University of Navarra

Working Paper
WP no 6
July, 1974
Rev. 7/07

ANTHROPOLOGY AND SOCIOLOGY: A CYBERNETICAL APPROACH

Juan A. Pérez López*

* Professor, Managing People in Organizations, IESE

IESE Business School – University of Navarra
Av. Pearson, 21 – 08034 Barcelona, Spain. Tel.: (+34) 93 253 42 00 Fax: (+34) 93 253 43 43
Camino del Cerro del Águila, 3 (Ctra. de Castilla, km 5,180) – 28023 Madrid, Spain. Tel.: (+34) 91 357 08 09 Fax: (+34) 91 357 29 13

ANTHROPOLOGY AND SOCIOLOGY. A CYBERNETICAL APPROACH[1]

Cybernetics

Cybernetics deals with the dynamical properties of different kinds of systems. It develops its analysis at a conceptual level, which might be said to correspond in physics to that of pure mechanics.

Every system appears as an entity which "supports" a particular relationship between a series of inputs and a series of outputs. Inputs can be seen as "stimuli" – actions of the environment upon the system – and outputs as "responses" – actions of the system upon the environment.

The analysis of those elements which help explain the behavior of the system, those which changes in the relationship between inputs and outputs that appear as a consequence of "learning" from accumulated experiences, constitutes the foundation of a very important system classification that categorizes them according to their "learning" capabilities. Three different kinds of systems can be considered:

- Stable systems
- Homeostatic (or ultrastable) systems
- Freely-adaptive systems

In all of these cases, "learning" refers to the property of a system by which it has the capacity to take advantage of past experiences in order to change its former ways of reaction to any particular stimulus, searching for better paths towards a "desired state" called "equilibrium". In order to understand the process, it helps to think of the system's structure description as a "decision rule" which relates stimuli to responses. Therefore, we have:

Stable Systems

Stable systems are those that do not change their decision rules. Experiences do not help mould or modify their responses to a particular stimulus. They do not "learn".

---

[1] This paper was written in 1973 by Juan Antonio Pérez López, and revised by Josep M. Rosanas in 2007.

Homeostatic (or ultrastable) Systems

Homeostatics system are those that improve their decision rules by the accumulation of experiences. They make “better decisions” than those made previously, which over time helps them to move on towards “equilibrium”. The system “learns”, and this learning means that its structure is becoming a better tool to deal with those problems that the system may have to solve due to environmental changes.

Homeostatic systems are also called “simple-adaptive systems”. They can be classified in two different sub-types:

1. The first sub-type assumes a perfect consistency between the evaluation of a response from the point of view of equilibrium (at a level that relates to system environment) and the evaluation of that response from the point of view of its contribution to learning.

2. The second sub-type does not assume that consistency. In order to account for this lack of congruence, it is necessary to accept two different “levels of equilibrium” in the system: “Internal (or structural) equilibrium” and “external equilibrium”. Systems of the second sub-type constitute the analytical framework that is needed to understand the dynamical processes of the simplest systems with bi-valued actions. Because of such lack of consistency between the “value” of an action from the point of view of “external equilibrium” and the “value” of that same action from the point of view of “internal equilibrium”, often the “best action” from one perspective is at the same time the “worst action” from the other. As a consequence, it is evident that it makes no sense to use the words “good” or “bad” to qualify the responses of these systems. These words implicitly assume a single level of equilibrium. To keep in mind the existence of two levels, we define the “effectiveness” of an action, as the “value” of that action from the point of view of its contribution towards external equilibrium; and we define “efficiency” as the “value” of an action from the point of view of its contribution towards achieving “internal equilibrium”.

Freely-Adaptive Systems

Freely-adaptive systems are those whose “decision rules” change as a consequence of experiences but without considering if the change is for good or for bad (i.e., whether the learning is “positive” or “negative”). Depending on the particular “history” of the system, it may “improve” or “jeopardize” its capabilities for adaptation. Evaluation of actions of freely-adaptive systems should be made from three different points of view:

1. *“Effectiveness” (of an action):* Evaluation of the action contribution towards external equilibrium.

2. *“Efficiency” (of an action):* Evaluation of the action contribution towards internal equilibrium.

3. *“Consistency” (of an action):* Evaluation of the action consequences on “future consistency” between “effectiveness” and “efficiency”.

"Consistent actions" are those that develop in the system those capabilities that help to eliminate any "decision" which could produce "negative learning".

Freely-adaptive systems constitute a "model" that describes the decision-making processes of any problem-solver that wants to solve two different problems simultaneously. This "model" helps to understand the process of synthesis.

It may be useful to compare the behavior of a freely-adaptive system to an homeostatic one, because both of them apply a "trial and error" process to learn. Such a process would ensure a "total equilibrium" for the homeostatic system: the behavior of the system could be represented by a series of waves which would converge along a line representing the "optimal behavior". In contrast, in the case of a freely-adaptive system, the process would not ensure the accomplishment of "equilibrium", unless any action chosen within the process were first to achieve consistency.

Cybernetical Analysis

One of the possible applications of cybernetical analysis is assessing the characteristics required by those "mechanisms" which must perform the "functions" specified for all the different system models. A second possibility is trying to find the "behavioral laws" applicable to "organizations of systems" of a certain kind. The end products of such analysis would be the discovery of "organizational laws" related to organizational equilibrium and based on the properties required to ensure "equilibrium" for the elementary systems that constitute the organization. For instance, an "organization" of freely-adaptive systems is in itself a freely-adaptive system. Once we have approached the analysis of "organization" in that way, we have found several questions which should be answered to illuminate the process or needs required for achieving "equilibrium" within an organization. One example could be: What is the relationship between "effectiveness" for the elementary systems and "efficiency" of the whole organization?, etc. To answer these questions is far from simple. However, an answer is implicitly assumed whenever a decision is prescribed for the whole organization.

This area of research is likely to be very helpful to formalize the analysis of human problems. Freely-adaptive systems constitute a better "model" of human beings than those that are frequently (almost always implicitly) used. We can hope that the "laws" that will be found when analyzing the equilibrium process of freely-adaptive systems organization will be, in relation to applied sociology, what physical laws are to engineering.

The typology of systems described in the first part of this paper, makes clear that stable systems are particular cases of homeostatic systems, which in themselves are particular cases of freely-adaptive systems. For instance, if a freely-adaptive system gets a "device" added to eliminate any possibility of choosing inconsistent actions, it would become a homeostatic system of the second sub-type.

It seems logical that an observer, confronted with the problem of explaining the behavior of any system endowed with learning properties, should approach to the analysis using the framework required to explain the dynamics of freely-adaptive systems. The decision to adopt a "restricted framework" – such as that of an homeostatic system – then would have to be justified, because it assumes that learning will *always* be positive.

Unfortunately, we find that in most cases this restricted framework is used to explain the behavior of freely-adaptive systems as if they were homeostatic or stable systems. A case in point: classical economic theory approaches economic phenomena as if human societies were homeostatic systems (of the second sub-type). Marxist revolution is meant to transform – as soon as possible – that system into one of the first sub-type.

It is interesting to discuss the reasons why, in my opinion, such analytical bias exists. It is as if the framework of stable systems were the only "scientific framework" available for explaining the systems behavior. We keep trying to explain the actions of any system by finding a *constant relationship* between *stimuli* and *reactions*. Of course, this constant relationship eludes our research efforts in the case of living organisms. In the case of human beings, for example, the relationship appears to be so elusive that many people have concluded that it may be impossible to find.

In spite of these frustrations, we rarely criticize the framework itself. But, it happens that the set of concepts which constitute the framework for analyzing dynamics of stable systems is not powerful enough to formalize dynamical processes of more complex systems. From the point of view of Cybernetics, Sociology appears to be a "theory of mechanics of organizations of freely-adaptive systems". It is by no means surprising that a "theory of mechanics of organizations of stable systems" would not be able to distinguish between the different levels of relevant behavior to explain adaptive processes of freely-adaptive systems. The latter theory lacks "variables" and constitutes an "incomplete model."

What is more surprising is the "prejudice" of maintaining, as a kind of dogma, the necessity of explaining human behavior on the basis of an incomplete set of variables (with the optimistic assumption that the "elusive relationship" will be found sooner or later). The basis for this "prejudice" is to be found, in my opinion, on psychological grounds. It represents the epistemological counterpart of the "practical mind", which tends to evaluate knowledge insofar as it helps to "control" systems but, gives little value to knowledge as a means to "understanding systems".

I am hopeful that the progress in rigorous reasoning processes, brought about by the development and application of cybernetical analysis, could contribute towards an adequate formalization of those phenomena which form the subject-matter of sociology. They could also be a good instrument in avoiding those pseudo-explanations of human behavior based on incomplete (and frequently implicit) models of human interaction.