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Human Systems Cybernetics

Cybernetics may be a framework for explaining the learning processes, in the acception of the theory of maintaining the equilibrium. The paper contains some considerations regarding the optimality defined by the learning processes.

1. The interest for the study of human processes is not new. Though in our century there are many voices declaring the man as an "unknown being", we must recognize that, from the Socrates "know yourself", the man permanently was a careful subject of study.

One of the problems which worried, in the last time, the research workers was the possibility of systemic interpretation of the learning process.

Human knowledge is the result of an interaction between an extraordinary biological structure — the human body and some artifacts, as are the books — and the real world. Human knowledge means structure in his body (not only in his brain), but the nature of such structures, their mode of codifying are yet insufficiently elucidated.

It is admitted today that there are two genetic processes, the biogenetic and the noogenetic one [1]. The noogenetic process means the learning structure in biogenetically created systems.

The totality of knowledges makes up a single system, because men are very similar as structuring potential, as they are determined by the same information system — biogenetics — and as the real world is essentially the same for all human beings, regardless thair location. The real world contains, at any moment, all knowledge structures, and those structures affect, in their turn, more and more the real world, because knowledge is by itself a noogenetic factor of considerable importance.

Processes through which knowledge structures are built up are very little known. But the fact seems to be clear that the formation of new images

or representations depends on the structure of the old ones, and the new structures are amalgamated with the old ones. We also know that the learning process is determined, not only by old or new images, but also by evaluation (awareness is a form of evaluation) and by emotion, which form together a filtering system. An image is generally comparable only with another image and not with the real world, and a true image is an image which did not disappoint i.e. an image with the help of which a confirmed prognosis could be done.

The success of the scientific undertaking is explained by the fact that scientists accepted an image only after it could be experimentally verified. The first result of the testing process in science is the elimination of error. The elimination of error does not lead by all means to truth. It can produce only the recognition of ignorance. We can argue that the problem of learning is the replacement of error through ignorance of various degrees and that we thus approximate the scientific truth.

So far, the contribution of the general systems paradigm to the drawing up of a firm theory of learning was a poor one.

This paradigm appeared 25 years ago, partly as a protest against the extreme specialization of the scientific disciplines, and partly as a desire of breaking the barriers between them, but also from the conviction that the disciplines were a product of the limitation of the knowledge process. The methodology of general systems represented hence a desire of communication between disciplines, in the hope of rendering obvious what is common to them. The founders of the Society of general systems defined, in their manifesto from December 1954, a general system as being a theoretical system, interesting more than a single discipline.

It is intersting to note that the general systems developed approximately at the same time with cybernetics (meant as a form of — control — through negative feedback). Cybernetics is a general system, identified in biologic, technical and economic sciences. Distinct phenomena as body homeostasis, operation of a thermostat and the cycles of market economy, fall, all of them, under the incidence of the same principle.

It we admit that cybernetics is the theory of maintaining the equilibrium, and that the learning is a system of desequilibria, which describes a permanent change, with some quasiequilibrium on the way then it becomes obvious why one tempted to approach the learning processes with the methods of cybernetics.

The understanding of the learning processes is considered now as one of the imperious needs of humanity. The solving of all social problems implies the learning, i.e. the advance towards the truth [2]. The methods of cybernetics — regarded as the form of control by feedback — can play a poor role in explaining the learning at the level of the man, and therefore there appeared recently new approaches, which amalgamate in what is named human systems cybernetics [3].

2. The study of the so called optimum problems — existing since the man is confronted with problems of choice — was strongly pronounced in the last decades, when the concept of optimum was connected to the concept of efficiency, and especially when the concept of efficiency was connected to that of human system.

The concept of optimum, interesting from the mathematical viewpoint, was investigated by all those who tried to apply mathematics for explaining or determining the course of things. Whether the mathematician or the economist or sociologist is in question, the concept of optimum was invariably linked to that of order. The sociologist dealt especially with the order which is imposed. The mathematician was interested purely and simply in order.

No matter how, at the basis of the ordering stands a process of comparison, determined by the existence of a criterion of comparison. Thus, we can say "greater than" or "less than" if we put into correspondence the compared objects with numbers from the sequence of numbers which have their order, an order imposed by itself, hence a natural order. We can similarly say "earlier" or "later", because the order in time is equivalent with the own order of the sequence of numbers.

Similarly, as any comparison criterion allows an ordering, in its turn any ordering allows to render evident some privileged objects: "the greatest", "the earliest", "the first" or "the last", a.s.o.

It remains only a step from here till establishing the optimum. The optimum is designed as being one of the privileged objects.

The "selection" of the optimum is hence subjective, as the optimum exists for somebody, and not in itself. The optimum has not its own existence. But the structure of order, which is the basis of the subjective establishing of the optimum is objective, i.e. it is noticed as a regularity.

The observation of regularities makes the object scientific research at all events, and this, helped or not by the mathematical language, tried with patience to identify the movement in the order structure, i.e. movements toward privileged states. Thus, rules of movement and especially rules of stoppage were marked out. The stoppage points, usually called equilibria, intrigued the philosophers, mathematicians and scientists, who asked themselves whether one can talk of natural optimum, or whether the imposing from outside of such an order does yes or not represents a violation of a natural law. This attitude become clearer in so far as the discipline called human systems cybernetics was outlined, though it was noticed formerly. Thus Petre Andrei noted, as early as in 1936, that the society is not organism and organization, that it is not something mechanical or artificially built, according to mathematical calculations, because it is spiritual unit, economic life, and the rules of right and the morale are spiritual complexes, which must be looked at as such [4].

The concept of optimum, intensely used in the economic sciences, is connected here to efficiency, the ordering criterion being external. In the case of controlled economies, this criterion is usually the social objective of the development of industry, and then planning means a procedure of formulating the social objective plus a procedure of attaining this objective. When the economy is looked at as a system, the subject of planning expresses both the interests emerging from the system, and the immanent interests of its various elements. The emergent properties are defined as integrity properties, i.e. as properties of the system not pertaining to the component elements. This explains the fact that, the total optimum does not correspond to the local optimums.

Usually, the contradiction total optimum — local optimum is solved by sacrifying one of the poles. In most cases the local optimum is not the preferred one.

This contradiction can be nevertheless solved also otherwise. One admits now the importance of synthesis instead of pendularity.

The first step is the acknoledgement of the multicriteria character of decision making. A decision can't be made by taking into account a single selection criterion.

The optimization methodologies drawn up in the previous years, confronted with the restrictions imposed by the energy crisis, determine now the replacement of certain rudimentary representations, we have about the factor of economic growth, by a more realistic and more shaded vision about the weight of the various elements that can determine the growth. This is the point of view of the experts [5], who admit with lucidity that the economy uses, in virtue of inertia, a series of notions, conceived and substantiated in other economic conditions, in the period of upsurge of industrialization period, wherein the rather naive estimate that nature's resources are inexhaustible, was prevalent. They feel since a long time the need of reflecting about the substance of the concept of efficiency based upon the theory of value. In the conditions of socialism and in the present situation of energy crisis, the content of the concept of economic and social efficiency of labour and its calculation methodology imposes the taking into account of the parameters of long lasting development.

The second step is to acknowledge the character of process of the decision making. The decision represents a result of a calculation, only in old books of operational researches, wherein the decision making is considered as knowing everything, as using a recipe and obtaining a solution. Actually, we have to deal with a complex process of formulating criteria, often imprecisely, i.e. to modify the image as far as new elements appear, some of them determined by the previous steps of the process. The old image about the optimum begins thus to shake [6].

According to the old image about the optimum, the one determined by the axiom of the "rational" choice, it is necessary, in order to find out the optimum, to know all alternatives from the beginning. Only by knowing all alternatives from the beginning, one can compare them, so as to determine the "best" one, regardless of the subjective charge of the term "good". When not all alternatives are known, it would seem senseless to speak of "the best" alternative, and nevertheless this is the used term, in real situations.

The industrialization plans of many countries are, all of them, examples of options in incomplete knowledge of the facts. The development of some industries based upon techniques, technologies, materials used within the consumption society or which can be obtained only through importation, ignored the energy crisis, the conjunctures wherein they appeared or were used, hence the alternatives of other peoples were purely and simply admitted.

A general process of changing evolutions is noticed at world's scale, and so much more, at national level, a critical analysis of the manner of defining the content of some economic categories is necessary, in order to reevaluate the parameter which will characterize a developing country.

3. The ignorance of some criteria, especially if they are fundamental, makes that the decision process be instable, and then the conclusion of considering a greater number of criteria is imposed. Taking into account that criteria are not known apriori, but are learned, the decision process seems to have much in common with a learning process. The current researches, centered on this paradigm, try to take into account the natural learning process peculiar to man, and less the abstract schemes deduced from abstract axioms, as is the axion of selection.

One of the attack ways is the one which deals with the structure of learning process. Thus it was noticed that the set of criteria, i.e. the set of subjective evaluations, has a very interesting order structure: to each pair of criteria corresponds another criterion which synthesises it. This fact allowed the study of criterion stability in the decision-making process. It would seem, as a consequence of this study, that the decision must not be understood as a selection, but as a motion toward a purpose: "the most stable" criterion. A natural movement, peculiar to man, is concerned, and not a movement imposed from outside.

The practical implications of these conclusions are important. The movement towards an aggregate criterion, resulting from local criteria through a systhesis process, means a pullback toward stable states. This pullback is natural, and the stopping in a state of equilibrium may be considered as a natural optimum, if the term "optimum" has still any importance.

The optimality gets now a somewhat new content, because it is induced by the learning process, internal to man, and it doesn't depend anymore on an external observer.

The representation of the natural learning process by a synthesis process allows its modelling with very general order structures, of the category type, which are algebraical structures, allowing a polyvalent logic. If we admit the affirmation of a celebrated mathematician, Saunders Mac Lane, that mathematics is a network of hidden structures, then it is probable that mathematics will be useful for investigating the optimality induced by the learning processes. Some results of Romanian researchers seem to encourage such an attempt.

We are not interested in the technical aspect of the problem, which depends obviously on the language at hand, but in the practical implications for the management science.

For a long time, at least a few decades, the attempts of projecting a better society used on older image about "design", and they hoped to find an ally in science, surely by ignoring the fact that science also operates sometimes with false images and that, in any case, it never exists an ultimate image. When speaking of "scientific management", the adjective "scientific" doesn't bring so much certitude as believed, and this fact must not be neglected when the result of projecting is the fate of a lot of people.

Science means the theory of the real, and mathematics represented the most attractive language for formulating theoretical physics, and this is why, in the sixties, a great credit was afforded to the attempts of mathematizing social sciences, imparting them sometimes a deductive character. The theory of optimization is a typical example of this phenomenon.

The powerful resistance the life opposed to the simplist methods, based upon the non-critical application of the selection axiom, led to new orientations [7], [8]. The rendering evident of the normative character of the classical unicriterial optimization model, in disagreement with life, led to the introduction of a correction, identifying or justifying, in any case, delimiting the field of human systems. A human system is not a system, purely and simply, because man is not an automaton.

Concepts which seemed to be useless for the management science are thus brought again in discussion, enriched, turned to good account.

So, for example, it is spoken anew of spirituality. This synthetical concept, designing the ideal values through which man goes beyond the natural existential datum and supposes himself as product of the nature — ignored by positivism and vulgar materialism — is taken anew into account.

Professor Mihai Drăgănescu, for instance, noted recently that the systems are of two kinds: open and half-open [8], and that the science of systems dealt so far only with the open systems, which are not the most suitable for man. He considered that, in the nature, the half-opening means the development in itself of the informational between certain limits. The fact of the existence of a way the half-opening was stated by Constantin Noica, when he studied the significance of the words "in within". An interpretation of the half-opening is that of a psychological level, having a material support of a more profound physical nature which allows new, free structures. All that is living appear, to Professor M. Drăgănescu, as half-open, and the greatest interest is presented by man, seen as an open and half-open system, the opening being dominant, and the half-openind more concealed. Only the systems deprived of life, hence the technical systems or automatons are strictly open. Human systems are not automatons because they are half-open. In other words man can reach depths.

The process of learning through synthesis could be put in connection with the way the man can reach depths [9], [10], [11].

The aggregation of the partial evaluations means practically the advance towards essence, and is based upon dialectic logic, adopting operators of the "and" type, equivalent with operators of the "nor" type.

The perception of the aggregated criterion previous put in connection with anti-consummerism, may be put in connection with the spiritualization of man, in general. Renouncing to the anchoring in optimal partial appearances, in order to surprise the natural optimum, represents a movement towards a purpose, and it is framed within the family of processes studied by human systems cybernetics.

Such studies show that, in human systems, we don't need the dichotomy total optimum — local optimum. If the local optimum in the natural one, and this is a single one for all, then — through communion — the total optimum is identical with the local one. We don't need any more, in this case to use the emergency concept, peculiar to open systems and rather conused even there.

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LA CYBERNETIQUES DES SYSTEMES HUMAINS

Considérée comme théorie du maintien de l'équilibre, la cybernétique peut offrir la posibilité d'expliquer les processus de la connaissance. L'auteur présente quelques opinions concernant l'optimalité définie par les processus de la connaissance.

КИБЕРНЕТИКА ЧЕЛОВЕЧЕСКИХ СИСТЕМ

При своём понимании, как теории сохранения равновесия, кибернетика может быть пригодной для объяснения процесса обучения. В работе приводятся некоторые соображения, относящиеся к оптимальности, определенной процессом обучения.

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