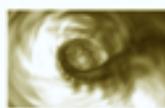# FROM MANUFACTURE TO COGNOFACTURE: A RELATIONAL VIABLE SYSTEMS THEORY FOR WARPING NETWORK

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ABSTRACT

Purpose*: The aim of this paper is contributing in developing a new approach related to the viability concept. This paper also demonstrates the relevance of change from the 'object' concept to the concept of 'relation' for organizational design.* Design/methodology/approach: *A system, or a viable unit in a relational sense, cannot be separated from its circumstances, what surrounds it must remain with it. What is referred to as external is not an entity apart from the unit, and, for that reason the definitions of 'medium' and 'environment' that are being used do not correspond to these criteria.* Findings*: In the present context, the value generation process is mainly located in the strategic role of intangibles; as noted earlier, value propagation necessarily implies understanding that this process is definitely distanced from traditional physical rules whenever there emerges a relational field that allows its implementation. If we understand that the fundamental unit is the relationship, then, complex weaving together is the result of the relational semiosis that has no representation as a sign, given that its expression comes from an emergence of differences that are not located in time-space.* Originality/value: *Emergent Design or Warp Network is fundamentally a relational process developed from co-autonomy upon a heterarchical operational structure. The main difference with previous models is we can warp a network from cognitive styles, semiosis and trust. That is, the connectivity presented is derived from a notion of intangibles.*
Keywords: *Relational theory, entorno, Viable Relational System, Warp Network, intangibles, knowledge, intellectual capital, networks, organizational design, second order cybernetics.*

A BRIEF INTRODUCTION

The Cartesian view and the disjointed image of the human world, insomuch as the so-called natural world, has been and is still the classic argumentative style of science (Berman, 1987; Buzai & Mateucci, 1998; Ritzer, 1993). The opposing forms of the same argumentative axle can be replicated by thousands; the subject and object are a priori entities, chance is an argument of the measure of maximum uncertainty, chaos is the name of a poorly determined regularity, etc. This is a dual world, but determined in the object, or rather, in the objectivity of the subject. Objectivity allows validation of the arguments against a reference point in experience, something that tautologically confirms the objectivity of the subject, which certainly is a predicate of the object (Glasersfeld, 1998). In the conception of this world that we have been taught and struggled to learn, the relationship as philosophy did not take place. For most scientific works, this is a given

world of objects that demands the researcher to elaborate interactions, transactions and co-actions among other forms of action (Berman, 1987).

RELATIONAL VIEW

We call the relational approach of knowing the *epistemological position* that privileges the observer/entorno relationship as a process of construction of territoriality, defining territoriality as a process of effective equivalence in the exchange of maps or landscapes (configurations of meaning), based on the activity generated in entorno's observers in communication. Effectiveness emerges in the affective domain.

This school proposes that knowledge is an emergent process of relational configurations that are generated from the extraction of differences by an observer within his entorno, which only has meaning for him (Lavanderos & Malpartida 2001; Malpartida, 1991; Malpartida & Lavanderos, 2000, Lavanderos, 2002). This meaning is what allows patterns of territoriality solicitation or, put another way, from creating identity through appropriating and belonging. From this process, territoriality as a collective idea is co-constructed among observers that constitute the network. Consequently, descriptions and interpretations are determined through cultural strategies of communication (communication closure) which we define as the generation of configurations of territoriality.

Therefore, from this point of view, territoriality cannot be experienced as a physical object, but as the strategy of the selection of alternatives from descriptive elements that emerge, as a property constitutive of the relation of observation (Abel, 1998; Bateson, 1984; Bullen, N., Jones, K., & Duncan, C., 1997; Edmonds 1999; Heylighen, 1997; Varela et al., 1992). From this perspective, the descriptive-interpretative process does not apply to a territory, but is a process of co-circumstantiality in distinguishing units, since it involves both the definition of the observer as the definition of the unit observed. The observer is constituted in the act of distinction as a unit (Maturana & Varela, 1982), being a centralizer of the relation with what is observed, and therefore, a participant in all of this. From the relational school, we could summarize the cognitive process as the generation of configurations of distinctions in relation to the meaning of the exchange of these distinctions, a product of the territoriality of the observer. The territoriality of the observer is evidenced through its discriminative-affective way of acting (distinction) in relation

to the unit of observation, which, through some criterion, interrupts a sequence and exposes it, acting on the basis of some meaning to be explained.

The possibility of describing comes out of our history of descriptions, our culture: we must recognize ourselves as part of the system of observation implicated in the communicational plot. From this perspective, the configuration of territoriality is co-constructed from our distinctions, as a relational organization/territoriality. The observer can no longer be considered only as autonomic, that is, responding only to internal mechanisms of self-organization (Varela et al., 1992) but rather as eco-semio-autonomic, that is, what is reproduced in relationship based on semiotic production. In this context, the observation as a form of distinction not only begins with certain criteria that it is necessary to make explicit, but also responds to a strategy and, of necessity, a cognitive style. Recall that in this, the communication among observers is of vital importance; for them, messages have meaning that is determined by the history of previous relationships and communications. Classifications, hierarchies and, finally, organization, emerge as part of the process of preserving the organization/territoriality relationship: territoriality organization, that is, they are not "applied to something."

The relationship is the basis –we say, as observers– for which and upon which we extract differences, and that these differences, extracted from the relationship, are argued as distinctions. Indeed it is a *trifference*, since the process involves what it extracts. In this process information is the first news added to the differences extracted.

This entire process occurs in an entity capable of 'trifferencing' and processing it as information. The information thus generated can then enter the domain of human communication with its enunciation, which, for the speaker, takes the form of a message. Gregory Bateson (1984) wrote that information was the product of a difference that makes a difference at a later time. In this process, then the referent and the observer/entorno are united into a single function. What is known as relations is what emerges from the multiple distinctions that observers generate in their entorno of observation; since this is the case, the basic relationship can receive multiple characterizations.

Our language is objectual, and in the continuous process of substantiation, we have turned verbs into nouns. The relationship –what is relational should be understood as a verb, as a functor,

and not as an object– in fact shows that verbs predicate actions, and rarely are links between subject and predicate.

The primary differentiation of the relationship is the difference, and its argument, a distinction (information). From the cognitive relationship, the first consists in distinctions, recognizing as different that which surrounds it. The distinction predicates the ability to cut out, circumscribe a unit and separate it from the rest. The extraction of a unit, the distinction foreground and background, has to do with the individualization and not necessarily with these being different "in fact", either generically or specifically. The generic or specific difference lies between one thing and another within something, something that should be common to both for an observer. Successive distinctions around objects distinguished as distinct from the observer, enter into the process of successive differentiations that form the spiral of what is: different/like. It might appear that the difference between this approach and the previous is very subtle; however, this subtlety for us is abysmal.

In summary, from the different cognitive positions we can say that if we consider the cognitive conception as related to the organization/territoriality relational unit to be pre-given, external or representable –as in symbolism and connectionism–, then cultural organization can be considered heteronomic in relation to the territoriality. This implies action schemes that consider the history of territoriality independent from culture. This is likely to be characterized as a perspective that understands the cultural organization and the territoriality (in this case, territory), where "and" makes explicit the disjunction between the two. The consequences of this, translate into the classifications, hierarchies and organizational models being applied to the territory as an object, because they are seen as separate entities.

Moreover, if we consider that the possibility of describing comes from our history of distinctions, that is, recognizing ourselves as part of the observing system involved in the communication plot; then, the territoriality is the result of a co-construction between the actors of that plot, beginning with their distinctions as a relational process. This having been said, the organization as organization/territoriality can be considered as an enactive system only if organization and territory have created a history of co-determined structural coupling, but in this case we would still de thinking of territory as an object. Alternative to this scheme, the territorial process arises as effective equivalence in the exchange of maps and landscapes (configurations of

meaning), based on the activity generated in the observers/entorno in communication. Effectiveness emerges in the affective domain in the differentiation process through agency and belonging. In this relational perspective there is no structural coupling. Classifications, hierarchies and finally organization emerge as part of the viability process of the organization/territoriality relationship, i.e., "they are not applied on something". Thus, the relational unity organization/territoriality and their configuration are a process which, as such, changes continuously in the maintenance of its organization. Consequently, the organization/territoriality system modeling process requires epistemological approaches that allow acting out of relational concepts. This means that for a given system, as eco-semio-self-organizing, organization actively determines the arrangement of its components and the significance of its character or behavior is meaningful only with respect to itself. This way of acting generates the plot of distinctions from its own diversity and connectivity. From these perspectives, organization does not apply to a territoriality; it is a process of co-circumstantiality in the distinction of units, which, in turn, implies both the definition of the observer and the definition of the unit observed. The observer is constituted in the act of distinction as a unit (Maturana & Varela, 1982). The observer is the centralizer of the relationship with the observed and, as such, participates in that; the possibility of the observed lies in the centralization and the self-referential state of the observer. It is always the observer who argues, discourse belongs to the subject observer in relation to what is observed, creating the observer system which, as such, is self-referential (Keeney, 1987).

This decisional configuration takes place in the relational space of semiosis, which means that our status as observers/speakers is experienced in the way we relate to each other to generate "natural" sense. So, an organization/ territoriality system is only possible, from this perspective, within a semiotic network. Therefore, a configuration of territoriality, is established as part of this network when members of the organization make it happen and bring it about by living it. As such, the identity and complexity of an organization continually arises when they live culturally the territoriality to which they belong. Beer makes the following hypothesis: "Invariance would exist in the behavior of individuals, 'normal' or not, that could spread to the group, reaching even the highest levels within the unit to which they belong". In other words, there should be rules or codes within a network that generate identity and allow self-organization.

With this in mind, Beer took 30 years to satisfy the question of how these units maintain themselves or how they manage to exist independently if their exterior is changing. This he called

its 'viability' and called his explanatory model as the Viable Systems Model (VSM). The concept of systemic viability has been widely used as a conceptual tool for understanding organizations, their redesign and support for change management. The VSM is perhaps one of the most insightful and powerful models currently available for the study of the structure of organizations. As Espejo observes (1989), it focuses on the resources and relationships needed to support the viability of an organization rather than on the formal structure of the organization, providing a way to overcome the traditional overemphasis on hierarchical relationships. Its underlying assumption is that viable organizations arise when people find successful strategies for working together, to the extent they are able to develop and maintain a group identity, despite environmental disturbances.

If we follow Beer and Espejo, we find that the emphasis is located in a double ontology: the being of the organization and the being of the environment. Faced with this, self-organization is a function of the preservation of the identity of the group. Otherwise, an external observer ought to distinguish two units, one of which has an ordering process that allows the observer to remove it from its surroundings or environment, an ordering process that also allows it to be classified as different, in an identity process. Given their training, Beer must necessarily make explicit the criteria on which to build identity and also, as a basis for conservation, maintaining the status of invariants. We will discuss this in the following paragraphs.

BEER'S INVARIANCES

As noted by Beer (1985): "The invariances that I had finally unearthed were stated; and the central principle of recursion (that every viable system contains and is contained in a viable system) stood duty as the explanation of all the observational evidence that had begun to accumulate from the military experience onward". If we pause a moment on this, we could assert that what Beer designates as viable are configurations within a continuum that has the status of being stored, it implies for practical purposes that no matter where you make the cut, the condition for viability will be there and will be reproduced at all levels of the organization. But how do we know? The possibility is to generate a second ontology, an "environment" against which the organization will have to adapt. This necessarily leads us to unveil the communication mechanisms that facilitate this ability to adapt, beginning with their own learning processes. That is, the participation of the same configurations will be observable at any level of organization: these settings that speak of complexity can be viewed as cohesive and coordinated autonomous networks. Coordination and

cohesion are processes that need a happy ending, one which can be achieved by control, monitoring and adaptation processes.

Let us move forward a little more. Reading Raúl Espejo (1989), we find categorical statements like "We are surrounded by a complexity much greater than we can confront with answers one to one". So necessarily, under this paradigm, we can say that organizations have less complexity than their environment, "there is a natural imbalance (inherent) that needs to be recognized and addressed through the leveraging of various strategies that the organization employs to carry this complexity within its range of response". Therefore, to address this complexity implies somehow to "measure it", since by stating that it is much greater we are somehow circumventing quantity. In this sense, Beer moves to Ashby's idea of variety, specifically the law that predicts that "Only variety can absorb variety". Thus, the VSM can enter under complex operating as an autonomous unit. In summary, the three cornerstones of VSM are located on dissociation: viable unit and environment, recursiveness and complexity.

Previously, we have mentioned that Beer was a precursor for the idea that relation can be found in the midst of variety since, necessarily and explicitly, the measurement takes place according to the observer and his relationship with what is observed. Nonetheless, Beer's starting point –that is, his disassociation from the base viable unity-environment– distances him from the relational to remain subsumed in the paradigm of the object and its lineal simplicity. For this reason, we need to break the Cartesian dualism object/environment.

While we agree with part of Beer´s definition, the fundamental difference is that the "viable" is the relational structure, the content that is reproduced, in different scales, is relational dynamics, so a relational viable system is one that "resolves its organizational conservation through a relational structural change strategy which consists in propagating value from the quality of relationships and the fit between them and their material-energetic resources". We understand that, as an organization, the set of relations that shape their identity that your condition is conservative. In this way, which may vary is the relationship structure, under the condition that the change holder is made or allowed by the organization.

Comment [ME1]: pregunta

Consistent with the above definitions, we define a **Viable Relational System**, **VRS**, as a configuration of relational networks that has achieved a coherent coupling between their relational configuration (tenability) and its material energy system (sustainability) so that it does

not jeopardize the relationships that generate their organization. Tenability or relational quality is evaluated from the coherence of command and its congruence or the capacity to exchange intra and inter network. Sustainability is assessed from the set of breakdowns or gaps identified in the processes that define production. In other words, managing a VRS translates into coupling processes, whether by design or redesign, with the possibility of reconfiguration of the network of relationships in order to approach the Pareto 80:20.

LANGUAGE PROBLEMS, SUSTAINABILITY AND TENABILITY

To deal with this, the first thing we do is separating the water. When we talk about sustainability we are making distinctions within the realm of energetic materials, in other words, it is the strategy in the use for the resources needed for operations that constitute potential products or services in the case of a productivity organization. Moreover, we talk about the tenability distinctions that arise within the ambit of relational networks. Therefore, developing indicators involves evaluating the robustness of this structure in relation to the semiosis that the system generates to preserve itself. Unlike traditional indices, this proposal permits assessing whether the organization, faced with a particular concept such as entorno, generates or not coherence and congruence in the decision-making process in relation to that. Sustainability, from this perspective, is the conservation strategy of the organization, as a relational system, starting from structural or configuration changes in relationships, determined by the culture.

As an example, let us suppose that you marry the daughter of a banker who has just died and left her his inheritance: it is highly possible that your sustainability is settled for a while. But, as your wife and you cannot stand each other, this makes your daily relationship become untenable. _But, if you are able to hold on, taking into account that your material and energy needs are satisfied, then we could say that your marriage has a viability strategy although the emotional cost is high. We could put it another way, your marriage, although it has viability, is far from the Pareto 80:20, such that the inheritance will tumble in less time.

ORGANIZATION STRUCTURE FOR VIABILITY

An organization is relationally viable if and when its relations make it viable. This assertion is fundamental to establish the form that constitutes organized relatedness. From this point of view, each and every process is productive: it is not possible to separate processes into primary and supportive ones. The identity of the organization is not the result of what it produces, be it product or service, but of the strategy to produce it. From this perspective, an organization can be explained as a semiotic flow which, like the irrigation ditches, should be organized to achieve the most effective span and the best quality of meaning. Therefore, the organization of the 21st century should bid farewell to the Taylor model if it wishes to incorporate the cognitive domain into its value scheme. We need to build a structure that allows us decisional reliability and agility. We begin by defining their outline or border on the basis of changes in flow. This leads us to use processes of interchange or trade or value exchange with other semiotic flow system. The border of our organization is defined by the semiosis of exchange value, which subsumes the semiosis of each and every relational process that are not produced for this purpose, both in content and meaning. This taken into account, the relational network *eco* defines itself making itself viable as a meta-network, which is co-formed from the coupling among units from the domains of tenability and sustainability. Unlike the viable systems of Beer, here co-autonomy occurs so that coordination is not a function of correcting the variety generated in the autonomic dynamics, but rather a catalytic process of selection of alternatives.

The viable relational model is based on a heterarchical network structure as a condition, which is organized into 4 processes: cohesion, coordination, communication and conduction (CO4). Heterarchy is a system in which members don't think about deciding about others, but interacting with others. This form of participation can generate multiple ideas, suggestions and support for a whole group to function properly. It provides greater freedom of action. Heterarchies are networks, often hierarchical, interconnected and overlapping with individual components that belong and act simultaneously on multiple networks and with a whole-system dynamics that governs and emerges precisely from this whole set of interactions. Starting with this idea, we can define the organization of an organization as a political system which designs and declares the political configuration of management. When we refer to configuration, we are giving an account of the form that results from the criteria that produce the organizational –political– fabric, the kind of relationships that permit putting it together –economic–, the coherence and

congruence of the weaving –social– in relation to the political configuration an its erotetic base – ontology, epistemology and methodology.

In short, an organization is composed of:

• Political System or 'viabiliazer': It configures and communicates the sense of management and the organization of this sense.

• Achievability or Relational System: It corrects the quality loss of the policy configuration consistency due to variety in coherence and congruence, propagating the sense of management.

• System Sustainability: This enables matter/energy resources so that the sense of management achieves its viability objectives.

To ensure that the processes that constitute it are viable, the Co4 unit needs to produce continuous data streams to ensure the nature of the conduction, continuously improving communication, coordination and cohesion. In the case of coordination it acts as a selector of processes that increase reliability, availability and decisional agility, that is, decisional catalyst.

THE WARP NETWORK (AN IMAGINARY DIALOGUE)

In a dialogue, a manager asks his colleague: "How were you able to make such large improvements in productivity in so little time?" The colleague replies: "I applied a warp drive, the kind NASA is experimenting with." The first, perplexed, exclaims: "A what, a warp? And what does this have to do with NASA?"

Now, what is this all about? In 1994, the Mexican physicist Miguel Alcubierre published in the *Journal Classical and Quantum Gravity* (1994) a mathematical model that allows traveling faster than the speed of light, at superluminal speed, by performing tricks with space-time. The system envisioned by Alcubierre for space travel system in English is called "Warp Drive" (the same name used in Star Trek movie). The basic principle of this method of hypothetical superluminal travel is that, instead of accelerating an object (the spaceship) to c or near c, the very "fabric" of space-time would be curved, so that the objects would be able to travel without any movement of the ship in the usual sense of the word: rather than the ship moving, space-time is moved: curved, "warped". In terms of the organization, the ship is the decisional, with a

hierarchical structure that remains invariant, and space-time are infinite networks where the organization (suppliers, customers, managers, administration, and so on) "surf".

If today the decisional speed has increased thanks to TICS, then how do we achieve the "superluminal" trip? To put it in another way, if the increasing in Internet connectivity and other notable progresses have accelerated speed decision in unthinkable ways, how do we take this advantage of this acceleration? In first place, what is needed it is not the use of the hierarchical structure to speed up decisions, but rather using the "curve" of networks. Or, to explain this in another way, the curving or deforming (warping), means using informal networks that are more flexible, accelerating them, achieving this superluminal voyage in the process of decision-making. Decisional shapes and styles curve or deform the decisional "fabric" of relational networks. Therefore, we must take advantage of these deformations, letting the casual functionality of the organization, as relations among units are not in the organization chart and become warped according to the importance of the objective and the decisional urgency to achieve it. In this way, we increase productivity by using the flexibility of relational networks, keeping only the hierarchy of responsibility: our "superluminal" trip.

The *Warp Network* is the configuration that results from the relational system, determined by the political vision of management. The latter is what defines legitimate connectivities or tautologies for communication; in other words, it is the shape of the relationship **oikos-semio-auto** organized from the semiosis of political vision.

In this design, there are no fixed limits regarding the beginning or end of organization, it reproduces itself continuously and, for that reason, the interior/exterior process of organization cannot be viewed separately (if, at this point, it is even possible to speak about that). From this point of view, it is strategic to understand the following: A change in the command structure must take place, that is, it isn't possible to continue making semiotic flows hierarchical. This implies making the hierarchical structure coexist with a horizontal system that allows for co-autonomy (*oikos-auto*). The political vision must be configured in such a way that its reproduction by propagation subsumes the independent decision-making processes of the structure type. This does not deny the importance of structural change in the sense of making propagation horizontal.

CONCLUSION

Organizations of the twenty-first century need plasticity, being understood as the existence in the here-and-now of operating methods that are defined to work transversely against strategic objectives; the minimum requirements having to do with the transversal, not permanence. The structural basis of *Emerging Design* (Warping Process) is the generation and concatenation of three main networks: *networks of reliability*, *availability* and *decisional agility*.

In addition, being a manager in an organization involves a particular way of being in the world, defined by the language game that a person must play to function and be recognized as a manager. Organizational concepts that shape notions of rationality, bureaucratic structure, delegation, control, etc., are management concepts that label and account for a world in which managers can act as managers. In a similar way, the concept and detailed language of leadership creates and defines the nature of leadership as an ongoing process. Seeing this in terms of the metaphor of language game, organizations are created and sustained as patterns of social activity through the use of language; they merely constitute a special form of discourse. In other words, the network is a way of thinking and doing, given from its history of decisions, which is conserved by acts of closure or protecting against external agents. This means that a person who joins a network to work for the first time will not understand the working codes of the network, even though the words are the same as he or she uses.

This being so, the state of Relational Viability of an organization implies thinking of it as a structure of relational networks that propagate value based on the quality of their relationships and the fit between these and the matter/energy resources that make it possible as an organization. In this way, if we understand organization as a group of persons that interact and manage processes for the production of knowledge and value, viability will depend on the strategic axes previously mentioned (tenability and sustainability). For this reason, making organizations viable under the present conditions of global knowledge implies making them change from rigid structures, such as hierarchies, to flexible structures such as heterarchies.

Mind-facture today has only one currency, the speed of decision-making.

REFERENCES

Abel, T. (1998) Complex adaptive systems, evolutionism, and ecology within anthropology: Interdisciplinary research for understanding cultural and ecological dynamics. *Journal of Ecological Anthropology 2*, 6-29.

Alcubierre, M. (1994) The Warp Drive: Hyper-fast Transluminic within General Relativity. *Classical and Quantum Gravity, 11*(5), L 73-77.

Bateson, G. (1984). *Pasos hacia una ecología de la mente*. Buenos Aires: Lohlé/Lumen.

Berman, M. (1987). El reencantamiento del mundo (S. Bendersky & F. Huneeus, Trans.). Santiago, Chile: Cuatro Vientos Editorial.

Beer, S. (1985). *Diagnosing the System for Organizations*. Chichester, UK: Wiley & Sons.

Berman, M. (1987*). El reencantamiento del mundo* (S. Bendersky & F. Huneeus, Trans.). Santiago, Chile: Cuatro Vientos Editorial.

Bullen, N., Jones, K., & Duncan, C. (1997). Modelling complexity: Analysing Individual between-and between-place variation-a multilvel tutorial. *Environment and Planning, A 29* (4), 585-609. DOI:10.1068/a290585

Buzai, G., & Mateucci, S. (Eds.). (1998). *Sistemas ambientales complejos: herramientas de análisis espacial*. Buenos Aires: Eudeba.

Edmonds, B. (1999): What is Complexity?: The philosophy of Complexity per se with application to some examples in evolution. In A. Heylighen & D. Aerts (Eds.) *The Evolution of Complexity*, (pp.1-18). Dordrecht, Netherlands: Kluwer.

Espejo, R. (1989). The Viable Systems Model. In R. Espejo & R. Harnden (Eds.). *Interpretations and Applications of Stafford Beer's VSM* (pp. 77-100) Chichester, UK: John Wiley & Sons.

Glasersfeld, E. von (1998). Farewell to the Objectivity. In The Eye of the Observer. In P. Watzlawick & P. Krieg (Eds.), *Contributions to Constructivism*, (p.21). Barcelona: Gedisa.

Heylighen, F. (1997). The growth of structural and functional complexity during evolution. In I. Hodder (Ed.) *Symbolic and Structural Archaeology*. Cambridge, UK: Cambridge University Press.

Keeney, B. (1987). *Estética del cambio*. Buenos Aires: Editorial Paidós.

Lavanderos L. & Malpartida, A. (2001). *Cognición y Territorio*. Santiago, Chile. Editorial Universitaria UTEM.

Lavanderos, L. (2002). *La Organización de las Unidades Cultura-Naturaleza*: *Hacia una concepción Relacional de la Cognición*. Tesis Doctoral. Universidad de Chile. Chile.

Malpartida, A. R. (1991). La noción de entorno en etología (una discusión etimo-epistemológica). *Ecognición* 2 (1), 39-46. Buenos Aires: Universidad CAECE.

Malpartida, A. & Lavanderos, L. (2000). Ecosystem and Ecotomo: a Nature or Society-Nature Relationship? *Acta Biotheoretica, 48* (2), 85-94. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/10963090

Maturana, H., Varela, F., & Beer, F. (1982). Teoría de la autopoiesis. *Cuadernos de GESI* (Study Group on Integrated Systems), 4, Buenos Aires: GESI.
Maturana, H. & Varela, F. (1984). *El Árbol del conocimiento. Las bases biológicas del entendimiento humano*. Santiago, Chile: Editorial Universitaria.

Varela, F., Thompson, E., & Rosch, E. (1992). *De cuerpo presente*. Barcelona: Editorial Gedisa.

Varela, F. (1984). Two Principles of Self –Organization, in H. Ulrich & G. Probst (Eds.) *Self-Organization and the Management of Social Systems*. Frankfurt: Springer.