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Information Problems in Information Society

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> **... difficulties arise from a theoretical and methodological design framework that rests upon an underconceptualised notion of information.**
>
> **... in living systems in general, and social systems in paticular, evolution and information are so tightly interrelated that it is not appropriate to discuss one without the other**.
>
> Bela Banathy (1996)

1. Introduction

Our tendency to name important period of human history is not only a vagary, it briefly characterises main features of an adequate society (or social systems) and its development. This name is a metaphor that help us to better understand this society and affects a perception of its general problems and ways of their solution too.

However the used term cannot comprehend elusive changeable and very intricate nature of human systems. Moreover each metaphor expresses the reality only from partial view and it could be misleading if it is not well grasped. Big idea of the information society as well as hopes and doubts connected with it are results of similar and conceptual obscurities.

2. New (information) society

Thirty years ago probably most from us believed that the name „century of the atom“ is fitting to the coming era and better future of human. Today many apprehends of the nuclear world and puts expectancy on information or more precisely on information technology.

Just many important arguments advocated the entrance into information society arises from famous Porat's studies based on empirical observation of some social and economics facts in United States in sixties and seventies. Nevertheless the later (in eighties) this idea was revised: Nobody today doubts about the

fundamental importance of information in society and its future development, but many authors points to other faces of newly emergent society. For example:

- Technocratic Society (Zbygniew Brzezinski)
- Post-industrial Society (Daniel Bell)
- Post-capitalist Society (Peter Drucker)
- Post-fordist Society (Lucas Introna)

Each of them emphasizes some different attributes of recently arising society and most of them connect its character with influenced significance of information or knowledge. In spite of the fact that the importance of information in many societal domains has been mentioned (Hayek 1945) and theoretical issues was founded in cybernetic (Wiener, 1948), a common awareness of it is connected with a development of computers and "digitally" oriented information technology. Despite remarkable success of information technology use many problems in society are not solved, other manifest more sharply and even furthers recently arise.

Undoubtedly each stage of the human society has specific problems, however present challenges might be distinguished by few traits, let us stress only two from them:

- They present a global character, at the same time they arise and influence events around the whole world. As such they causes "turbulent character" of the world in which the uncertainty is a natural constituent of its order.
- Firstly in history they present – thanks to capabilities of the modern technology – the "global danger": the possibility to change, to break, to jeopardize and even to destroy the life on the Earth. Probably many apparent threats (for example an atom bomb) are less exposure than many other hidden matters (arising for example from genetic engineering).

Reasonably only a few reflecting the recent character of the society don't consider about information and don't point out at the increasing significance of knowledge and information. Actually the essential changes characterizing a movement to information society originate from increasing complexity of the „global world" that is narrowly connected just with new possibilities to handle information. However recognized importance of information within all domains of our life including politics, business, education and others social domains is not attended by a better understanding of information. And the use of new and unprecedented possibilities to treat information through „old ways of thinking" cannot provide expected benefits.

3. Phenomena of the information

A common comprehension of information arises from a mechanical and objective principles of positivistic thinking. In this sense the information is a strongly given entity reflecting (mirroring) or representing the reality. As such the amount of information decreases uncertainty and allows to decide and to plan in the better way…

Probably most important problem in this „information confusion" is sweeping of divers aspects or types of information that emerge along with increasing complexity of considered systems. Regarding the term "information" we do not distinguish the different nature of the mentioned concept abundantly and consequently;

we confuse and simplify it in an unacceptably way. As a result of that clutter we manage information – we substitute dealing with information for a data manipulation excepting the reduction of uncertainty…

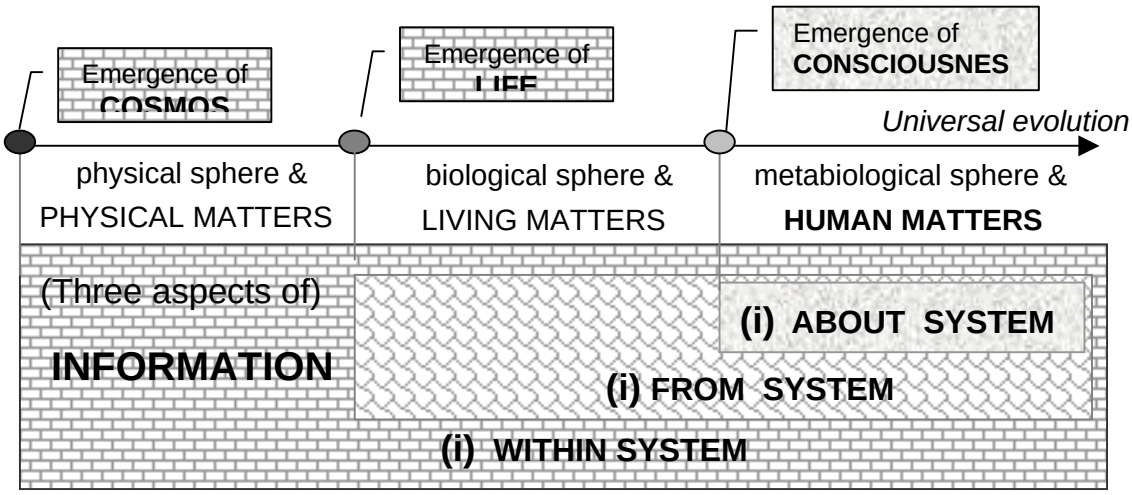


Figure 1 Three emergent aspects of information, depended on adequate emergency of the universe

For the next consideration we can use categories of nature, suggested by Jonas Salk (1983) who defines three main eras of the universal evolution and increasing complexity He outlines three types of systems (or matter): physical, biological, each of them is characterised by new emergent and essential properties. The emergence of new system's property narrowly incident to new aspects (or types) of information. For systems on each higher level are important aspects of information from lower levels, however new aspect emerges and changes the concept of the system's complexity - the situation is brief and well arranged in the figure 1.

On the lowest level of physical systems the („physical") information is an intrinsic property of systems. It is (internal) **information in** system that has an objective character and determines its order and/or structure on the one side and characterizes its state on the other.

The second (biological) sphere introduces new quality - living systems, that are autonomous towards their environment and adapting to it. Internal (i.e. genetic) information of living systems is transmitted from one generation to the next in replication process with random character of „nature selection".

However newly emerging aspect (type, concept) of information emerges on this level and plays essential role for adaptation of living system which receives **information from** its environment. Two important facts implicate its essential properties:

- The environment presents higher (wider) system with internal information. However received information depends on properties of receptors and particular condition too - it has not objective (but nor subjective) character.
- Such information is impetus (rather than input) that initiates certain response of the receiver - his behaviour. Important condition necessary for systems evolution (adaptation of species) is the possibility of different („individual") responses to the same received information - it doesn't determine response strongly but

receiving system has certain looseness (information is more loose) in its responding action.

The relations between receiving information and resulting behaviour depend upon the receiver, respectively on a complexity and quality of his "nervous systems". The more complex nervous systems use information from last experiences, they are capable to learn himself and use some kind of "knowledge". As well as the experiences result from an individual interaction with the environment (higher system) mentioned relations (and knowledge) have individual character. From a general view the resulting behaviour becomes more loos similarly as a "meaning" of considered information.

The highest systems level results from the emergence of human conscious, and mind's activities that are often considered as information handling. The conscious gives an unique and essential possibility of abstract thinking and perform on symbols. Bertalanffy (1972) stresses this essential attribute of human calling him „*animal symbolicus*". Human - thanks to his conscious - aware himself in contrary of the other world - produce **information about system**.

This information is presented through symbols which form is commonly named data[1]). Not before this level we can consider about "human" information (Stonier, 1990) and semiotic character (no only comprehension) of the information (Stamper, 1973) obtains important role. Meaning of shared information is interpreted during human mental processes in that individual (personal) knowledge plays fundamental role.

Let us notice a few considerable aspects of this type of information:

- Human, symbolic presented information, is a product of individual mind. It presents a result of human cognition and thinking including individual intentionality (Searle, 1986) as individual opinions, intentions (inc. to desinform), believes…
- This information expresses a vision of system together with a relationship of its "author" (originator) to this system… However it has not "objective constitution" it is a part of an objectively existing information in social systems.
- As a received information has a character of mentioned impetus, influencing and triggering behavior of other systems elements - people, animals and machines. This behavior is determined in the case of machines and less or more loose in the case of people.
- Different ways of the same data shared in system result into different meanings – shared information cover certain effect of uncertainty (mostly beyond description in terms of probability).
- This type information needs not to decrease uncertainty, very often brings obscurity, doubtfulness and uncertainty. The issue of its validity and credibility(rather than "truthfulness") secures essential significance.
- To decrease a danger of misinterpretation and understanding within systems needs better communication of information as a shared of its meaning. It

[1]) Many authors accept the fact that data present a form of information only with hesitation. They confuse the question "What are data ?" with the question "What data express ?". In addition to that they confound the answer too and reduce it upon "The evident or better measured and quantified facts."

is not possible to degrade the communication of (human) information on transmission of data (symbols) through channel.

4. Tangle of information and knowledge

While the distinction between information and data is mentioned for a long time and it is covered in each better textbook the distinction between information and knowledge enjoys a higher attention in the recent time. Nevertheless their concepts are more complicated and confused - usually we depict information and knowledge in a mutual interaction.

Both concepts are interlaced in common using: Cambridge International Dictionary of English defines:

- *Information* is a knowledge about something, esp. facts and news.
- *Knowledge* (is) understanding of or information about a subject which has been obtained by experience or study, and which is either in person's mind or processed by people generally.

In this sense information is considered as the notion "information in system" mentioned above, while "knowledge" cover the concept of "information about system". The common notion of information covers (and confuses) two very important concepts:

- information as a „internal property of universe" („negentropy", which determine system)
- information as a knowledge (that is result of individual human cognition).

Similarly many modern authors (Miller 1978; Stonier, 1990; Kampis, 1991; Banathy, 1997) consider more aspects of information, some from them speak about "informations" (Pedersen, 1996). Very interesting is Miller's work, elucidating different form or aspects of information within living systems and their relations and mutual changes. Also Kampis considers two aspects of information: In the sense of knowledge he names it as "nonreferential information" and in the different (opposite) sense he defines "referential information" and connects it with actions that results into changes in (received) systems. Just this Kapis concepts of "information as action" corresponds to mentioned type "information from system". To accept third concept (aspect) of information labelled by Banathy (1997) as "state referential", we can brief arrange table No. 1, that compares the used terms and briefly characterizes three mentioned aspects of information, its denotation and implication.

An interchange and a conversion of information types create closed loops or "information circle". In other words: Mentioned circle covers associations of knowledge, information (as actions / impetus) and states of the world. Regarding three mentioned types of information we can show described concept of information(s) by the following figure No. 2. The figure shows complicated relations between information that determines each system, human perception & cognition on the one side and (human) actions managing this system. Schematically drawn circle is actually much more complicated in a consequence of rich and naturally uncertain communication (or information flows) within social systems.

TABLE 1 The characterize and compare of three main aspects of information

Common name	Systems concept	Kampis terms	Character
NEGENTROPY	Information in system	State referential information [2]	It determines system and /or characterizes its state
INFORMATION	Information from system	Nonreferential information	It is interchanged between living system and its environment
KNOWLEDGE	Information about system	Referential information	Product of experiences, mental processes and mind

Sketched basic rotation of information conceives basic framework of evolution (including traditional evolution of living systems). This circle has a character of nature loop – it is not possible to interrupt it, however it is practicable – with consequences upon evolution. This fact raises ordinarily unthought dilemma of information handling, including the use of modern information technology and building/using of designed information systems. Therefore both mentioned activities as well as many others, that present pragmatically oriented trends of modern "information" society, need good understanding of information.

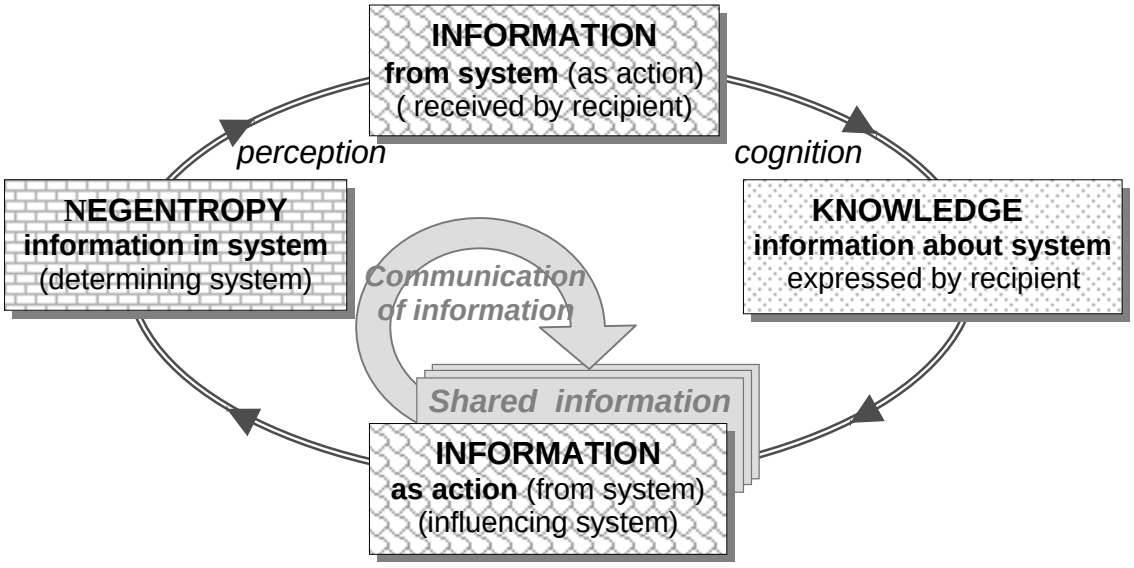


Figure 2 Closed information loop (circle): associations of three aspects of information enriched about human communication of information in social systems

However difficulties arising from getting over a mechanistic concept of information don't finish by acceptation of three proposed ideas of information.

[2]) Bela Banathy - linking to Kampis concepts – uses the term „state referential information"

Next from them arises the relative character of information: one is as well receiver of information (from system) as a producer of explicitly manifested revealed knowledge (information about system). Taking the consequences it becomes information from system for other potential receivers and changes internal information of system at the same time. Laws and enactment given from the to top public offers good examples: they determine social system, they influence behavior of knowing (receivers), they could be interpreted in different ways…

5. Entangling with data and information

More often mentioned and more typical is effort to render a nature of meaningful information and its confused relation to data and information. Also British Standard (BS 3527, Part 1, 1976) defines information as "*the meaning that human assigns to data by means of conventions used in their presentation."* Many authors suggest altered vision association between them, some try to amplify it just for a knowledge and yet anothers use some further entities as "wisdom" (Ackoff, 1989) or "capta" (= captured data, Checkland, 1998). They attempt to connect data and information through human mind in this way, however linear and causal relations cannot catch the nature of information. Typical result presents a "linear chain" schematically drawn in the figure 3.

Figure 3 Line, showing relations between information aspects

The meaning is associated just with information (information from system / as action) and its constitution qualified to biological and mental processes or to self-production and autopoises (Mingers, 1995). Just appropriate ideas and theories overstepping mechanical paradigm give new attributes to information, knowledge and meaning too. They are not steady and firmly given as a "content" or "representation" but they result from activities of living systems. Kampis, 1991, p. 436 suggests:

> *… information in cell is not about something. That is, information is not passive, representational and established, but active, specificational, and productive.*

Regarding this actualities we can sketch new and necessarily simplifying schema (see figure 4) that demonstrate more intricate relations within (closed loop of) information processes resulting meaningful actions. The learning process creating intrinsic human knowledge plays fundamental role like this which this tacit knowledge engages in the process of interpretation data into meaningful information (as action).

6. Ambiguity of knowledge

Let us emphasize the distinction between “learning” and more passive “teaching” [3]): Learning process presents active perceptive and cognitive activities originating from individual human interaction with environment. Individual intrinsic knowledge results from experiences acquired in this interaction. On the opposite side the teaching activities are based upon the communication of explicitly declared information about system (that has a character of knowledge too). As such it information is presented through language symbols and need individual intrinsic knowledge…

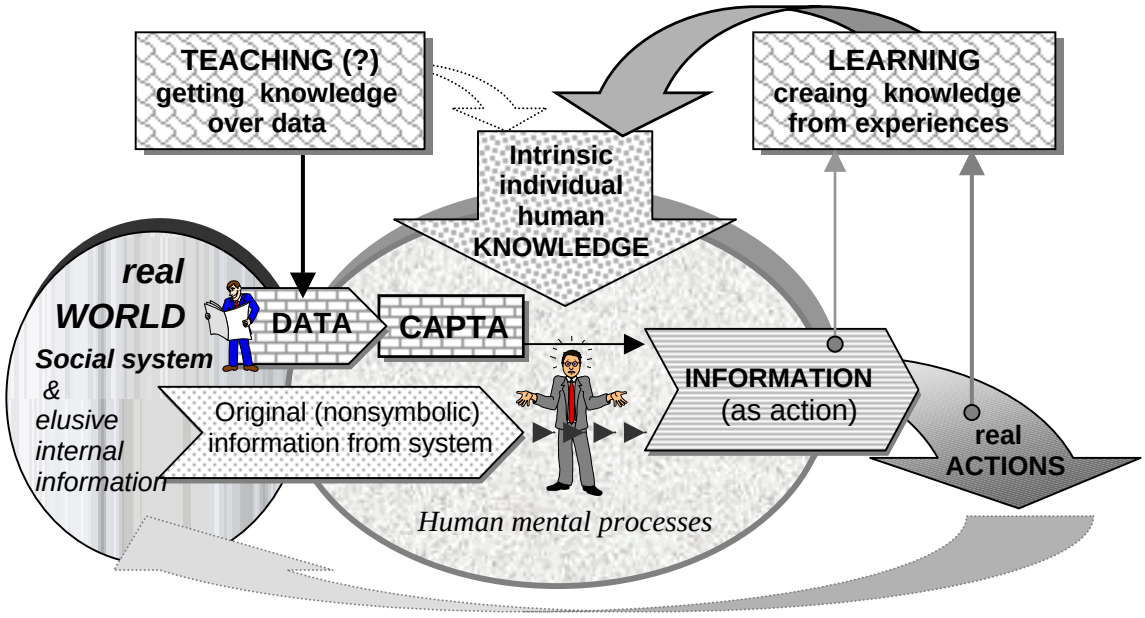


Figure 4 Information circle regarding human information handling

In spite of this intrinsic knowledge has a character of intimated general concept of “information about system” and constitutes an unique singleton. It is a important part of human fenophenotype and we can use a metaphor “it complements genetic information provision of the man” and puts the basis of his individuality. Intrinsic knowledge as well as cognition originates a nature of autopoises, living systems and – on developed abstract level connecting with “symbolic function - of a human too. Regarding this a holistic character of intrinsic knowledge emerges and a comprehension of “knowledge (cognitive) system” appears more appropriate than thinking of the “single knowledge”.

Let us point to a few important attributes of human intrinsic knowledge (system):

- It is not neither objective (independent upon the man) nor subjective (independent upon environment) – intrinsic knowledge is just individual (Winograd and Flores, 1986). Arising from unique interaction of the individual with his environment in evolution process it covers some shared values, patterns of behavior, culture norms…

[3]) I am not quite sure if chosen terms distinguish intentioned ideas precisely: it is very difficult express so nice sense, moreover in a foreign language.

- It is based on abstract and symbolic cogitation – it has conceptual character closely associated with an ability to use languages and primarily based upon mother tongue. Coherence (no hierarchy) of syntactic, semantic and pragmatic aspects emanating from experiences enriches human knowledge with value, intentionality and probably with an emotionality too.
- Intrinsic knowledge appears as a dynamic and self-developing system. It is not based upon the relations named as representation, but it is "*activelly built up by cognition, that serves the subject's organization of the experiential world, not the discovery of an objective ontological reality" (*von Glaserfeld, 1991, p.233).

It is necessary to differentiate carefully the intrinsic human knowledge from a meaning that is used in some other domains:

Firstly the concept of knowledge (and its representation) plays an essential role in the artificial intelligence primarily. In this case knowledge presents value free and formalised fact (factual knowledge) and resolutely defined rules for their using (procedural knowledge) handled independently from its user.

Similarly the concept of "organizational knowledge" and "organizational learning" is rather metaphor, however organization comprises resembling properties. Actually the intrinsic knowledge is the inborn attribute of biological single (person) and the adequate organizational feature emerges depending on information changes (see "information circle) within organization.

7. Conclusion for future information society

Just intrinsic knowledge constitutes fundamental framework of dealing with human information and consequently of an individual competence as ability to compete in evolution process. Individual character of intrinsic knowledge results into many different ways of interpreted information, its meanings and (free) individual behavior. Emergent uncertainty – undesirable from a mechanistic worldview – is fundamental attributes of successful (?) evolution of human species…

Better considering the nature of information and its role in evolution would contribute to better understanding of human nature as well as the problems of society, including more pragmatic activities from ecology and education, through business … up to the design and implementation of information systems or effectiveness of (modern) information technology.

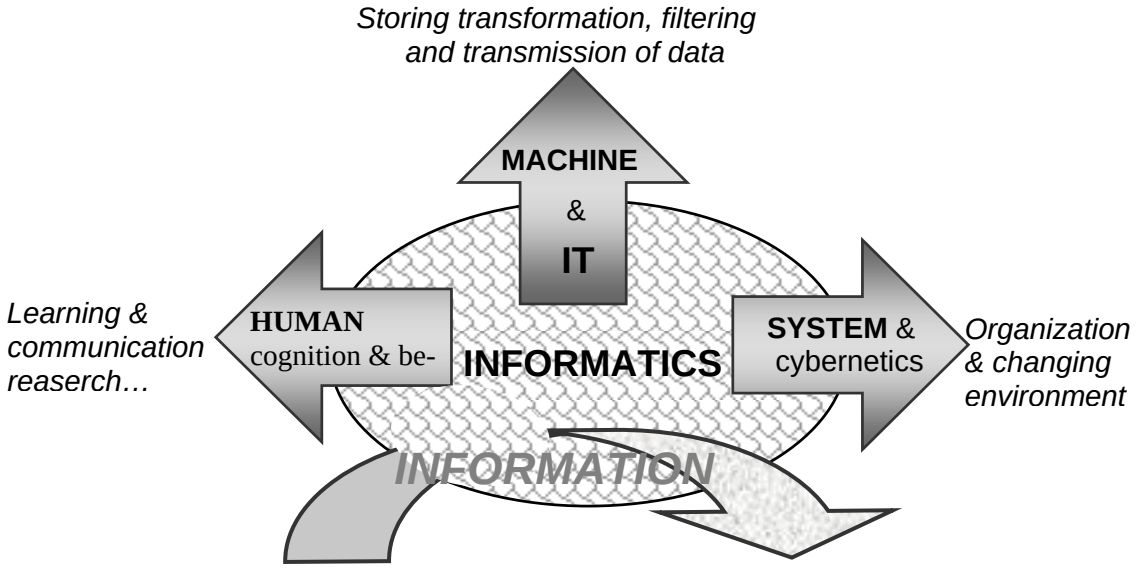
Actually the importance of information in society doesn't increase – it has fundamental significance since long ago. What really increases are a necessity to survive in much more turbulent world of which complexity (amount of information – Klír, 1991) originates from dramatic accelerating evolution in the last "industrial" era.

The huge amount of human information – information about systems, presented by data – have increased in an extraordinary way thank to many "artificial" activities and systems as scientific investigation, public education, mass-media… and information systems based on information technology (inc. internet etc.). Understanding information we should agree with (Holtham's (1996) argumentation that „*We have so many different inputs of data now in most societies and organizations that it actually becomes harder to extract the useful information".*

Our intrinsic knowledge – the framework for human information dealing – does not develop in an appropriate way. Any information technology cannot

change it, however it can to support needed changes. In opposite: its fantastic power use in spirit of mechanical paradigm rather expands quantity of exploited data. Without the applicable receiver's (intrinsic) knowledge this situation baffles interpretation and causes information overload in this ways. Fundamental is our "paradigm shift"…

From many particular ways let us point to the modification of the concept of "informatics" and its education (that commonly covers rather teaching than learning). Wider concept, including no only technologically oriented skills (manipulating with computers in worse case) other branches: systems associations and cognitive human abilities, is sketched on figure 5.



Figurre 5 Wider concept of informatics – from a systems point of view

Each technology encloses certain amount of knowledge (Salomon, 1992), given by its authors: designer, architects, producers, organizers, engineers, initiators… but it is used by some others. Users are empowered thanks to use it without an adequate competence, without understanding of association and consequences. Natural interchange of information is cracked and the evolution process is effected and new issue of power emergent. Namely large information systems based on information technology, designed by many engineers produces little perceptible, anonymous – and therefore badly controlled – power…

By the way: Zbygniew Brzezinski (1993) – from entirely different positions - indicates two points that humanity must get in hand on the eve of new millenium: *genetic engineering and artificial intelligence*. Both cover information dealing…

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