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The Dynamics and Architecture of Informing Systems

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Abstract

The *purpose* of this investigation is to define the architecture of computer informing systems. The *methodology* is based on an interdisciplinary, big-picture view of the cognition units which provide the foundation for informing systems. Among the *findings* are the following: informing systems should be designed for rigor and relevance with respect to the cognitive units (information), integrating its purpose and goal to achieve its expected utility; informing systems should also be designed for reasoning richness, informing modes, informing quality, and predicting informing biases and filters. *Practical implications:* A well-designed informing system should provide as an output a message and resonant change by reflecting information that triggers the client's behavior. *Social implication:* The quest for the development of informing systems is not supported by Academia in practice; it is only supported by a close circle of early leaders of such systemic applications who sought to enhance the existing information systems which very often process data but do not inform as they should. *Originality:* This investigation, by providing an interdisciplinary and graphic modeling of informing channels and systems, indicates the vitality of these systems and their potential to create better decision-making in order to solve problems and sustain organizations and civilization.

Keywords: cognition units, informing systems, information systems, information rigor, information relevance, informing resonance, resonant change, informing purpose, reasoning richness, informing quality, informing security, informing space, wise civilization, cognitive space, real space, cyberspace, data, information, concept, knowledge, wisdom, information perspective, information image.

Introduction

The purpose of this investigation is to examine traditional information systems and argue how they should evolve into informing systems (E. Cohen, 1999) in present times when the information infrastructure, driven by computers, is evolving into the info-communication infrastructure. Private networks, such as LAN, MAN, RAN, WAN, GAN, and VAN, are penetrating the information infrastructures of intra-corporation and intra-governmental agencies as well as the Internet, which enters the cyberspace of consumers and citizens and merges with intra-organizational information infrastructures.

In this all-embracing digital networking of organizations and peoples around the globe, the emphasis is switching from passive data processing to interactive, online real-time informing of end-users. These end-users look not merely at end-

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less pages of columns and rows of data, but they also predominately want to look for critical information which supports management by exceptions and objectives (MBO) and other management techniques. High volumes of data are needed to run an enterprise or agency, but they are not the subject of special managerial attention, with the exception of accounting and inventories management. Nowadays, managers—particularly executives—look for information systems which resonate, as Gil and Bhattacherjee (2009, p. 42) observed. Gil and Bhattacherjee want the system to inform and resonate which implies its amplification while going through the info-communication channel; it reminds them of a sound created by a string and amplified by an instrument in a concert hall, which is amplified even more (by acoustics) by the time it reaches the listeners (clients).

Eli Cohen (2009b, pp. 7-19) even goes further stating that the MIS discipline looks more for rigor than for relevance. Needless to say, information rigor leads to an information system bureaucratic technocracy which implements information systems (IS) which are less efficient, less effective and less relevant. The reaction to this situation was the rise of a re-engineering trend at the end of the 20th century focused on fixing information systems, which had thus far been designed as "information islands." Systems like enterprise resource planning (ERP) supposedly had to fix that problem (from bottom-up, data-driven to top-down, system-driven designs); ERP, made by the German company SAP, embraced almost 40% of the world market. Unfortunately, this system is overdesigned with the famous German rigor, which is very difficult to learn and apply. It also is very expensive, and, eo ipso, it is probably not effective, particularly in small and medium sized enterprises which count every dollar/euro.

In the search for information relevance, Grandon Gill (2009a, p. 239) has called for informing resonance which the client should experience to help make a good decision on time, for as Gill states, "Otherwise the client will likely remain uninformed." Gill (2009a, pp. 245-250) also observed that informing resonance depends on the client's information biases, cognitive biases, risk biases, and uncertainty biases which, with other filters and factors, he put into a Client Resonance Model (2009a, p. 249). Both Eli Cohen and Grandon Gill touched on the very important issue of informing quality, which in some cases decided the fate of the world. The following examples support this argument:

- On December 7, 1941 when Pearl Harbor was attacked by the Japanese Air Force, President F.D. Roosevelt was informed about the attack, which resonated in him in such a way that he took the opportunity to enter immediately into the War against Germany (December 11, 1941, hours after Germany declared war against the U.S.) and Japan—a war which was not popular among the American people at that time. Now, however, one can see the logical reason to enter the war: President Roosevelt did not want to risk further expansion of the German-Italian-Japanese Axis which eventually could be unstoppable.
- Early on the morning of June 6, 1944—known as the "D-Day"—Adolf Hitler was awakened and informed that the Allied Forces had landed in France and had attacked the German military forces. However, this informing was done by the assistant so inadequately that it did not create any informing resonance in Hitler, who went back to bed and asked not to be awakened again. For Germany the outcome of the informing was very bad. Hitler's bias was such that he assumed the Allied Forces could not land on French shores without commercial port facilities and the few ports on that side of the English Channel were under German control.
- In October, 2001, the ENRON Company from Huston, which was engaged in trading energy, had a MIS whose reports were not read by the top executives. They were engaged in so-called "creative accounting" which involved putting a lot of money in off-shore private accounts at the cost of steady financial deterioration of the company. The executives

knew what was going on but did not like to read negative reports. Later, during the court trials (triggered by stockholders), they defended themselves by arguing that they did not see the reports. As a consequence of the scandal, new regulations and legislation were enacted to expand the accuracy of financial reporting for public companies (Ayala & Ibárgüen, 2006). One piece of legislation, the Sarbanes-Oxley Act (SOX, 2002), increased penalties for destroying, altering, or fabricating records in federal investigations or for attempting to defraud shareholders (D. A. Cohen, Dey, & Lys, 2005). The act also increased the accountability of auditing firms to remain unbiased and independent of their clients in part because a famous firm, Arthur Anderson, which was auditing ENRON's operations, purposely misinformed or even pseudoinformed ENRON executives, providing the information the executives wanted to see. Needless to say, Arthur Anderson has declared bankruptcy and had to change its name to Accenture in order to stay in consulting business.

These examples showing the importance informing suggest that the development of information systems should be modernized from the old school of data processing (practiced since the 19th century with punched cards and since the 1950s with computers) to the new school of informing systems. It should be noted that informing systems imply the involvements of human beings, who apply the mentioned information systems. To do so one must notice that the examples above of informing practices indicate that the integration of information with communication into info-communication takes place with the behavior of clients (E. Cohen, 2009b) as well. In this investigation, behavior will be understood as being coded in reflective information which, besides a message, is a product of the informing process. This is important since even the best developed informing system may be neglected by its clients as it was depicted in the case of ENRON. Therefore, in this investigation concerning how to develop good informing systems, ideas about the communication process and systems will be combined with ideas about information systems.

To emphasize the power of informing, what Cohen and Gill referred to as informing resonance this author will refer to as resonant change since, when change is taking place, it is worthy to be informed about it! For instance, the German assistant wanted to inform Hitler that the long expected Allied invasion of Europe was taking place, which was a big change in the war and, in fact, was crucial for the ultimate outcome in Europe. Likewise, Roosevelt understood the Japanese attack on Pearl Harbor was a big change in international relations which allowed him to enter the U.S into the war. So change is the resonant signal for a client to do something important.

Why does informing happen when a change of state (of any issue, system, organism, and so forth) is provided? This can be explained by using the mathematical formula (developed by Hartley (1928) and Shannon (1948)) for defining the quantity of information:

$$I = - \text{Log}_2 \; p\,(\alpha)$$

What is the value of information (I) which tells us on Monday about event (α), for example, that tomorrow is Tuesday? If the probability of such event is 100% or p=1, then I = 0, since $2^0 = 1$. This means that such an announcement, e.g., that Monday is followed by Tuesday, does not contain any information. For there to be information, the informing, in practice, should at least provide a message about a change.

Once one understands that informing is essentially about a change, one must ask whether it is only about a change. Certainly, informing is not only about a change in the informing environment but also in minds of clients, using here E. Cohen's terms for informing users/agents/parties. In other words, the end product of informing is gained cognition, decision, and/or action.

The question, then, is what is information? On this subject there is a huge scientific literature, whose source can be traced to the theory of information defined by Shannon and Weaver (1949).

However, this theory treats information as a sort of bullet which is transmitted through a communication channel. Therefore, information is analyzed from the viewpoint of transmission engineering. This theory mostly investigates the syntax of information entropy while the semantics and pragmatics of info-communication, which are very important for the theory of informing, are left out of the theory's concern. Zbigniew Gackowski (2006, 2011) attempted with excellent rigor to mathematically define the semantics of information by putting its syntax into a series of mathematical transformations. This makes it appear as though it would be possible to understand a book's content (semantics) by analyzing its grammar or that by knowing the number of characters one can understand a plot in that book. This author doubts whether such a feat is really possible.

In the times of the Information Wave (the end of the 20th and the beginning of the 21st century), there have been many attempts to define information. These endeavors mostly contrast data with information (Davenport, 1997, p. 9; Davis & Ledington, 1991, p. 4; Drucker, 1989, p.46; Knox, 2007; Tuomi 2000). With the advent of knowledge systems, knowledge has been inserted into the grinder along with data and information. Some models did not forget wisdom, and that was put in that grinder too, creating the DIKW Model. Unfortunately this model has a serious error: it does not have concept in its hierarchy. Without concept, units of cognition such as knowledge and wisdom have no application. On the other hand, Targowski's model, called the Semantic Ladder (DICKW), included concept in his publications (1990a, p. 136; 2003, p. 115) and will therefore be treated as the foundation in this investigation.

If informing is a mental process, this means that it deals with cognition, and as such it has several units, one of which is information. Of course information as the substance of a mental process has many perspectives and images, for example, among its perspectives one can recognize quantitative information, qualitative, cognitive, computer, decision-making, and managerial to name a few. Among information images one can recognize information as a resource, as a system, as a mind, as communication, as synchronism, as a superhighway, as power, and as art (Targowski 2009, pp. 218-239). For each category of information perspective and image, one can offer a definition. In this investigation the cognitive and computer perspectives are mainly under consideration.

In this study, informing systems will be investigated in terms of their purposes, reasoning richness, quality and security within info-communications channels as well as the Operational Management Apparatus of Mind (OMAM) and its info-steering process which reflects meta-informing. The results of this investigation will be discussed in the closing section on implications for developing informing systems. These implications should enhance the methodologies of designing mediated and not mediated information systems into methodologies of designing informing systems which dynamically and effectively support human efforts to informing at the highest quality level. This effort through better informing should reduce the chaos (entropy) and promote knowledge and wisdom as the most advanced units of human cognition.

The Cognition Reservoir of Civilization which Minimizes Chaos

In order to describe the central role of information in civilization development, the theory of Information Ecology has created a model that views the existing body of accumulated human information as distinct from the minds of information clients (E. Cohen, 1999). This body of information is called a Cognition Reservoir (CR) and is shown in Figure 1. Recognition of the CR permits researchers and informing clients to understand cognition units' role in enhancing human cognition about the world. Information Ecology considers the interaction between informing clients and the CR to be the most significant factor shaping civilization's development.

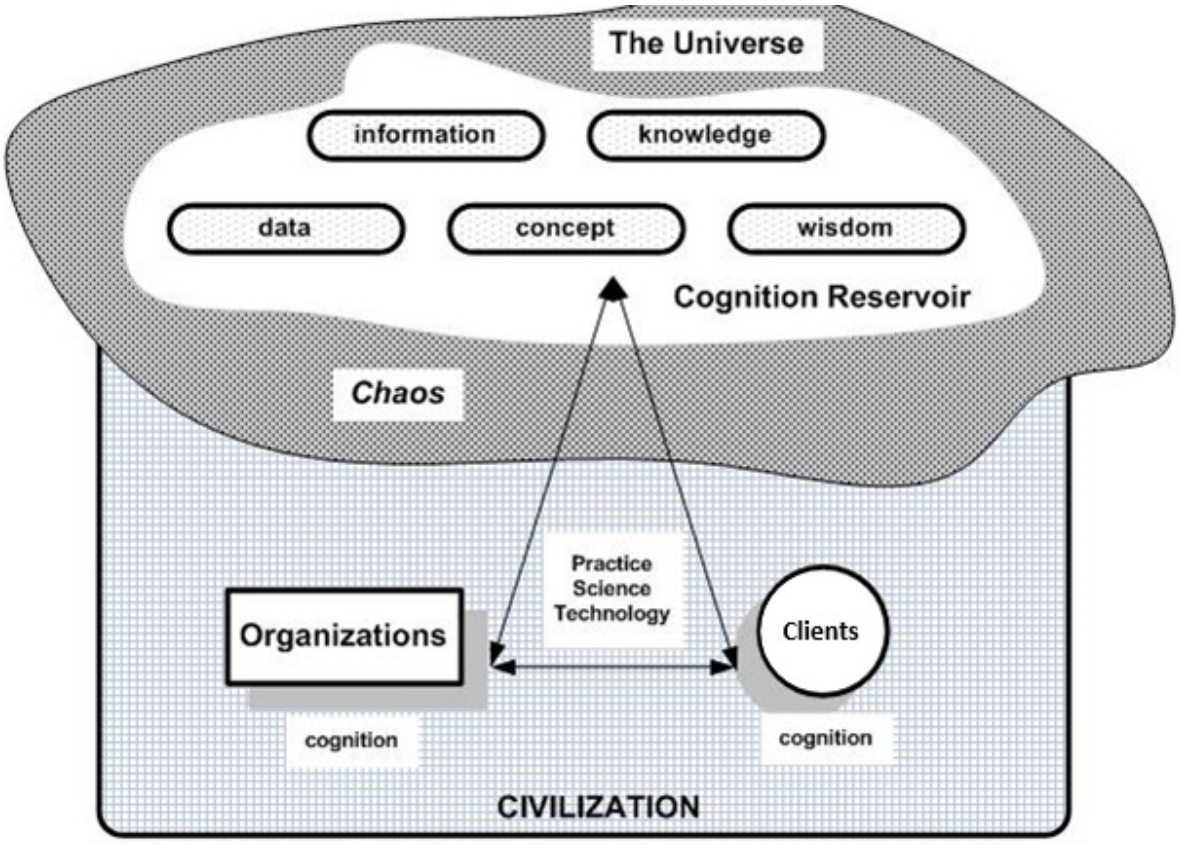

Figure 1. The cognition reservoir of civilization as the informing science framework (first recognized by E. Cohen, 1999) whose purpose is to minimize chaos (entropy) in civilization with awareness of what is good and bad.

The Cognition Reservoir contains a semantic cross-section of cognition (decreased chaos-entropy) with cognition units of data, information, concept, knowledge, and wisdom. These units are created by science and practice (culture and infrastructure in general (Targowski, 2015, p. 5) and are stored and retrieved by different kinds of natural skills and technology, such as writing, papyrus, books, print, libraries, computers, and tele-nets, which has led to the rise of communication-information sciences and management, including the science of informing (E. Cohen, 1999).

The info-communication process conveys meaning through five units of cognition:

- *Datum (D)*

  A measuring unit of cognition that describes transactions between natural, artificial or other semantic systems. In business, data can measure performance characteristics of production, distribution, transportation, construction, or service. Data would include, for example, that the Dow Jones Stock Index (at the New York Stock Exchange) was 17,000 points high on February 15, 2015.

- *Information (I)*

  A comparative unit of cognition that defines a change between the previous and present state of natural, artificial, or semantic systems. Businesses often compare performance characteristics in two or more periods. Information would include, for example, that the Dow Jones Stock Index was 17,000 points high on February 12, 2015 and it was 16,000 points in on February 13, 2015: a **change** of -1,000 or 5.8% from its previous level. In the

literature information has many definitions; in this decision-making context information is treated as cognition which has the potential to inform. More general in terms of sender-centered definition of information, Gill (2015a, p. 95) perceives information as encoded data, knowledge, and relationships that have been transformed in a manner that makes it suitable for informing and reflecting the intent of the sender.

- *Concept (C)*

  A perceptive unit of cognition that driven by change conveyed by information generates thoughts, ideas, and solutions which create our intuitions and intentions—that is, a sense of direction. A concept would include, for example, that, due to large changes in the market, an investor might consider selling, buying, or holding his/her stocks.

- *Knowledge (K)*

  A reasoning unit of cognition that creates awareness based on scientific data (e.g., the Census Bureau, research, etc.), laws, rules, principles, coherent inferences, established patterns, methods, and systems. Knowledge provides a point of reference, a standard for analyzing data, information, and concepts. Knowledge can be categorized in many ways. Below are four different kinds:

  - Domain knowledge (K_d)
  - Societal knowledge (K_s)
  - Personal knowledge (K_p)
  - Moral knowledge (K_m)

  Elaborating on the previous examples, an investor will apply his/her or an adviser's financial knowledge (K_d) to find out which concept he/she should apply. He/she can also apply the remaining kinds of knowledge to evaluate each concept option.

- *Wisdom (W)*

  A pragmatic unit of cognition that generates volition—a chosen way of acting and communicating. Wisdom is a process of choosing among available concept options, and it is based on knowledge, practice, moral factors, and/or intuition. Concluding our example, an investor might choose to wait and see the Federal Reserves' decision on the interest rate before choosing whether to buy or sell.

The cognition units that compose the Cognition Reservoir can be structured from the simplest to most complex in the Semantic Ladder, shown in Figure 2. Events occur at the level of existence that are communicated as data and inserted into the Semantic Ladder of a person, discipline, or organization. This data is subsequently processed into information; information is then processed into concepts which are later evaluated by available knowledge and filtered before one of the concepts is chosen at the level of wisdom by the decision-maker. Then, a *frame* consisting of a message and the decision-maker's intentions (very often different from the message's content) is returned as feed-back to the level of existence.

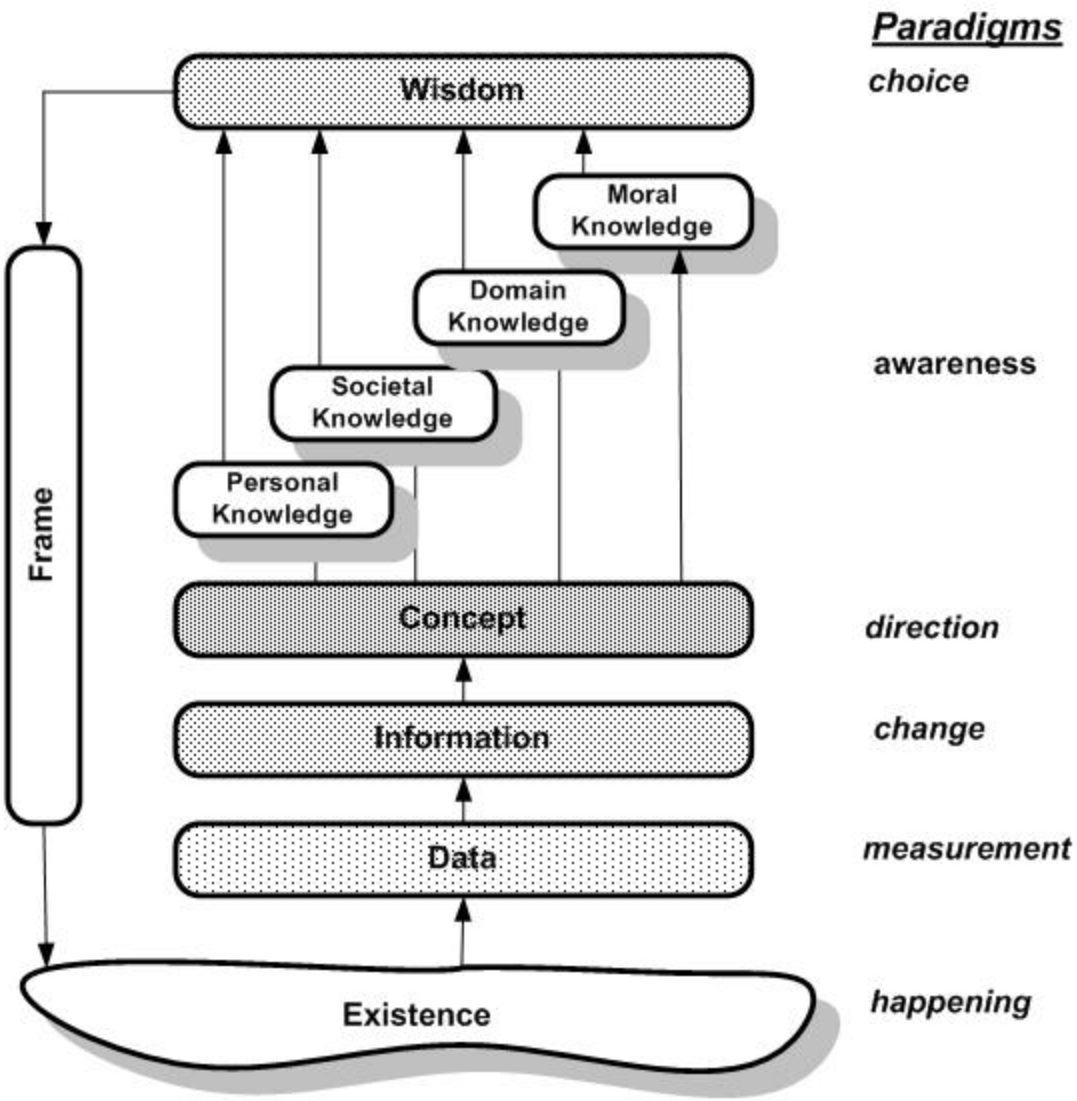

Figure 2. The Semantic Ladder

The Computerized Cognition Perspective

Human cognition increases along with the development of info-communication human interactions within a community's activities and/or technology, at first through printing and later via punched cards, computers, and, most recently, tele-computing. The latter is known under the name of information systems (IS) or as computer information systems (CIS). However, every level of cognition requires a different kind of mediated IS.

At the lowest cognition level *data processing* takes place under the format of *Transaction Processing Systems*. At the level of information, supporting systems are a kind of *Information System*, which compare "planned" with "actual" performance characteristics. The higher levels of cognition require *Expert Systems* based on pre-programmed artificial intelligence with the exception of *knowledge processing* where, in addition, *Data Mining Systems* are of great value too to pursue new rules, patterns and good practices which can eventually update a given Expert System's rules and ways of inferencing. It is a new possibility elevated in the 2010s to enhance Expert Systems such as Mycin built in early 1970s, when Big Data were unknown. It means that

today one can think about developing Adaptive Expert Systems for the environment with frequently changed patterns of behavior, like airspace.

The hierarchy of *Computerized Cognition Systems* (CCS) is depicted in Figure 3. All of these systems require different architectures, skills to build them, timelines, and budgets. It is analogous to the situation in construction, where residential houses need different know-how than public buildings and so forth. The end product of such hierarchical semantic processing is a communication *frame* (or a "packet" in the Internet's jargon) which contains a message with a solution and *reflecting information* (RI). This is the final stage of the informing process. Reflecting information identifies intentions either expressed by a body language if a choice is provided by a person or by a semantic puzzle if the choice is provided by a computerized information system. Very often RI frame is more important than a message. It is often practiced in face-to-face communication or in diplomatic correspondence, where what has not been mentioned is the real message.

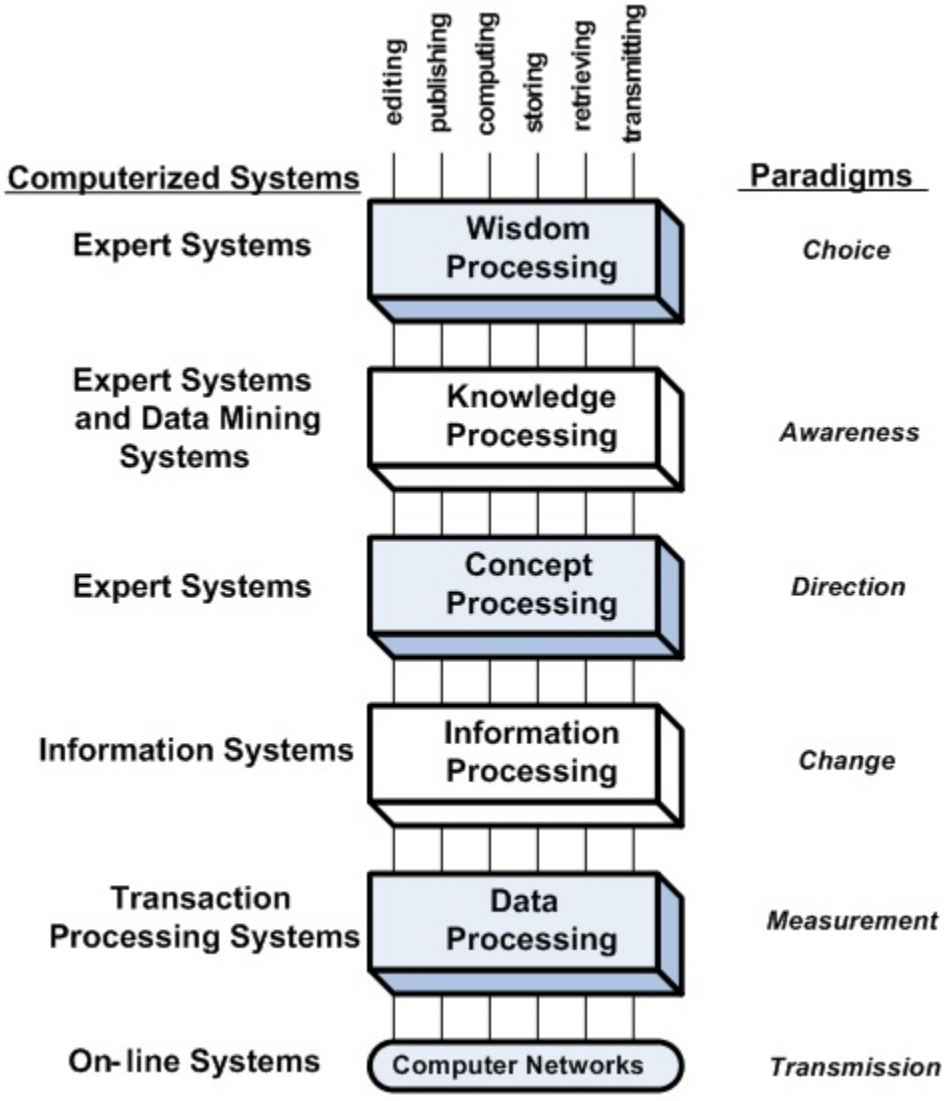

Figure 3. The hierarchy of Computerized Cognition Systems

From the technological point of view, the earliest data processing systems have been processing DATA such as statistical, accounting, weather, accidents, deaths, and so forth since the 19th century. Data was processed first on punched card machines, often called Hollerith machines. Later, since the 1950s, it has been processed on computers, which is still the case today since data is the foundation for the further enhancement of cognition.

Information systems became applicable after computer disks replaced magnetic tapes and allowed for random access to data which allowed for comparisons of sets of data in real time and, of course, online. Certainly this was the beginning of the development of *informing systems*, which began delivering a *change* in an automated way in the informing environment to users/clients who were looking for that change. This *change* is referred to by Gill (2009a, p. 239) as *informing resonance*, which has "a meaningful impact on the client's mental model." While *informing resonance* sounds very universal, *change* sounds *practical*. The latter has broad applications in business and economic, political, and educational settings. Even with respect to internal cognitive processes, like thinking for the sake of thinking, change usually leads to "a change of mind" which is of course an important internal *informing resonance*.

The change or informing resonance triggers the generation of the next unit of cognition: *concept* (or, *conceptualization*), that is, what to do with *resonant change*? This is the most important unit of cognition. Without it the next levels of cognition would not have applications. It is unfortunate that almost all published models of so called DIKW do not recognize the unit of concept. This unit provides the solutions that offer directions for further actions (operations and/or thinking). This level of cognition is the most difficult to computerize, and it is practically impossible for ill-defined decisions, mostly undertaken at the strategic level. For example, should the U.S. send the American Military to Iraq for the second time to fight ISIS? A well-defined situation is rather easy to automate (which is the case for preprogrammed robots); however, a semi-defined decision is difficult to computerize with the exception of certain situations when artificial intelligence has tested techniques (mostly based on forward and backward chaining). These kinds of systems are called Expert Systems (EXS). Today they are widely applied in automated customer service.

However, even when one solution (option) is defined, it is necessary to evaluate its usefulness for a given decision-making process. If more options are defined it is necessary to evaluate each option by using a given domain's knowledge (laws, rules, principles, and so forth). Sometimes one can compare those options using quantitative calculations (compering costs, times, resources used, and so forth) or applying qualitative techniques (fuzzy indicators like good, better and so on).

Once the options have been evaluated, one must choose one option as the final semantic solution. Here one can use techniques such as mini-max, maxi-min, equal chance, and so forth. This level of cognition requires wisdom, which is good judgment and choice. Expert systems are applied at this level if the developers of such systems have wise procedures and know how to convert them into EXS. The final semantic solution is packed into a communication frame and sent to a client/user for operations, archiving, and/or conceptualization.

Although a frame is the final semantic solution, it is not the final stage of informing.

The Informing Process as a Communication Process with a Resonant Change and Reflecting Information

According to Gackowski (2011, p. 60) "what distinguishes informing from communications is that informing necessarily produces an impact on the client side." He perceives informing as a tool applied in supporting operations (2011, p. 68). Perhaps this is right, although, to certain extent, he reduces the universal communication process between clients, parties, agents, and users

to its applications in practical operations and calls it informing. In this way Gackowski excludes internal informing processing that supports the kind of thinking which does not end in operations. It is necessary to recall that the Targowski-Bowman Layer-based Pragmatic Model of Communication (Targowski & Bowman, 1988) defined a *semantic reaction*, not a message and reflecting information, as the end product which is acknowledged by a communicated party on the receiving side. In informing, the semantic reaction triggered by a communication process is called *informing resonance* (Gill, 2009a, p. 239), which this author refers to as *resonant change* in order to make it sound more practical. Resonant change is calculated by comparing sets of data (see the Semantic Ladder).

Most communication process models that could be adapted for the informing process are, in fact, models of a message transmission. The earliest model developed by Shannon and Weaver (1949) is useful for calculating in bits the capacity of a transmission channel and its entropy caused by so-called white noise. This model is useful in telecommunications when engineering a transmission channel. The following communication models began to recognize communication reaction: the model developed by Berlo (1960) and the contextual net models developed by Figgins & Golen (1984), Campbell and Level (1985), Lewis (1987), and others. A model developed by Korzybski (1958) noticed semantic reaction. However, none of the earlier models adequately considered the interplay between communication and the human decision-making process. Most of the models focused primarily on the external message—the bits of information encoded by an informer and passed along a channel to a receiver for decoding, as occurs in military settings. Needless to say Claude Shannon (1916-2001), an American mathematician and electronic engineer, is known as the father of "information theory" (published in a landmark paper in 1948), which was influenced by his work as a cryptographer during World War II. Hence, his interest in information was influenced by the war machine, where he was mostly preoccupied with coding and decoding.

In the Information Wave of civilization that is occurring in the present we need a model that more accurately defines what actually happens when two people or artificial systems communicate. Some progress in the endeavor for a communication model that takes into account internal stages—filters of a message—is reflected in models developed by Jamieson and Hyland (2006) and Gill (2009a, p. 249), who developed the very complex Client Resonance Model which includes several factors on the client-receiver side such as attention, information, cognitive filters, risk and time, motivation, and visceral factors (emotions and feelings) which act at three levels: Level 1-Concept, Level 2-Structures, and Level 3-Compiled. Grandon Gill also defines the general interactions among these filters and attributes.

To compile most of the factors which shape an informing message while passing through the informing process, it is necessary to define ten links of informing chains on both sides of the communication process as it is depicted in Figure 4. Besides the ten links on the chain which shape an informing message, the *informing space* is also recognized. The latter is composed of the following elements:

- A message containing a new cognition for the receiving client.
- Resonant change, which triggers the informing process and is explicitly or implicitly incorporated into the message.
- Reflecting information which is coded, for example, into the body language of communicating parties, particularly into the informer's informing.
- Behavior triggered by reflecting information, for example, under the form of body language.

The best informing takes place if the informing spaces of both clients are pragmatically (why communicate), semantically (what to communicate), and syntactically (how to communicate) similar.

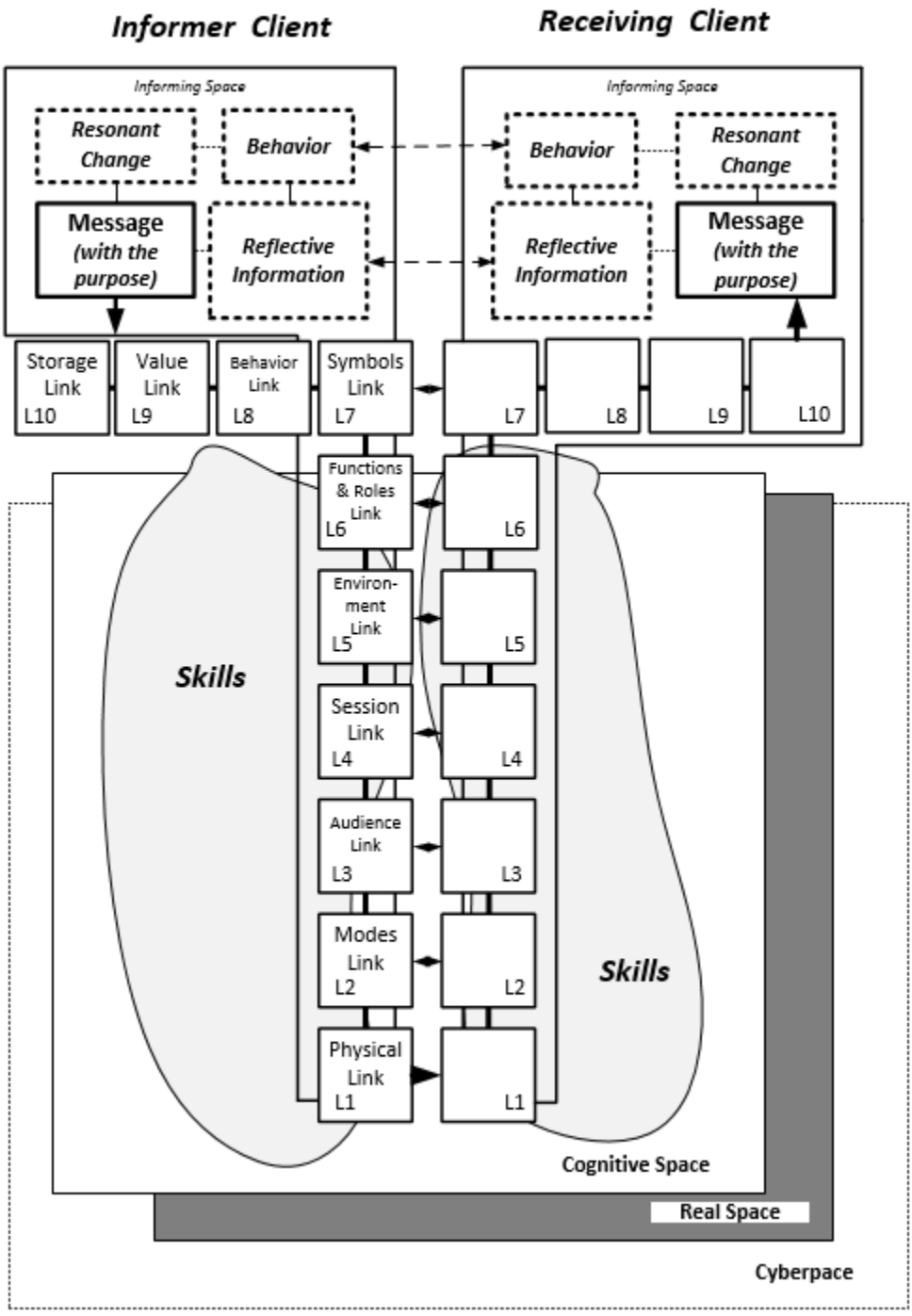

Figure 4. The informing process as a communication process with a communication space

Multiple links (or layers) of the informing process impact the meaning of a message. These links are hierarchical, from the purely physical to the purely mental. At the most basic level—L1—of the informer, the cognition of the actual message enters the physical path to the receiving client. This link may transmit in real-time, or it may be recorded and transmitted with a delay. The path

between the informer's L1 and the receiver's L1 can be through voice, paper, telephone, radio, computer networks or other physical connections.

The next level—the Mode Link, L2—defines a mode of communication (informing). One can recognized the following main modes:

- Command – Control Mode
- Negotiation – Motivation Mode
- Conflict Management Mode
- Information Exchange Mode
- Other modes

The Mode Link will impact the content of reflecting information, depending on the communicating parties' perception of the chosen system. For example, an informer afraid of being taped may generate reflecting information which sounds like motivation but actually means control. Or, for example, the government may motivate citizens to use social networks to be better informed, but it may have in mind better control of their views and behavior. The Mode Link will also determine the proper technological knowledge and skills to implement a given system of informing.

The Audience Link—L3—selects the right recipients of this kind of a message to inform others. Of course, depending on the size and nature of the audience, the informer's reflecting information may apply a self-censored message to not say what he/she wanted to in order to avoid some embarrassment.

The Session Link—L4—is concerned with the space and time of the informing process. It defines whether transmission will occur in a real-time exchange or a store-and-forward exchange. Face-to-face meetings, telephone conversation, computer conferences, and video-conferences would be considered real-time since both parties do informing simultaneously. Letters, reports, e-mail, and voice mail, on the other hand, are store-and-forward exchanges because the message must be stored before it can be received.

The Environmental Link—L5—includes the influence of the physical and psychological environment upon the communication process. People watching a TV program will communicate differently than those who communicate in a restaurant attending a birthday party. Each of the communicators will apply his/her experience of how to do informing in a given environment. Furthermore, it can be a cognitive, real, or virtual environment where each may apply a different set of rules of communication. For example, formal rules of informing are recommended in the real organizational environment where functions and roles are perceived quite clearly. On the other hand, no rigid rules of informing are required at all if a communicator is informing him/herself in his/her own cognition space. In addition, the rules and symbols as well as language are different when they are applied in cyberspace among young generations.

The Function & Role Link—L6—shapes the message and reflecting information in a way which is typical for a given function and role of communicating clients. Such functions as managerial or executive are taken into account, as are such roles as leader or follower when deciding how to define a message and reflecting information. In general the following combinations of roles can be recognized in the practice of informing: boss/subordinate, parent/child, lover/friend, and so forth. Informing during a hiring interview will be different than during a session of problem solving. For example, the body language of both parties is very important for informing during a hiring session. A job seeking person may be involved in the informing process with respect to his/her knowledge and skills when asked a question by a recruiter and vice versa; the latter's reflecting information (body language) may tell a lot when he/she says "we will be in touch."

The Symbol Link—L7—is the first completely mental link. The external links (L1 through L5) may act independently. The mental links (L6-L10), however, tend to change in a coordinated way rather than independently, since they are controlled by info-steering processes in the Operational Management Apparatus residing in our mind. This link addresses the issue of the symbol system used to exchange cognition between informing parties. For example, during World War II the Germans applied the Enigma code to hide their radio-communicated messages among military units. On the other hand the Americans used a Native American language as the code for military purposes. The names of these code talkers were strongly associated with bilingual Navajo speakers who were specially recruited during World War II by the Marines to serve in their standard communications units in the Pacific Theater. Code talking, however, was pioneered by Cherokee and Choctaw Native Americans during World War II (Holley, 2005). If a message informer selects symbols unknown by the receiving client, the informing process will result in a deep misunderstanding due to decoding.

The Behavior Link—L8—is in charge of observing the behavior of a party with which a given informer is expected to communicate. The Operational Management Apparatus of the minds of both parties will evaluate whether non-verbal (body language) and verbal messages contradict each other. If they do, the receiving client is more likely to believe the non-verbal message. For example, when President George H.W. Bush Sr. was asked whether he would raise taxes he replied "read my lips, no new taxes." The impact of the election promise was considerable, and many supporters of Bush believe it helped Bush win the 1988 presidential election.

The Values Link—L9—defines the impact of the values held by the informer and receiver on the informing process. Do they share common values or differ, and how can this impact the informing process? For example, the Americans and Russians both speak in the 21st century about democracy, but their conception of what democracy entails are entirely different. The Value Link filters a message and adds its own understanding of value which supports that message. This editing of a message is done by the Operational Management Apparatus of both communicating parties.

The Storage & Retrieval Link—L10—allows for retrieval of past learned cognition (data, information, concept, knowledge and wisdom) which can influence a current informing process in the scope of a message as well as reflecting information which generates suitable behavior.

Understanding the interdependencies of these ten links allows for defining and carrying out of a better organized informing process. In such cases, confusion can be decoded through an analysis of the impact on the informing process' ten links.

Needless to say, the success of the informing process depends on the communication skills of both clients. When the skills of both clients are asymmetrical, the informing success is in question.

The main relations between generic elements of the informing (communication) process are depicted in Figure 5.

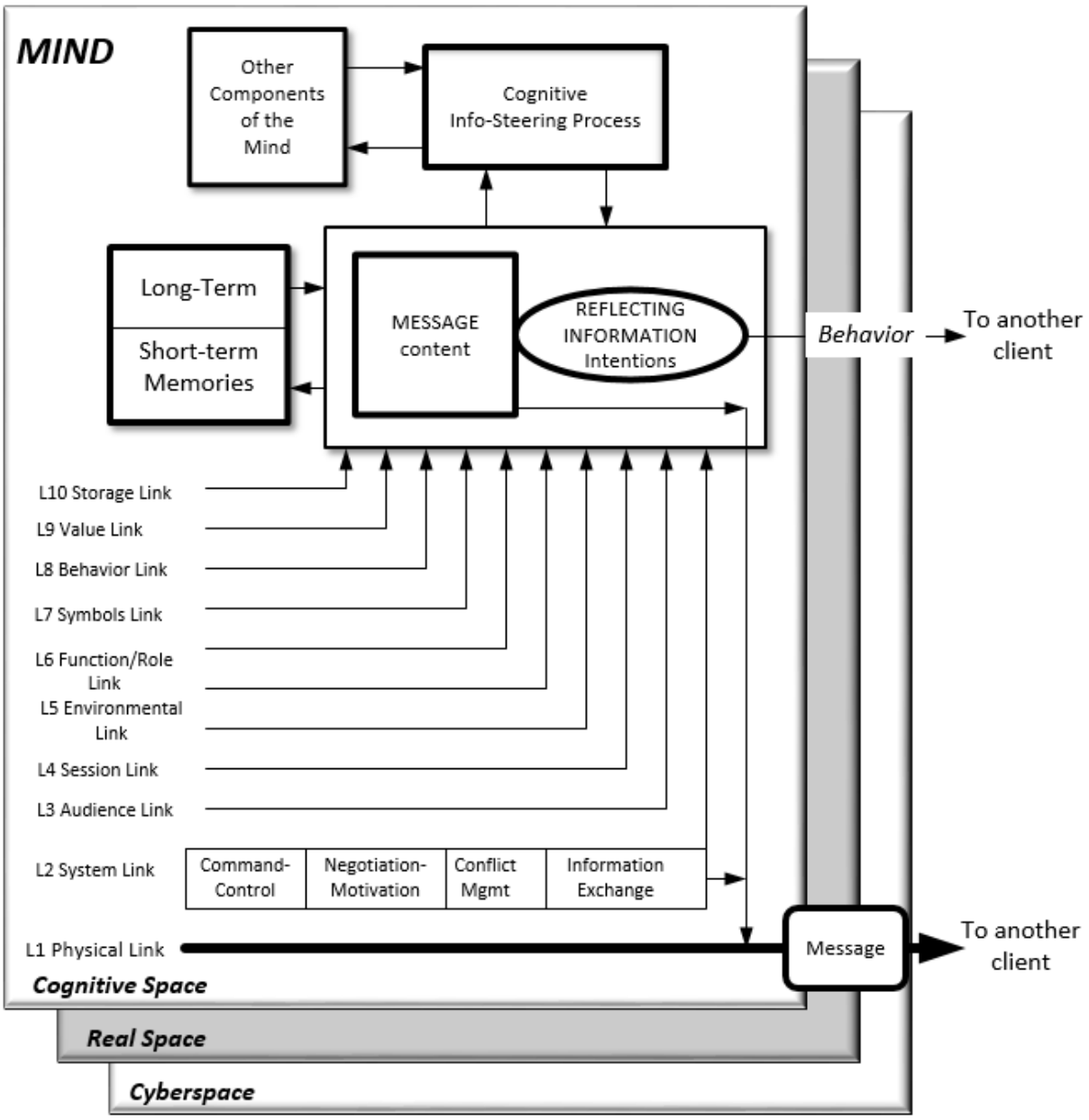

Figure 5. The main relations among the main elements of the informing (communication) process.

Communicative Mind and Its Operational Management Apparatus

The communication (informing) process is not merely a syntactic (how to communicate) semantic (what to communicate), and pragmatic (why to communicate) oriented apparatus: It is also driven by behavior of communicating (informing) clients, parties, and users. The behavior of communicators is particularly shaped by:

- The state of interest, desire and purpose to communicate (informing),
- The state of emotion caused by the informing process (for example by a bad message)

- The state of attention (for example whether an informer received a request for informing or he/she missed it?)
- The state of active cognition such as actual awareness of stored data, information, concepts, knowledge, and wisdom about the subject of a given informing session/project. These cognition units are stored in long-term memory.

All these factors are controled by the info-steering process which generates active relations among the components of the OMA as well as among consciousness, sub-consciousness, instincts, bio-clocks, and heritages coded in the DNA. This process in effect generates volition and a semantic reaction like resonant change. Figure 6 depicts the Targowski-van Hoorde Model of the OMA of Mind (OMAM).

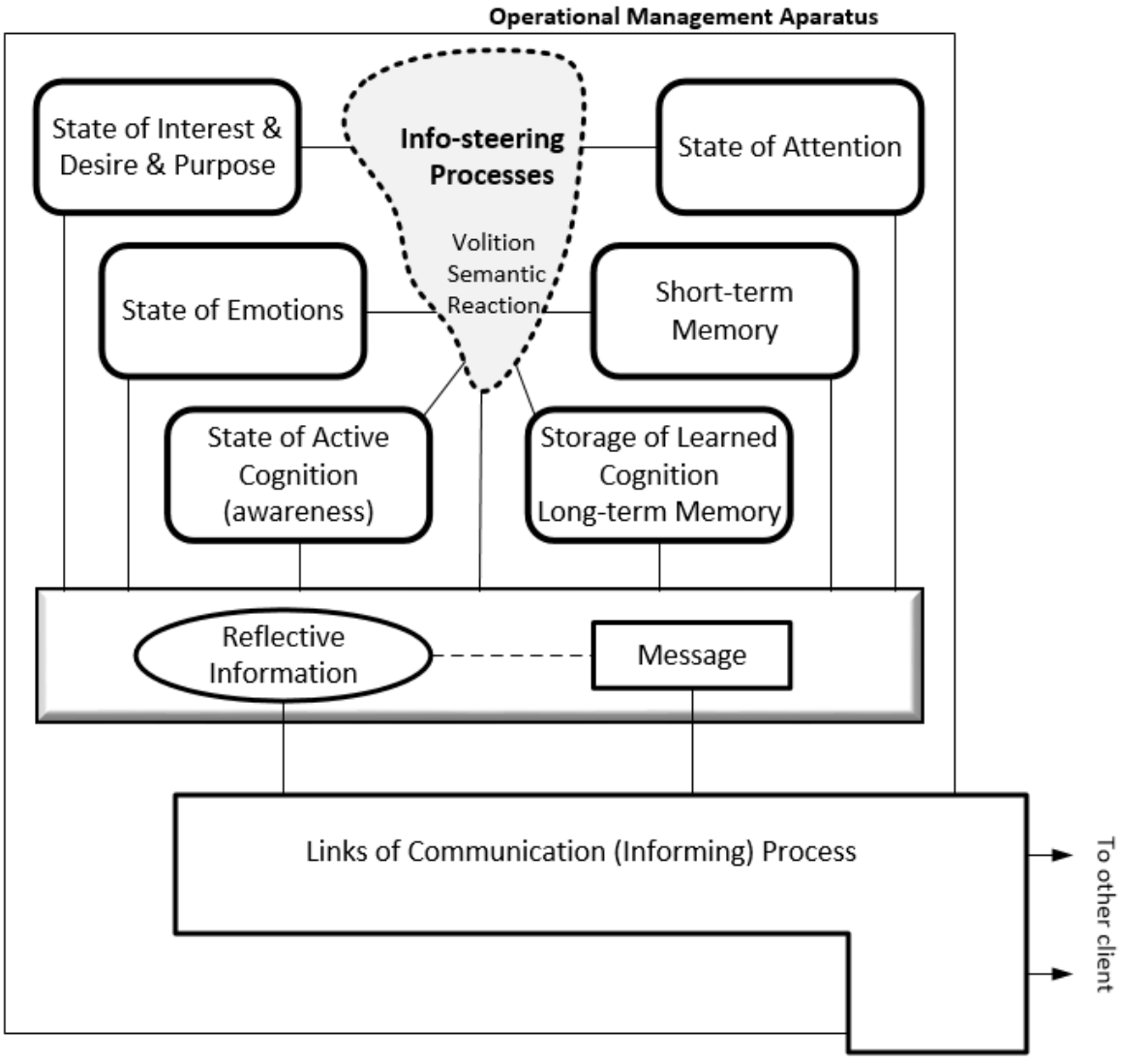

Figure 6. A model of the Operational Management Apparatus of Mind (OMAM) The Targowski-van Hoorde Model (Targowski, 1990b).

The concept of an info-steering process can be applied in almost every facet of the Information Wave. Let's examine the dynamics of a management process of the Operational Management Apparatus as it is defined in Figure 7. This process produces the following outcomes:

- Means (resource allocation within the boundaries of the mind's components, such as, for example, attention time, emotional level of intensity, scope of interest and desire, and capacity of short and long-term memories)
- Cognition (data, information, concepts, knowledge, wisdom as the output of a given informing process/project)
- Communication (message and behavior defined for a given informing session)
- Methods ("tools" which have been applied for the purpose of this steering process, for example software used to compute key performance indicators under the control of a given CEO)

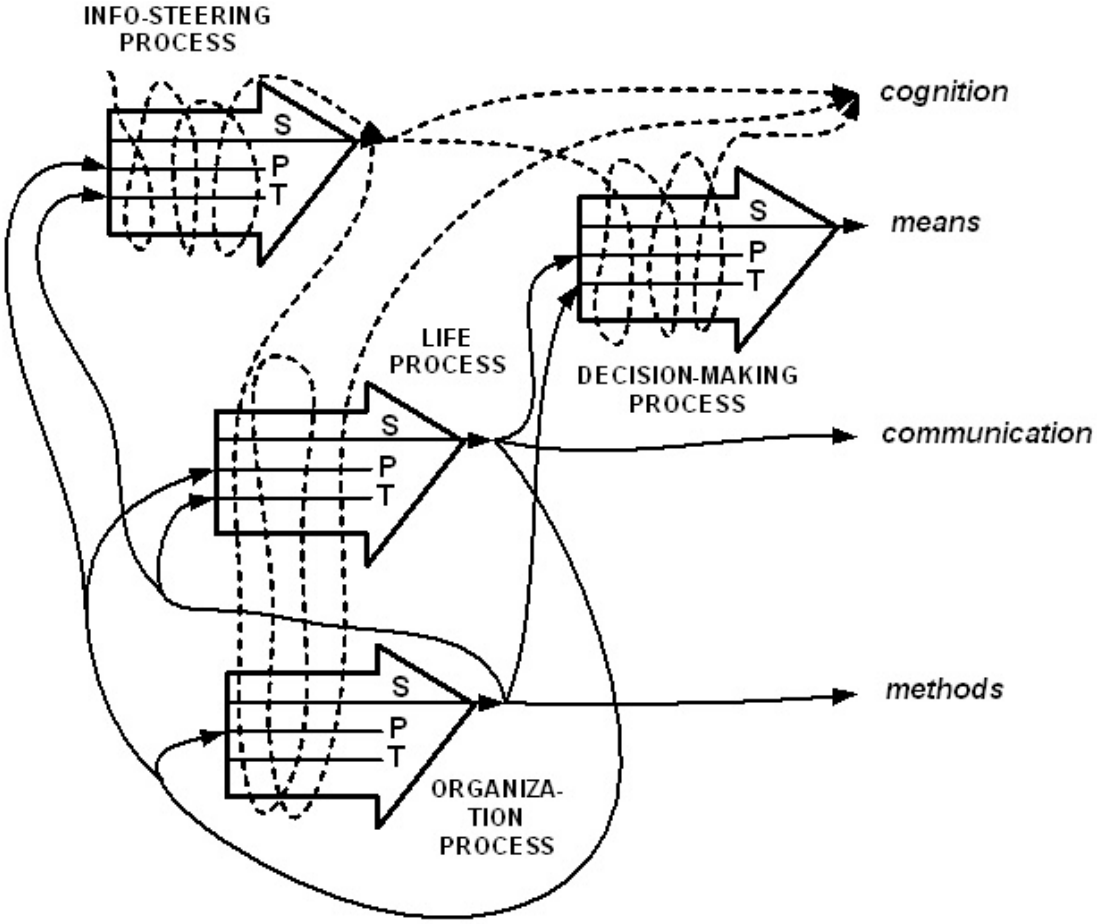

Figure 7. A model of the role of the info-steering process in harmonizing the main managerial processes. S-substance, P-performer, T-tools.
The Chajtman-Targowski Model (Targowski, 2009, p. 234).

These outcomes are possible since the info-steering process coordinates other managerial processes, such as the life process (a person who manages a given informing session), the human-organization behavior process (which usually takes place in organizations), and the decision-making process. As Chajtman (1977) defined in his theory of production, each of these processes

takes place because a substance, performers, and tools exist. The synchronized role of the info-steering process is shown in Figure 7.

The life process of a person's substance is his/her behavior. A performer is a 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 other related processes in a given time period. For example, this could include a Computer Information System, management by objectives (MBO), e-mail, mobile communication, etc.

The decision-making process in an organization operates via certain means (e.g., money, manpower, material, machines, time, information, etc.) and allocates them under the form of a chosen decision. Then a performer/decision-maker applies decisional tools (information systems, optimization techniques, services, infrastructure, and so forth) in making decisions.

The info-steering process produces informed synchronization of all other components of the processes. 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. Information synchronism is in fact a force behind a manager's (or politician's, sociologist's, or historian's) sensitivity to harmony and the invisibility of consciousness, humanity, and technology. The fragmentation of management theory (as well as 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 synchronistic point of view. However, this kind of information synchronism, which is taking place in a mind, occurs at the level of matter, nerves, and chemical components such as serotonin, dopamine, and so forth. In modeling this synchronism, we human researchers try to apply digital notation since at the current state of development it is the easiest way of analyzing.

The Purpose of Informing

Aristotle (384-322 BCE) was perhaps right in saying that if people do not know the purpose of their life, they cannot make wise decisions and wisely communicate. Indeed, in his day and age, human life was much less complicated than it is now in Western Civilization. 2,400 years ago, the purpose of life was to survive until the following day, have something to eat, and avoid getting killed or being held captive and becoming a slave. The average life expectancy was 25 years of age.

The literature of management research is well familiar with a hierarchy that characterizes the life of man—Maslow's Hierarchy (Maslow, 1943) which classifies man's needs according to those of physiology (air, water, food, sleep, procreative sex), safety (of the body, family, employment, resources), love/belonging (friendship, family, sexual intimacy), esteem (confidence, achievement, respect), and self-actualization (morality, creativity, problem solving). Although Abraham Maslow investigated the needs of people such as FDR and Einstein, self-actualization does not appear to have been the main goal of their lives.

Therefore, a Hierarchical Model of the Purpose of Life (values) is shown in Figure 8.

The hierarchy of the purposes of life has been built upon the assumption that a wise life is essential for life advancement and meeting ever higher targets. This model does not contain the proposition by Aristotle that a fulfilled man is a happy individual since human life can be happy if it has a positive balance. Happiness is so elusive and transient that it cannot be imagined to be attained permanently (Targowski, 2009). There are few exceptions, and therefore any goal of life can be reached only with a partial attainment of happiness (Targowski, 2013). Not infrequently a purpose of life can be attained at the expense of happiness, that is, by paying a high price. Most

revolutionaries who fulfilled their life's purpose—i.e., social and political achievements— had to cope with existential adversities, making them unhappy.

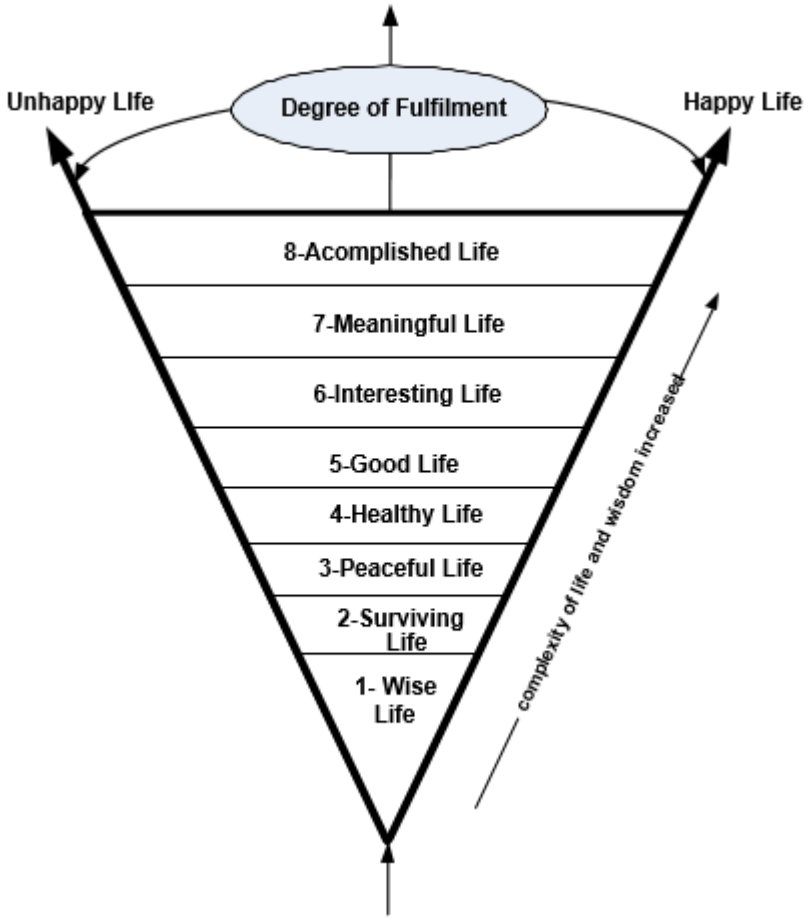

Figure 8. A Hierarchical Model of the Purpose of Life in Western Civilization in the 21st Century (Targowski, 2011, p. 50).

Take, for example, the U.K. Prime Minister Winston Churchill, who was instrumental in Britain's victory in World War II in 1945. He lost the post-war elections to a little known politician; the voters thought that their hero needed to relax, and for the time of peace they needed a politician of a different format. One of the leaders of the French Revolution (and the Great Terror in particular), M. Robespierre, achieved so much; however, his life ended on a guillotine. This cannot be considered happiness. The Bolshevik leader V.I. Lenin won the revolution but paid for it with his own life, as he was most probably poisoned by J. Stalin. Hitler, who did so much for Germany in 1939-1943, poisoned himself in order not to see his defeat. This, too, can hardly be called happiness. But each of those leaders, when attaining their goal, must have felt happy to some extent.

A similar model can be applied for the purpose of an organization as it is shown in Figure 9.

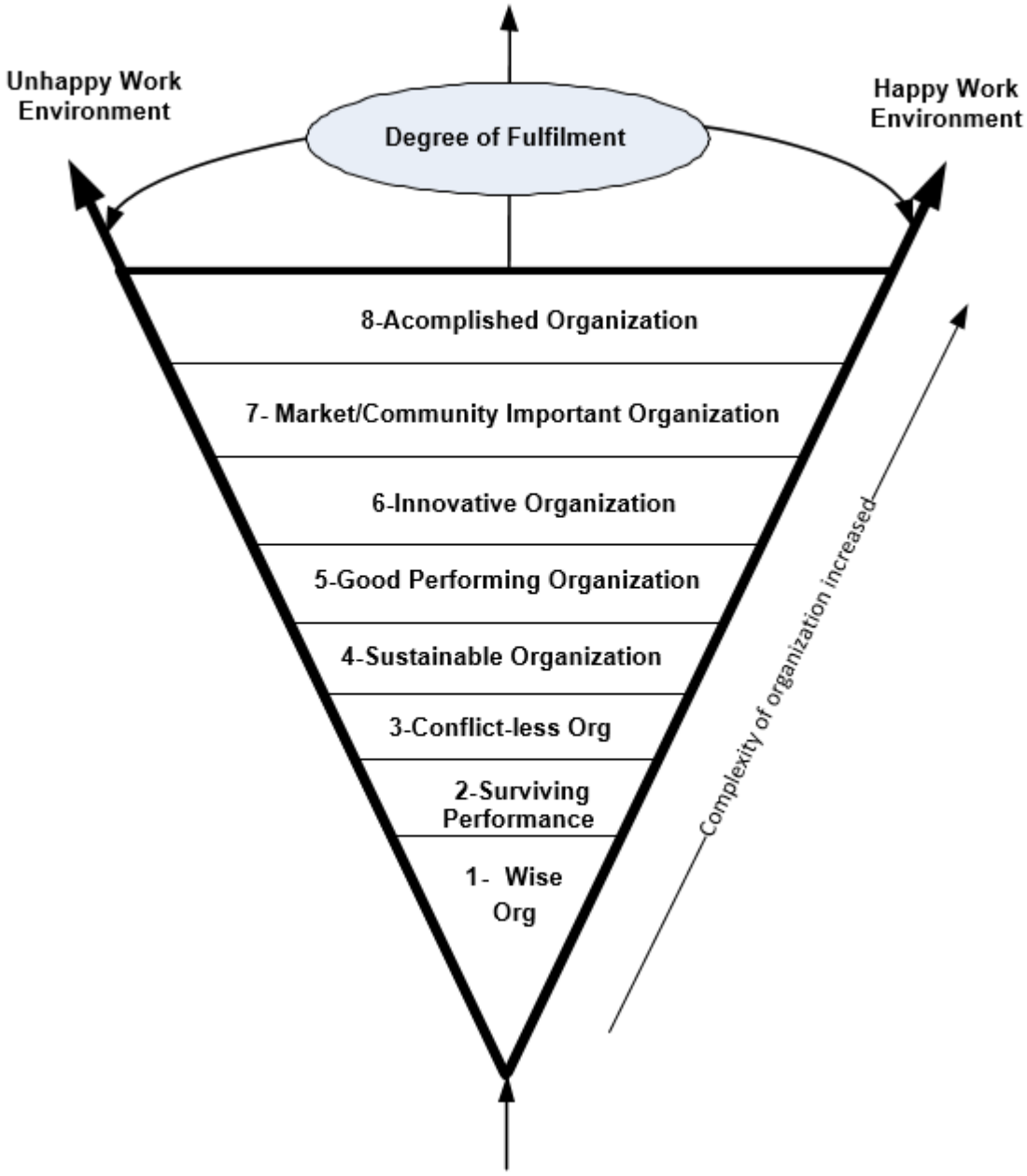

Figure 9. The Hierarchy of the Performance of an Organization.

The organizational purpose has been well investigated under the form of differentiated goals by Grandon Gill (2009b, pp. 204-215).

Informing Quality

The following levels of informing quality are possible in societal settings:

1. *Transinforming* takes place when the purpose of informing (P), the message (M) and the resonant change (reflecting information) (C) are the same for both clients: informer and receiver. This means that the frame (F) for both is the same. The informer has informed the receiver without misunderstanding. The original message is neither enhanced nor di-

minished while being transported and filtered through two communication channels (see Figure 4). This can be represented by the following formula (where j = 1, 2, 3, …n):

$$F_{rj} = F_{sj} \quad \text{and} \quad P_{rj} = P_{sj}\,;\; M_{rj} = M_{sj}\,;\; C_{rj} = C_{sj}$$

Two people who know each other well may achieve trans-informing about some subject. The shared message and the shared resonant change are essentially identical. For example, such a trans-informing session can take place in the command-control system where both parties apply well formatted elements of the communication process about a subject well know or one that is under constant investigation; therefore, both clients learn the meaning of basic elements of that process and even may expect their values in certain brackets.

2. *Pseudoinforming* takes place when the receiver adds additional information to the informer's message. This situation is reflected in the following formula (assuming that $P_{rj} = P_{sj)}$:

$$F_{rj} \neq F_{sj} \text{ and } M_{sj} + \Delta M_{rj,}$$

One politician, for example, might deliberately send an ambiguous message, to which the receiver (or the media) would add additional layers of meaning, most of which were unintended by the politician. The receiver, though, might insist that he/she understood the "real intentions" of the politician. If later events prove that the receiver's conception is incorrect, the politician could claim that he or she intended something else. Also, *pseudoinforming* may occur when $P_{rj} \neq P_{sj.}$

3. *Misinforming* (leads to lack of impact or uninforming (Gill, 2015b, p.155, 173) takes place when an informer and receiver exchange only subsets of messages and resonant change, whose compensating subsets have been lost in the Symbol Link (L7) during the coding process. The following formula depicts these situations:

a) Assuming $P_{rj} = P_{sj}$ $\quad F_{rj} \neq F_{sj}$ and $M_{sj} \subset M_{rj}$ and $C_{sj} \subset C_{rj}$ or

b) Assuming $P_{rj} \neq P_{sj}$ $\quad F_{rj} \neq F_{sj}$ and $M_{sj} \subset M_{rj}$ and $C_{sj} \subset C_{rj}$

Misinforming (a) would occur, for example, if a professor were to provide only a partial explanation for a subject, assuming the students would read the remainder of the explanation in their textbooks. Later, the students would show they are misinformed by providing only a partial message and partial resonant change on their examinations. Misinforming (b) would occur, for example, if a used car dealer has different purposes than a buyer: namely, the former need not tell the full truth about the condition of a car, and a buyer has partial information about the car. This is the case of asymmetric informing with a purpose.

4. *Parainforming* occurs when the receiver's own resonant change distorts the informer's purpose. Unlike *pseudoinforming*, in which the resonant change adds additional layers of meaning, in *parainforming* the original layers are themselves distorted. General semanticists refer to this as bypassing. This occurs in politics, for example, when the informing party supposedly calls for an election to pretend it is following the constitution, though, in fact, the election will be fabricated. Parainforming may be illustrated by the following formula:

Assuming $P_{rj} \neq P_{sj}$ $\quad F_{rj} \neq F_{sj}$ and $C_{sj} \neq C_{rj}$ but $M_{rj} = M_{sj}$

At its simplest level, parainforming occurs when two people/parties use the same words to have different meanings. For example, in dictatorship-like political regimes, the word freedom means something different than in real democratic countries. Even in democratic countries, when a president evaluates his/her accomplishments, the citizens may disagree since their resonant change differs from the president's feelings about the resonant change which took place in the country. Parainforming occurs when the informer's purpose is distorted by the receiver's resonant change (which means distrust). Parainforming very often involves purpose-driven manipulation of the audience and clients.

The informing quality of parainforming is even worse than misinforming. While misinforming may be not intentional and very often is caused by the conditions of the communication channel and skills of the parties, parainforming is the intentional plan to communicate a wrong frame in the setting of different purposes of parties. In societal situations, particularly in politics, this situation is called "brain washing."

5. *Disinforming* – reflects the intent to deceive a receiver client by providing false information (Gill, 2015b, p. 174). It means that Prj ≠ Psj; however the receiver can eventually find-out later that the informer provided false information.
6. *Datainforming* occurs when the receiver obtains a message containing, for example, an address, telephone number, the price of a stock, weather conditions, and so forth. The receiver obtains the data in accordance with his/her needs (purpose/goal). Datainforming is depicted as follows (assuming the purposes of both sides are irrelevant):

$$F_{rj} = F_{sj} \text{ where } M_{rj} = M_{sj} ; \ C_{sj} = 0 \text{ but } C_{rj} \neq 0$$

7. *Metainforming* takes place in the info-steering process (Figure 6) as the informer conceives, designs, and controls an act of informing. Because *metainforming* takes place entirely within the Cognitive Management Apparatus of a Mind, its formula is as follows:

$$F_{rj} = F_{sj} \quad \text{or } F_{rj} \neq F_{sj}$$

This model of informing quality offers a new paradigm that focuses on the quality of the message. The previous models of communication theory focused on the quality of the channel, looking at communication as essentially a matter of engineering issues.

The hierarchy of informing quality settings are depicted in Figure 10. This hierarchy illustrates how the informing process and system are both difficult and easy to communicate beyond the transinforming situation.

Informing with Reasoning Richness

The premise of this perspective is that management is looking for explicit informing to make rational decisions; therefore, it is ready to process the desired kind of cognitive unit in certain manners in order to achieve this goal. Managers and executives apply a variety of media to process and communicate the state of affairs in a correct manner. The hierarchy of professional message formats driven by applied media is modeled in Figure 11.

Computer print-outs and reports describing routines are located at the lowest level in the hierarchy. These types of messages are processed by the heavily computerized information systems. At the next level one finds aims, positions, and status-oriented messages which are described by statements on computer screens. These kinds of messages can be processed by computerized information systems with a friendly graphic-user interface (GUI). The third level of the hierarchy contains declarations describing ideas and solutions such as "read my lips, no more taxes," or "freedom everywhere." It is at this level that the meaning of the message is of greatest im-

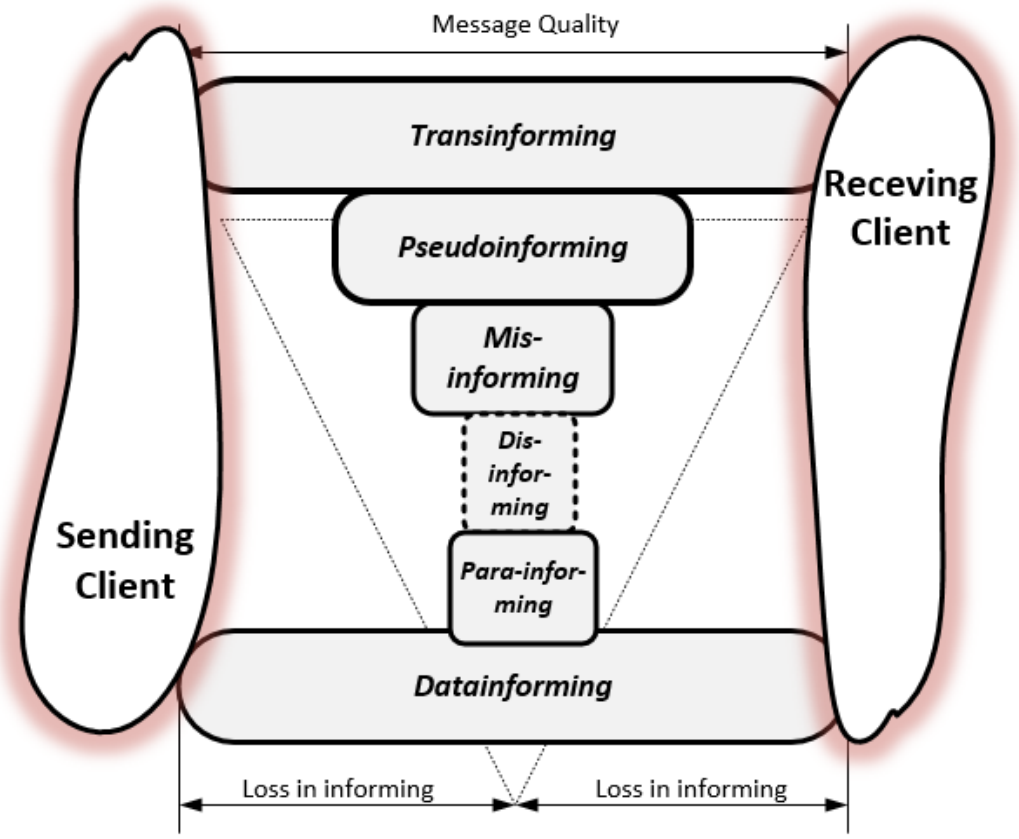

Figure 10. The hierarchy of informing quality settings.

portance; however, it is also very difficult to automate. At the top of the pyramid are action-oriented messages such as face-to-face communication, telephone & 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 reasoning richness, defined as information richness by Daft and Lengel (1986) and as the potential of the informing to carry the right scope and capacity of data. In this study reasoning richness is defined as the ability to communicate (informing) a message in the most meaningful and effective manner.

Secured Informing

The rapid progress of tele-information technology based on the Internet triggered cyber warfare and cybercrimes worldwide. The New World Order established after the fall the Soviet Empire in 1991 is full of serious international conflicts such the Clash of Civilizations (Huntington, 1996) and Cold War II between Russia and the United States and European Union, triggered by the Russian invasion of Crimea and South-Eastern Ukraine. There are also well-known concerns over threats to privacy and security posed by the cyberattacks under the form of extensive personal, organizational, and state data collected by private and governmental organizations and agencies. A series of cyberattacks on Estonia began on April, 27, 2007 and swamped websites of Estonian organizations, including Estonian parliament, banks, ministries, newspapers and broadcasters, amid the country's disagreement with Russia about the relocation of the Bronze Soldier of Tallinn

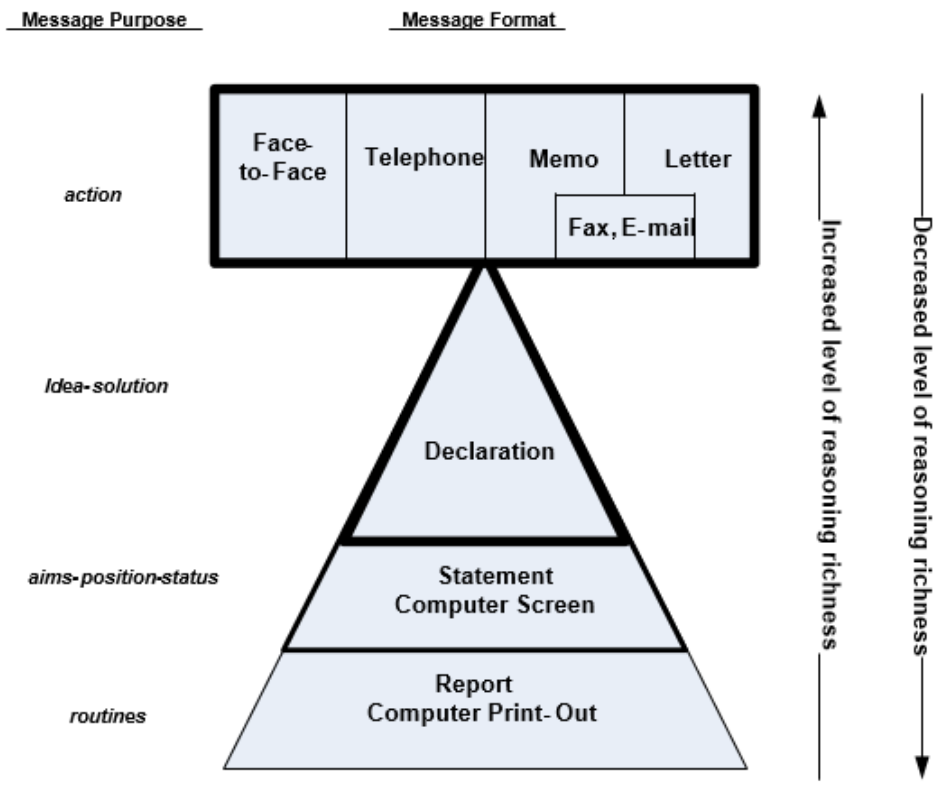

Figure 11. The hierarchy of message formats depending on the kind of technology applied in a given informing system which defines reasoning richness.

(Traynor, 2007). Another large cyberattacks took place on July 20, 2008, weeks before the Russian invasion of Georgia; the "zombie" computers were already on the attack against Georgia (Markoff, 2008). In the latest in a string of intrusions into U.S. agencies' high-tech systems, the Office of Personnel Management (OPM) suffered in 2015 one of the largest breaches of information ever on government workers. The office handles employee records and security clearances (Spetlanick & Brunnstrom, 2015).

Cyber warfare involves actions by a nation-state or international organization to attack and attempt to damage another nation's computers or information networks (digital infrastructure) through, for example, computer viruses or denial-of-service attacks. Making databases manageable is essential for an active organization.

There are numerous ways in which a cyber-attack can occur and a variety of impacts that might result. These include denial-of-service attacks from outside a firewall, manipulating data from within a firewall, interrupting communications, taking control of a system, and others.

Analyzing every possible attack on all systems and assessing the impact to both planned support and operations would be impractical. Even if it were done, the results from such an analysis would be obsolete before completion. Therefore one must establish the priority of securing the active functioning of critical informing systems.

For example, the Pentagon on April 23, 2015, took a major step designed to introduce a measure of fear in potential cyber-adversaries, releasing a new strategy that for the first time explicitly

discusses the circumstances under which cyber-weapons could be used against an attacker and naming the countries which, according to the Pentagon, present the greatest threat to the United States: China, Russia, Iran, and North Korea.

Big and small businesses alike and the banking and financial sector in particular have come under an increasing number of attacks by cyber criminals primarily motivated by financial profit. Stealing online credentials with a view to committing fraud has emerged as a popular criminal tactic, with Adobe, Target, Home Depot, and several other high-profile companies and governmental agencies (e.g., the Federal Office of Personnel Management) reporting compromises of customer data.

Big software suppliers apply disruption as a strategy against cyber criminals, and Microsoft has announced the launch of new Cyber Crime Centers in some countries. New businesses are also developing, such as data brokerage, also called information brokers or information resellers. This business collects personal information about consumers and sells that information to other organizations. Data brokers can collect information about consumers from a variety of public and non-public sources including courthouse records, website cookies, and loyalty card programs. Typically, brokers create profiles of individuals for marketing purposes and sell them to businesses who want to target their advertisements and special offers. Data brokers may refer to themselves as being database marketers or consumer data analytics firms (Rouse, 2013). These kinds of businesses mostly operate without the consumer's knowledge and agreement.

Currently, there is no legislation that requires a data broker to share the information they have gathered with the consumers they have profiled. In an effort to provide transparency, however, the data broker Acxiom has created a web site called Aboutthedata.com. The site allows consumers to register and see what information Acxiom has collected about them and correct data that is wrong. Critics, however, maintain that the website is just another way for the company to gather more data.

Needless to say, foreign (and national too) intelligence agencies analyze personal data on social networks in order to prevent cybercrime and to gather information about citizens, acting like "Big Brother". For example the National Security Agency (NSA) in the U.S. has swept up the telephone records of millions of people, arguing that it allows the NSA to trace terrorists. In May, 2015, the Congress regulated the way in which the NSA can collect data and what data it cannot collect. The bill mostly emphasizes oversight of the NSA's operations.

Some vigilante individuals provide online access to governmental documents of certain countries in order to show how certain governments limit the freedom of citizens as a sort of Big Brother. For example, WikiLeaks is an international, non-profit, journalistic organization, which publishes secret information, news leaks, and classified media from anonymous sources. Its website, initiated in 2006 in Iceland by the organization Sunshine Press, claimed a database of more than 1.2 million documents within a year of its launch. Julian Assange, an Australian Internet activist, is generally described as its founder, editor-in-chief, and director. He is treated by some as the whistle-blower of governmental and corporate crimes, corruption, ecological disasters, and so forth and by others as the publisher of confidential information which could potentially harm many people.

Cyber warfare, cyber-crime, information brokers, governmental intelligence agencies, organizations like WikiLeaks, and others assure us that our personal data and organizational data, which should be classified, are extremely vulnerable for all sorts of cyber-attacks. In fact, however, it is impossible to make any data 100% secured since supercomputers can simulate any ID and password in a short time—unless, of course, the computers are offline and are transported by human couriers with suitcases locked to their hands (as used to be the diplomatic practice). That said,

such a pessimistic opinion is no reason to neglect the planning and implementation of all available security tools to minimize eventual losses.

Implications for Informing Systems' Development

The purpose of good informing is to reach the level of transinforming. This can be done through spoken informing systems and cognition systems called information systems. Based on the Semantic Ladder one can characterize both these categories of systems in the following manner:

A. Planning informing for one of the following purposes (exemplifying organizational ones); wise organization, surviving performance organization (e.g., coming out of bankruptcy), or conflict-less organization, or good performing organization, or innovative organization, or market/community important organization, or accomplished organization. Planning informing for one of the following modes of informing systems: Command-Control System, or Negotiation-Motivation System, or Conflict-Management System, or Information Exchange, or Other system

B. Planning informing for one of the following utilities (value of informing, Gill, 2009b, 197-238): Utility as valence (positive or negative intrinsic emotions), utility as dominance, utility as indifference, utility as compromise, utility as meeting or exceeding expectations, utility below expectations, other utilities.

C. Planning informing for one of the following goals (Gill, 2009b supporting a planned informing utility: performance goal, or approach/avoidance goal, or distal/proximal goal, or externally/internally established goal, or specific goal, or other goal.

D. Planning for one of the following objectives: Key Performance Indicator (KPI) of finance, or/and Key Performance Indicator (KPI) of customers/members, or/and Key Performance Indicator (KPI) of learning/innovation, or/and Key Performance Indicator (KPI) of operations, or/and Key Performance Indicator (KPI) of others.

E. Planning for one of following qualitative aims: Strategy of implementing a selected goal, policy of implementing a selected strategy, others.

F. Planning for expected biases and filters of the client (Gill, 2009a, pp. 245-249); Information biases, cognitive biases, risk biases, uncertainty biases, filters of attention and motivation, others.

G. Planning for reasoning richness by selecting the format of a message: Face-to-face informing, telephone-based informing, fax-based informing, e-mail-based informing, memo or letter informing, computer-based informing, others.

H. Planning the expected informing quality (Metainforming) as follows: transinforming (aiming for a full understanding), or pseudoinforming (expecting and preparing that the receiver may add additional layers for understanding a sent message), or misinforming (assuming that asymmetric communication may take place and either welcoming such a situation or carefully planning the informing process and system to minimize discrepancies of communication), or disinforming, parainforming (assuming the manipulation of a message and, generally speaking, a receiver's informing space), or datainforming (organizing a data set for client-friendly reception), or others.

I. Planning a portal medium of informing as follows: spoken informing (F2F), memo/letter-driven informing, mediated informing through portal delivery systems: Face-to-Face (F2F), Smartphone, Skype, E-mail, Fax, Radio, Television, Website, others

J. Planning one of the following computer supported cognitive systems or all of them in enterprise-wide settings: Data Informing System (Data Descriptions and/or Transactions Processing), Change Informing System (Management Dashboard), Concept Informing System (Expert System), Knowledge Informing System (Bid Data/Data Mining System), Wisdom Informing System (Wisdom Repository System), others.

K. Planning informing systems for security includes the following undertakings: assessing the risk of databases for terrorist and hacker attacks, establishing the priorities of systems in case of activating the back-up systems, choosing online versus offline databases according to the probability of attacks, establishing servers with fire walls, establishing user identification and password systems which are immune from supercomputer attacks, establishing servers in-house and in clouds with respect to their potential for external attacks, establishing back-up solutions in the case of cyberwar and/or cybercrime, hiring and training specialists for keeping a secure data environment, implementing comprehensive security policies, training users for security risks and back-ups, others.

The planning process of transforming informing-aims into an informing system is depicted in Figure 12.

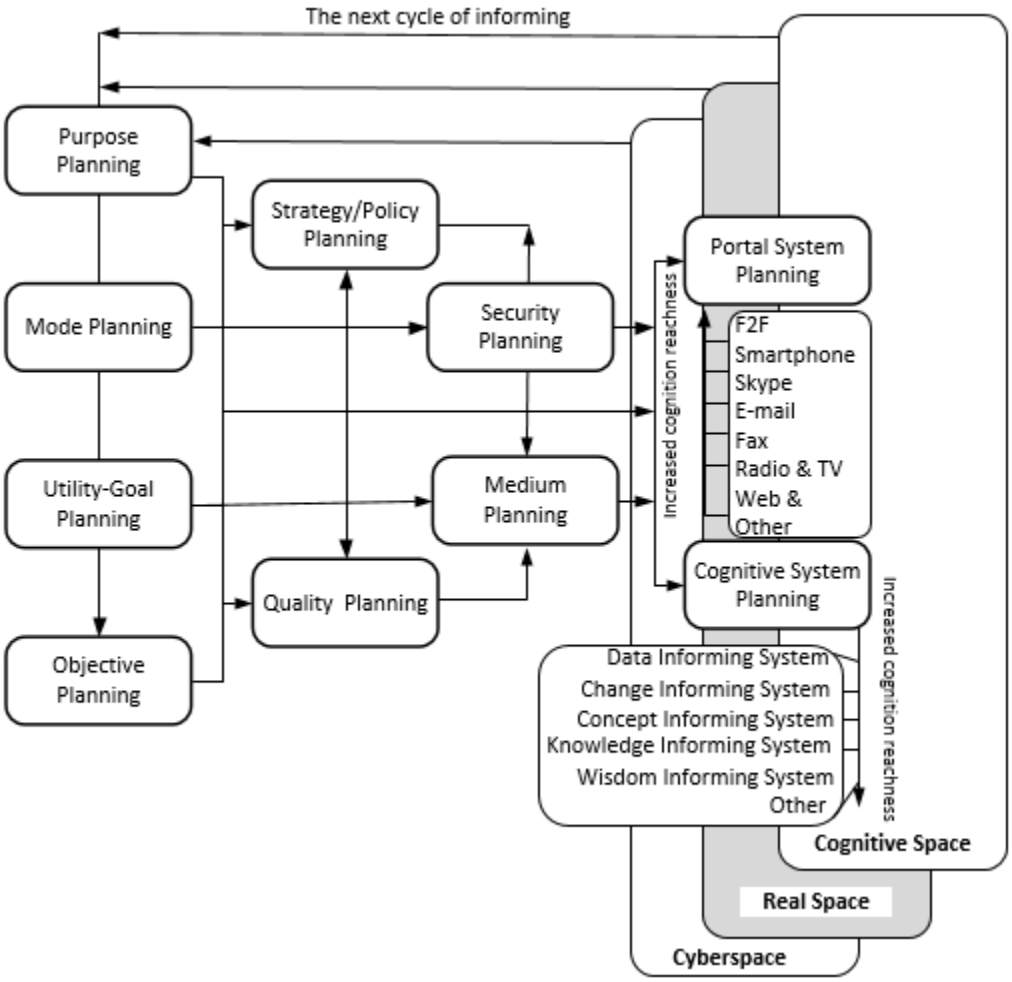

Figure 12. The planning process of developing an informing delivery system in three kinds of space.

In planning an informing system, an analysis of the expected informing richness & quality should be conducted through each link as follows:

- Link 10: Is the storage/retrieval link adequate to handle planned informing?
- Link 9: Are the purposes (values) of the informing parties the same or different?
- Link 8: What behavior is likely to result if a particular message is sent?
- Link 7: To what degree do the informer and receiver interpret each other's verbal and nonverbal symbols?
- Link 6: What kind of roles do each client have and how are they related?
- Link 5: Is the environment appropriate for a given informing session?
- Link 4: Are both clients are committed to sharing a common informing session?
- Link 3: Do both clients consider the informing message important?
- Link 2: Does the mode of informing correctly reflect the situation?
- Link 1: Is the selected physical/cognitive/cyberspace channel right for the aims and skills of both parties?

The Architecture of an Informing System

The concept and trend of informing systems development should be considered in the early 21st century as an enhanced layer of existing and new information systems. In developed nations computer information systems are well developed and widely applied, and it is not wise to expect that all of these systems should be replaced by informing systems. This situation reminds one of a case of software programmed in the COBOL language in 1960-80s. This language was effective for data processing but was not suitable for an interaction with the end-users' GUI (Graphic User Interface). Instead of rewriting all COBOL-programmed software, it was possible to add a new layer of interactive procedures called GUI written in more modern languages (like C/C++, Java, JavaScript, HTML, PHP, Python, or Ruby). To add such a layer of interaction to COBOL-oriented software was a very good business for service software companies in the 1980-90s.

Furthermore, it is not necessary that every information system must be of an informing kind. In enterprise-wide systems there are many ISs which link other ISs, like the Bill of Material Processor (BOMP) which links a products plan with Material Requirements Planning (MRP I)—the latter links with Manufacturing Recourses Planning (MRP II). On the other hand it would be recommended that final reports of MRP I and MRP II should contain the informing capability for enterprise executives. The classic example of an informing system is a management dashboard designed for each executive and mostly for CEOs and functional vice-presidents.

Therefore, the architecture of an *informing* system (depicted in Figure 13) includes as a base the architecture of an information system. This architecture is illustrated for the informing environment (E. Cohen, 1999), composed of the computerized delivery informing system which info-communicates with the client to accomplish a given task.

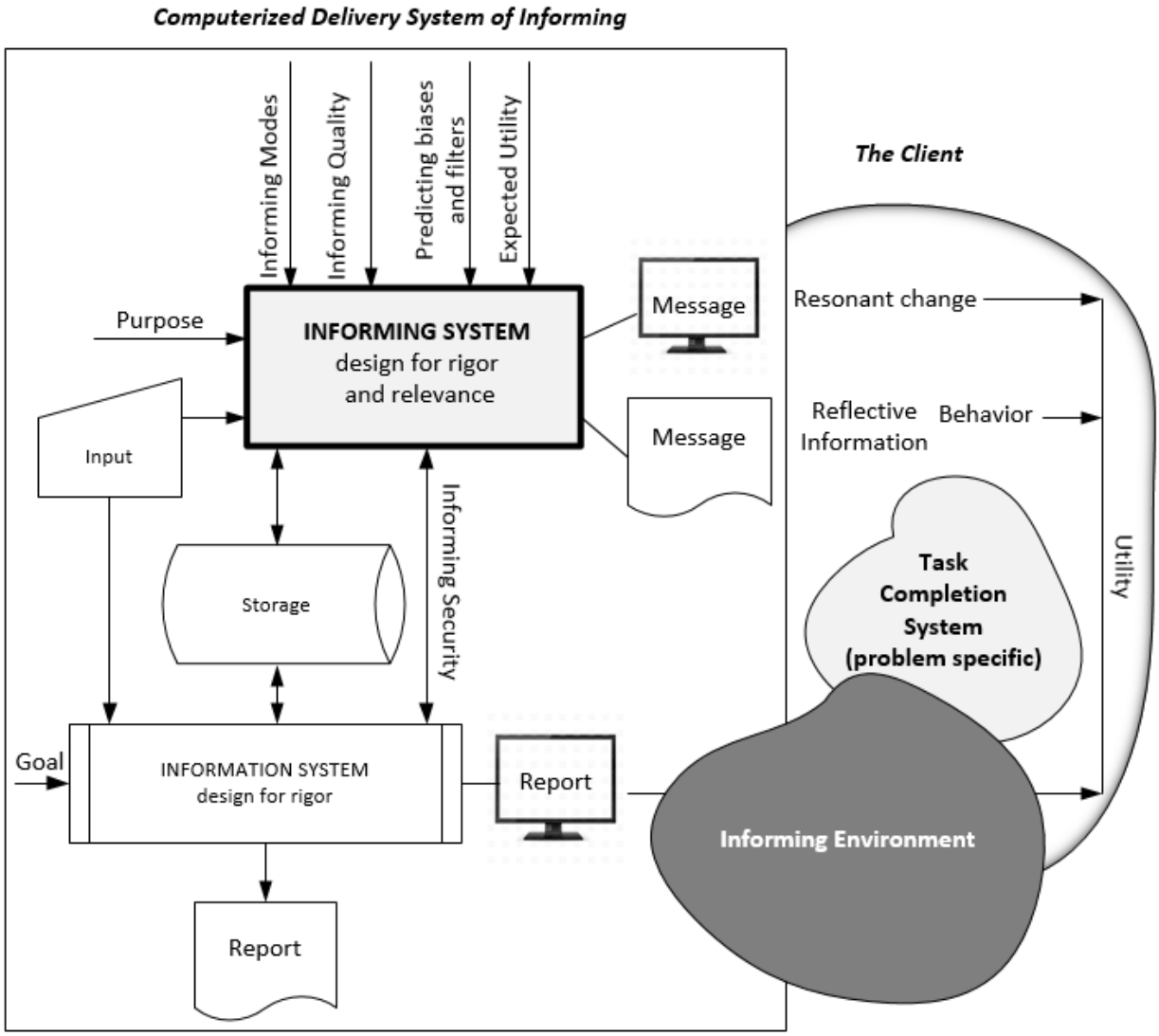

Figure 13. The Architecture of an informing system as a computerized delivery system

Based on this architecture, Table 1 illustrates the main attributes of information systems and informing systems.

Table 1. The attributes of information and informing systems

ATTRIBUTES	INFORMATION SYSTEM	INFORMING SYSTEM	OUTCOME
Client's support through	Report	Message with Resonant Change and Reflective Information causing Behavior	Fully informed Client and Task; the Utility accomplished (possibly, depending on the Client's attitude)
Designed for	Rigor	Rigor and Relevance	Good System
Main aims of a System	Goal to support data/reports for performance monitoring	Purpose such as a Vision	Long and short term aims included and synchronized
Informing enhancing considerations	Data structures, Manipulations, Retrieval, Security, and Reporting	Informing Modes, Informing Quality, Expected Utility	System sophistication improved from syntax to semantics and pragmatics of cognition enriching
Informing with biases and filters expecting	Skills limits	Information, Cognition, Risk, Uncertainty, filters of attention and motivation	Informing with optimal scope for given skills and predicting biases and filters
Knowledge & Skills of system development	Established in vertical IS curriculum supported by compartmentalized knowledge & skills	New Knowledge & Skills require strong interdisciplinary curriculum and approaches	Very difficult to enrich this stage due to a long professional tradition of IS curriculum and practice
Needs for informing systems	Not yet well recognized	Only pioneers of informing systems perceive the needs for this kind of systems	Success of informing systems in practice depend on the executive culture of leading & managing

The following example can illustrate the dynamics of the whole informing process reflected by the presented computerized informing environment in Figure 10 and characterized in Table 1:

- Informing environment: Suppose a global corporation which produces cars is looking for countries where parts and subassemblies for a global car model can be produced. This means that parts and subassemblies produced in any country by branches of that corporation must fit the global car model.
- The client is a CEO who will decide which countries should be chosen which would fit the requirements of the corporation's global car.
- The task completion system is one which should determine what kind of cognition (information) should be made available for the CEO of the corporation. To define these requirements, one must define the following:
    - Purpose – this global corporation should be a meaningful global car manufacturer which can reach at least 15% of the market share.
    - Expected utility – global dominance in the market for low-priced cars.

- Informing mode - Negotiation-Motivation, particularly looking for information about tax relief and other benefits which motivate foreign investors in Asia, Europe, America, Africa, and Oceania.
- Informing quality – the trans-informing of the board members based on well-selected and delivered information with excellent GUI.

The delivery system is chosen: the management dashboard is based on the corporation ERP system and is extended to external data and information sources providing unstructured information.

Conclusion

The development of informing systems will be difficult since the academic environment is not suitable for inter-disciplinary cooperation which is required in developing such systems (Cohen, 2009a, pp. 767-788).

The informing system should be a meaningful system in making businesses, corporations, and governmental agencies more sensitive to recognizing a resonant change and applying the right strategy to the change's necessities.

However, an informing system—even the best—is not a guarantee to solve every documented problem since the client must decide whether he/she wants to follow that system's suggestions or neglect them. The latter "do nothing" situation or/and a low political will are very popular among executives and politicians nowadays.

From the point of view of doing a good job, the development of informing systems must be accepted by Academia and practiced by organizations which care about good leadership and management in order to sustain those organizations and civilization.

The informing systems are positive, since they enhance cognition and responsiveness to changes—particularly negative ones which need corrections—and contribute to updated learning and enhanced cognition.

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Biography

Andrew Targowski is an informatician, civilizationist and philosopher. He is an author of 37 books on information technology, civilization, philosophy, and political science. He is a professor of computer information systems at Western Michigan University. He is President Emeritus of the International Society for the Comparative Study of Civilizations (2007-2013). In Poland in the 1970s he initiated the INFOSTRADA Project which has been adapted as the Information Superhighway in the U.S. providing a new paradigm for a New Economy, triggered by the Internet. He initiated and was the Chief Developer of the PESEL system, providing a social security number for 38 million Polish citizens.