Towards a General Theory of Information

Laura L. Pană
Polytechnic University of Bucharest, Romania

INTRODUCTION

Today's society and our entire epoch are often characterized as the information society, respectively the information epoch, which is the current stage of the technical era. The technology developed on information bases – Information Technology – is now exhaustively studied and further rapidly developed. Consequently, technical information is nowadays the most accessed. This article attempts to bring nearer to completeness the theory of information by analyzing social and human information, existing in various, human-like and human-made structures, processes and activities. The complex status of information is based on its double quality, namely that of an essential component of existence at all its structural levels, and that of a founding concept for many scientific, technical and philosophical disciplines. An interdisciplinary study of information is thus accomplished, by using findings from several scientific and philosophical disciplines, from Information Epistemology or Information Aesthetics to Neuroinformatics and Neurorobotics. Various information types, specific for different existential levels, such as structural information, functional information or free information will be characterized and defined, as well integrated in a general overview of the world of information. New research themes such as information values, information efficiency and information responsibility are proposed at the end of article.

BACKGROUND

Intellectual life is dominated today by information-related activities such as information generation, information processing, evaluating, managing and using. Under these conditions, even society, as well as the whole existence could appear as a hierarchical succession of informational structures, processes and activities. This information-centered vision is supported by a series of scientific representations and philosophical outlooks. Some outstanding findings of these cognition area show, respectively argue that information is present, active and has a decisive importance at each layer and in every field of existence: in nature, society and technology. In the field of physics, various structural layers of existence are often associated with certain informational features. Sometimes the hypothesis of generation of distinct existence forms by various information contents is formulated. At other times, even a distinct kind of matter is postulated – the so named *informatter* –, characterized by some deep constitutive information sorts, such as electric charge, lepton or baryon number, charm and strangeness (Drăgănescu, pp. 52, 228, 219).

The synthetic concept of *informational energy* was coined and elaborated by means of mathematical statistics (Onicescu, pp. 4-5). The formula associated with this concept makes possible an overall characterization of the organization state of a system: when the system is completely disorganized, its informational energy is minimal, and when the states of the system tend to be reduced to a single state, its organization is total and the informational energy to maximum.

Energy, organization and information are correlated and within different technical approaches. Norbert Wiener was the first who explicitly stated that information is that what counteracts the degradation of energy as the increasing of disorder in systems, and who defined information as negative entropy or *negentropy*. In other, kindred, but more

nuanced approaches, as that of J. Guillaumaud, who accept only an analogy between negentropy and information, this latter is understood as *potential anti-entropy,* with the same role: that of a measure of the degree of organization of a system. Recently, datastore technologies were enriched with *active anti-entropy* applications, by which can be developed faster-growing Web-based, mobile and social networking activities, as well as cloud services, used to solve conflicts between information object replicas stored on different nodes or between concurrent client updates, and devoted to avoid physical data loss and corruption, and other events that distributed systems are built to handle. A *passive anti-entropy* system heals information object conflicts only when a read request reaches the web service from a client: any conflicts between objects that are not read by clients will go undetected. In an active anti-entropy technology, conflict resolution runs as a continuous background process, by which databases are updated in real time as new writes come in, which reduces the time that it takes to detect and repair missing or divergent replicas.

Some authors studied *information entropy* and more, its role in *social entropy*. They demonstrated that the quantity of information in a social system depends only on its complexity and dynamics (Şileţchi & Lascu, p. 19), but also that important in social entropy reducing are not only order and disorder, but also orientation or disorientation of social processes (p. 37-53); a well oriented social development can stabilize the variation of social entropy and thus can decrease the probability of crises in the society - nature interaction as in society (p. 130). Aiming to clarify some structural and operational aspects of human psychology by applying an informational research perspective, some scholars discover that information itself can be alienated in psychiatric diseases or can be alienating, when induces incertitude in individual or public mind, and indecision at social level. They use the notion of *informational conscience* (Pamfil & Ogodescu, p. 186) and propose a genetic definition of information (pp. 190-201).

By the concept of *quasi-information* R. Ruyer aims to explain and to give a content to the idea that information is inserted in matter even from the layer of elementary particles, but he also believes that the term designates everything that can be subsumed to notions such as potentiality, sense, finality, instinct or competency. He specifies that consciousness is the most important, because it alone can induce order in the world.

Other authors, such as G. Simondon, refuse to reduce the extension of information as a concept to its technical meanings, and argue that it perfectly responds simultaneously to the exigencies of quantum physics, biology and psychology or social studies, because it is linked only with energy and structure, and because of its purely operative feature (Simondon, pp. 219-220). He goes even further and – as shoved by one of his disciples – reforms the concept of information both in terms of system's meta-stability and of processes of transductivity (Bardin, p. 27).

An even larger extension of the term is proposed by J. Zeman, who studies the applications of the concept of information channel both to cosmic information flows and epistemic processes, and shows the role of information as the main negentropic factor in knowledge and learning (Zeman, 247). The concept of *informational time* and its measurement in these kinds of processes are initiated by him (p. 253).

Several scientific disciplines highlight the status of information in existence by imposing the concept of *structural information*. This notion, which also circulates in the form of "molecular information", is used in biology and in macromolecular biochemistry, which is also called informational biochemistry. In these scientific areas have been developed methods of calculating the amount of structural information necessary to obtain complex structures (copolymers) or to measure the entropy of cell in multiplication (functional or abnormal).

Renowned representatives of Information Science and Technology are recognized for their practical approaches which are, however, in deep

Related Content

IT Solutions Supporting the Management of Higher Education Institutions in Poland
Elbieta Janczyk-Strzaa (2018). *Encyclopedia of Information Science and Technology, Fourth Edition (pp. 3910-3921).*
www.irma-international.org/chapter/it-solutions-supporting-the-management-of-higher-education-institutions-in-poland/184099

Using Receiver Operating Characteristic (ROC) Analysis to Evaluate Information -Based Decision-Making
Nan Hu (2018). *Encyclopedia of Information Science and Technology, Fourth Edition (pp. 2213-2223).*
www.irma-international.org/chapter/using-receiver-operating-characteristic-roc-analysis-to-evaluate-information--based-decision-making/183933

Information Systems, Software Engineering, and Systems Thinking: Challenges and Opportunities
Doncho Petkov, Denis Edgar-Nevill, Raymond Madachyand Rory O'Connor (2008). *International Journal of Information Technologies and Systems Approach (pp. 62-78).*
www.irma-international.org/article/information-systems-software-engineering-systems/2534

Real-Time Communication Support in IEEE 802.11-Based Wireless Mesh Networks
Carlos M. D. Viegas, Francisco Vasquesand Paulo Portugal (2015). *Encyclopedia of Information Science and Technology, Third Edition (pp. 7247-7259).*
www.irma-international.org/chapter/real-time-communication-support-in-ieee-80211-based-wireless-mesh-networks/112422

Current Situation and Appraisal Tendencies of M-Learning
Laura Briz-Ponce, Juan Antonio Juanes-Méndezand Francisco José García-Peñalvo (2018). *Global Implications of Emerging Technology Trends (pp. 115-129).*
www.irma-international.org/chapter/current-situation-and-appraisal-tendencies-of-m-learning/195825