The configuration of a complex theoretical system for training human resources in universities of the knowledge's age

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Abstract

Modern societies are struggling through the transition whereby they try to reach the status of "*Informative Societies, "Societies of knowledge" "Societies of learning" or "Societies in risk of emergency*". A process through which these Societies are facing the turmoil caused by newinformative technologies. This difficulty makes it necessary and urgent re-define the role of the theoretical systems, whose arguments intend to legitimize educative models in the universities and their pedagogic task- as an educative basis- aimed to configure the cognitive system suitable for these societies. Following the approaches of Luhmann, Maturana, Varela, Pask, Castel, Cornella, Vilar, Von Foersters and some others, we stress the so called "over-information" and the "info-structures" and display the new equations , the new logics , which universities must adopt for thinking on these informative societies. Our goal is to define a complex theoretical system able to support the role of universities in the incorporation of complex cognitive systems appropriate for complex societies.

Key words: Societies of knowledge, Complex Cognitive System, Closed System, Autopoietic System, Indagative Communities, complex theoretical system.

1. Introduction

Social scientifics are reviewing again the classical theoriticists. The task is thus; to dissect, to carry out exegesis, to recombine classic theories. Classical are classical because they credit themselves, according to the current usage, by self-reference. To orient oneself toward the great theoriticists and to specialize upon them can be regarded as theoretical research. At an abstract level, through this way syndromes of theory emerge, such as the theory of action, the theory of systems, interactionism, the theory of communication, structuralism and dialectic materialism. From these combinations novelty achievements can be expected. For instance, the theory of systems is injected to Marxism. It happens that interactionism and structuralism are not as different as initially assumed. Weber's History of Society is a more than possible concept for Marxists; it is systematized through the technique of the crossed impact diagrams of Talcot Parsons.

The theory of action is reconstructed as the theory of structure, the theory of structure as theory of language, the theory of language as theory of texts, and the theory of texts as the theory of action.

In view of these fusions it is possible and also necessary trying to recover the real configuration of the classical theoriticists. All the stated above does not lack interest and it is not useless. But the farther the classical are in history the more is necessary to distinguish the concrete or abstract, theoretical or biographical disposition that we hold upon them.

What have we then? The social scientificist (observer) gets confused when facing the fast and growing complexity of theoretical discussion. The more those relevant authors are known and the higher are the analytical aspirations on their texts when inquiring in the context of secondary bibliography, the more oneself gets involved in the game of combinations. And the more the emphasis changes in going from a theoretical frame to another, the more complex the knowledge faced by the following research, becomes.

Therefore, a Complex Theoretical System to replace the previous one is needed. Modern societies struggle with the transition through which they are reaching the status of "Informative Societies", "Societies of knowledge", "Societies of learning" or "Societies in risk of emergencies", as they find themselves in the turmoil of new informative technologies. In the face of these challenges it is necessary and urgent to reconsider the role of theoretical systems that argue and legitimise educative models in universities and their pedagogic aims - as an educative basis- intended to form the appropriate cognitive system for these possible societies.

The Copernican twist, being experienced in modern societies and the transition from a post-industrial age to a global panorama ruled by information, demand a new theoretical system, able to provide grounds and light to universities for meeting the expectations of the context, such as Sergio Vilar holds: "The society which we live in, specially its educative centres are stuck in an old rationality: that on from the Newtonian determinism" (Vilar, 1997, p.11). More than a teaching reform, more than thinking in remaking educative praxis, a thinking's revolution is needed in the conformation of our mental constructions and their representation. For reaching these goals, the conjunction of new technologies with trans-disciplinary methods, is what can offer a strategic intelligence and intelligent strategies at once.

This thinking's revolution implies an actual educative transformation, which cannot be based on traditional theoretical systems supporting pedagogy and didactic. Effectively, great changes start in the classroom; through a pedagogical relation between teachers and students… the departing point is pedagogic; hence the theoretical system must consider this aspect.

FollowingLuhmann, Maturana, Varela, Pask, Castell, Cornella, Vilar, Von Foerster, Gunther and others, we stress the so called "over-information" and the "info-structures" and display the new equations, new logics[1]that universities ought to adopt when thinking on these informative societies, bearing in mind the "informative economies" and the "culture of information"; we intend to define a complex theoretical system able to hold the role of universities in developing complex cognitive systems appropriate for these kinds of complex societies.
We propose then an educative hypothesis: a new theoretical system aimed to understand the educative task, which is inmerse in what can be termed "Informative Societies", "Societies of Knowledge", "Societies of Learning" or "Societies in risk of Emergency", in which teachers and students must assume a new role based on mediations between human experience and the existing information.

2. The university in the age of knowledge

Since the Middle Ages, Universities have held as a fundamental role: the generation and transmission of knowledge, values and ideas, seeking to solve through multiple scientific, techniques and artistic disciplines, the various problems which every historical period demands.

The educative centres, are currently immersed in an old rationality (Vilar, 1997, p.12), which according to Vilar, is rooted in the Aristotelian logic, in the methodological divisions proposed by Descartes, and in the Newtonian determinism. A logic that is simplistic, deterministic, disciplinary, analytic, and positivist; whose goal is to link the past with the present, by means of excluding and old-fashioned ultra-hierarchical structures, which is intended to consolidate repetition and obedience. The generation of knowledge has become the main source of productivity, along with the processing of information and the communication of the symbol (Castells, 2000).

The university system represents the basis of nodal learning and the social role; this is the case of Latin America, where the capacity of production and transference of knowledge is quantitatively and qualitatively concentrated. Thus, this system emerges as a strategic aspect in relation to the construction of a society based on knowledge.

Nowadays, post-industrial society demands universities, operating as educative centres and cultural promotion in agreement with Societies of knowledge immerse in the new rationality defined by complexity, indeterminism, transdisciplinarity, and syntheticism. Universities whose aim must be to project and to optimise the virtual technologies oriented towards the future, and reticular, shared and integrative of diverse imaginative and inventive criteria; whose aim be teaching for freedom and creativity.

They ought to provide students the skills for developing an active and reflective thinking, allowing them to connect phenomena and to discover and to solve emerging and complex

problems, which modern societies present. These are the goals that universities must seek and promote in their communities. Vilar holds that "more than a reform of teaching, what is needed is a revolution of thinking concerning the conformation of our mental constructions and their representation"(Vilar, 1997, p.12).

Based on Cartesian postulates, promoting the split and simplification of knowledge through academic disciplines, universities had tended to the creation of departments and specialities increasingly specific, and to control, reproduce and fractionate the universe to be known.

Whereas the old paradigmatic methodology implies to fractionate and to specialize, for the age of knowledge it is necessary a paradigm in which disciplines come together and interpenetrate each other[2]with the aim of understanding and explaining each complex fact being affected by diverse factors; historic, social, and natural, which demands an transdisciplinary analysis. It is important to mention that interpretation is only possible when systems to be interpreted are self-referential and autopoietics; when they keep the "closure" of their operations (Luhmann, 1993) and can be presented as a closed unit in its own complexity and its capacity of selection. The new sciences of complexity have found out that different from the supposedly ordered, static, simple and deterministic world; in nature disorders abound and get mixed with other hyper-complex phenomena, creating new orders, between human and the rest of living beings. In this complexity what is needed, are institutions able to articulate the local with the global.

3. Educating complex and polyvalent human beings[3]

Vilar (1997) argues that as the modern world is hyper-complex, plenty of connections and webs so is human being: we have the tendency to generalization, polyvalence, and the capacity to perform different activities. Therefore, the excessive specialization and the reductionist disciplinary areas, to which modernity has brought us, result unnatural, damaging and detrimental.

The tendency of a university in the age of knowledge must be that of seeking a holistic and global comprehension, pursuing, rather than fragmentation crucial knowledge; the general principles, the analogical dynamics, and the fundamental notions of the main problems. In this respect, transdisciplinarity acquires a paramount role in linking complex phenomena, creating meeting and confluent points, bridge-knowledge between different disciplines. In summary, what Vilar terms meta-knowledge generated by meta-sciences according to Haken[4].

The need of educating individuals through a transdisciplinary approach, making them able to seek to understand problems in a broad sense, are demands of current companies and companies' recruiters. They require qualified professionals, able to assume diverse posts and to solve emerging problems both at the local and the global levels, as a result of their capacity of visualizing different issues from a totalising and integrative perspective.

A fast- moving society demands proffesionals being creative and sensitive at once, and able to respond to changing circumstances and to afford unexpected and emerging events or phenomena. Therefore, universities' educative systems must contribute to develop these kinds of professionals by means of holistic approaches.

4. Educative institutions *autopoietics*

A university in agreement with the age of knowledge, must be an "autopoietic organization" [5]: able to create itself and to learn from itself, to improve without expecting external solutions, and to develop fast and efficient solutions. When the environment rapidly changes, the organization must adapt itself quickly to this circumstance to survive.

Bolívar holds that educative centres must be *organizations able to learn*, and to become learning, interchanging and collaborative communities, where individuals learn through daily interaction with others and with the external environment. Insofar as groups learn when their members collaborate to reach common aims, the whole systems learn from feedback from the environment and by anticipating forthcoming changes (Bolívar, 2000). Organizations or systems that observe and observe each other's second order concepts (based in Bateson); that learn how to learn meta-theories, that know the learning process, and to explain explanations. The second order is the need of a more complex order to explain the previous one (Foerster, 1994).

This is a complex and changing environment, universities must live interactively (receiving and responding messages) with their surroundings, in this case, other educative centres, local communities, and their political and social context. Universities cannot survive detached from their communities.

An organization open to learn, does not set limits to internal knowledge, It developes links or networks with other centres; and establish an inter-organizative interchange of knowledge and experiences between various educative and private institutions (Universities, companies). Therefore, this interchange makes it possible to share knowledge, experiences, resources, and to make correct decisions.

Based on a study carried out among five European universities[6], that were outstanding during the nineties as innovative institutions, Burton Clarck found out that from traditional institutions focused in training professionals, they became top institutions in relation to scientific and technological research and in the development of new educative alternatives for a more differentiated public. These institutions managed to diversify the offer of their services and products and to rise their quality and to increase their links with productive groups and their environment, as well as to gain autonomy by finding alternative financial sources. According to the author, these achievements were based on the confluence of five common patterns among these universities:

a) A strong leading group
b) The development and creation of linking unities through research centres
c) Diversification of financial sources
d) Participation of the academic professionals
e) Diffusion and promotion of a working culture based on innovation among the whole community (Clarck, 2000).

5. Conclusions

We propose an "illustration of the illustration"; in other words, to review the validity of concept and perspectives and modes of analysis, which where useful for a period but no longer work for analysing a society so different to that of the eighteenth and nineteenth centuries, which is our

society. Concepts and traditions having configured the great humanist discourse of the European illustration: the reason, the finality, the subject, the action, determined concepts of politics, economics, law, etc. All of them illuminated their own age and emerged with a radical and novelty character in their time. But for our society, they are not but valuable memories. They will never be able to be suitable analytical tools to understand the contemporary society.

Universities require a new theoretical constitution, by means of which their main role must be to develop cognitive systems aimed to understanding, comprehending, explaining and influencing *complexity.* Complexity as dynamism, as an excess of possibilities, as the presence of multiple alternatives, as the realm of differences, as a space ruled by the relation in the face of any kind of mechanical determinism. Our time faces the challenge of complexity and our society is an answer to this challenge. The new theoretical system of universities most seeks to reduce complexity and whereby to make it transparent, but never to make it disappear. This would mean to annul its own object of knowledge.

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[1] These new logics are somehow, conceptual tools, whose application entails to continuously approach new analytical contexts and to face new problems and new solutions. See Pérez (2001).

[2] Fundamental concept defined by NiklasLuhmann as a particular mode of systemic construction, in which the system places at the disposal of another system its own complexity. Each one of the systems which interpret each other is for the other and environment. Interpretation permits the contact between systems and the formation of new levels of complexity.

[3] Scientific category proposed by G. Gunther, who develops a particular fusion between cybernetic and some of the postulates of the classical German Philosophy. Especially relevant is his heterodox attempt to propose an operative and polyvalent logic, which presents as an alternative, in some aspects, to the bivalent logic of the Western tradition. The German sociologist NiklasLuhmann utilizes it in his theory of the observation. And an element that allows him to deal with the consequences derived from the existence of a plurality of systems, which observe each other. Luhmann thinks that the attempts of Von Foerster and Gunther face the problem of plurality of subjects and the demand of placing oneself in the level of the observation of the observations. See Pérez (2001).

[4] Term given by Haken to scientific trends trying to embrace the totality of the sciences. They are a response to the growing specialization of human knowledge" "which go beyond the boundaries of sciences from which they emerged; but this is not new, during the forties this role was assumed by the general theory of systems by Bertalanffy, and in the sixties by the Synergetic of Haken.

[5]The most peculiar characteristic of an autopoietica organization is the fact that it raises it self with its own ropes and constitutes itself as distinct from the surrounding environment through its own dynamic in a way that both factors are inseparable. See Pérez (2001).
[6]Warwick, Inglaterra; Strathclyde, Escocia; Twente, Holanda; Universidad Tecnológica de Chalmers, Suecia, Joenssu, Finlandia.