became the capital of decadence. The play and movie "Cabaret" illustrates this period in German culture. In 1933 when Hitler came to power, the deconstruction of German culture began on a wide and premeditated scale. Police closed the famous Bauhaus school. About 25 directors of museums were fired; leading artists fled the country. Minister of Propaganda Joseph Goebbels ordered books to be burned which were not in line with national propaganda. It took place in the same country where a century before Heinrich Heine had said: "where books burn there minds flare up." All avant-garde painters were condemned. The Fuhrer asked "what artist is that who paints sky in green and grass in blue?" He called the avant-garde a sick people who should be sent to psychiatric hospitals. Only a new school of "the beautiful German" could be practiced. It was nothing more than a repetition of Soviet socialist realism.

Both Communism and Nazism are histories of censored and falsified information. Their goal was to keep people under strong control through fear and tension. Both "new civilizations" "overwhelmed the minds" of citizens and did not allow independent, critical, active thinking. One civilization was eliminated by force, the other by the idea of freedom.

Today, a free man applies art, literature, and music as a thermometer of life's rush and a compass which indicates the world's state of mind. These

Table 10-2. Information matrix, perspectives vs images in 2000th

PERSPECTIVES OF INFORMATION	INFORMATION & IMAGE AS								
	Re-source	System	Mind	Communication	Synchronism	Super-Highway	Power	Art	TOTAL
Quantitative	COM	COM	COM	COM	COM	COM	COM	COM	8 8 COM
Qualitative	CTR	CTR	CTR	CTR	CTR	CTR	CTR	CTR COG	8 8 CTR 1 1 COG
Cognitive	CTR	CTR	COG	COG	CTR	COG COM	CTR	COG	4 4 CTR 4 4 COG 1 1 COM
Computer	CTR	CTR	COG	CTR COG COM	CTR	CTR COM COG	CTR	COM	6 6 CTR 3 3 COG 3 3 COM
Decision-Making	CTR	CCTR	COG	COM	CTR	CTR COM COG	CTR	COG COM CTR	6 6 CTR 3 3 COG 3 3 COM
Managerial	CTR	CCTR	COG	CTR COG COM	CTR	CTR COM COG	CTR	CTR	7 7 CTR 3 3 COG 2 2 COM
TOTAL	5 CTR 1 COM	5CTR 1 COM	4COG 1COM 1CTR	4COG 4COM 3CTR	5CTR 1COM	5COM 4CTR 4COG	5CTR 1COM	3COG 3COM 3CTR	3 31 CTR 1 17 COM 1 14 COG

Source: The author's estimation

instruments are metaphors, since art's calling is to provide a perception of reality in a language of beauty. Nevertheless, art, to be important, must look for truth. This quest is undertaken nowadays by artist-photographers who travel around the world and document tragic and unwise human stories, which can be called *wisdom processing*, as an alert to be more informed and wise about these causes and results.

THE INFORMATION MATRIX

The use of information perspectives and images depends on a kind of application. Table 10-2 il-

lustrates a combination of possible inclusions of either information perspectives or images to each other, taking into account such goals as control (CTR), cognition (COG), and communication (COM). For example, if a decision-making processual perspective is designed thus, it would be recommended to include six CONTROL-indicated information images to optimize that goal, three COGNITION-indicated information images to optimize that goal, and three COMMUNICATION-indicated information images to optimize that goal. Vice versa, if a resource image of information is planned thus, it would be recommended to include five CONTROL-indicated information perspectives to optimize that goal and

one COMMUNICATION-indicated information perspective to optimize that goal.

Table 10-2 helps in defining the following conclusions that:

1. The most popular aim of information is control (CTR).
2. Aims of information images as communication (COM) and cognition (COG) goals are only half as popular than CRT.

It would perhaps be wise to advise that, to avoid unnecessary conflicts at all levels of humanity, goals of improving cognition and communication should be supported strongly and more widely than nowadays. Even saying that, the more we know, the less we need to be controlled or to be engaged in controlling. Of course, communication should also be improved, since it is a tool to share cognition.

THE INFORMED ARCHITECTURE OF AN ORGANIZATION

The Information Wave impacts the architecture of an organization, which becomes more information-systems-intensive, as is shown in Figure 10-16. Every facet of an organization is nowadays supported by computerized information systems (CIS) which interact through computer networks. The architecture shown is an ideal one, which identifies popular CIS, applicable in business and institutional organizations. Of course, it is still too soon to identify any organization which applies all those systems in a very orderly manner.

A process of reaching a level of “perfect” systematization of an entity passes through the following organization configurations, classified by the technology criterion (Targowski, 2003):

1. *Off-line organization* – is a typical solution for the kind of industrial enterprise which operated in the 1950s and 1960s. Several

applications, such as payroll, stock control, production control, and customer orders, are processed independently, and their data is provided in batches.

2. *Networked organization* – is based on computer networks such as Local Area Network (LAN), Metropolitan Area Network (MAN), Wide Area Network (WAN), Global Area Network (GAN), and the Internet. Applications are interconnected electronically, which leads toward a so-called extended organization, or in business, an *extended enterprise*, in which suppliers are connected with producers via a supply chain management (SCM) system to support just-in-time manufacturing.
3. *Integrated organization* – once an organization is connected into computer networks, the next step in its evolution is the integration of applications around a common database. In business, this integration is done presently by enterprise resource planning (ERP) software.
4. *Informed organization* – when an organization is networked and integrated, organizations look for the added value that CIS can bring to management. So far, the CIS(s) have been organized around a formula of *planned versus actual* performance, and systems are of the OLTP (online transaction processing) kind. In the *informed* configuration, systems are driven by OLAP (online analytical processing), which leads toward the application of a knowledge management system (KMS). This system’s main component is data mining, which generates new patterns and rules of a given organization’s stakeholders’ behavior. This is de facto knowledge processing, increasing awareness of decision-makers about issues, which up till then were beyond their grasp.
5. *Communicated organization* – when the content of information is at the optimal level (connected and integrated), it is necessary