

GLOBAL INTERDEPENDENCE AND BIOSOCIAL SYSTEMS

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Summary

The purpose of this article is to explore and discuss the relationship between global interdependence and the biosocial (self-referencing) nature of human systems and its effect on sustainability. Emphasis is given to the perspective that human life may be viewed as a collective global resource and that humankind has the potential for self-organization, sustainable global development and an improved quality and equity of life.

Exploring the implications and meaning of holistic concepts like “global” and relatively

new constructs like “biosocial” can provide clues about the complex context within which human practices occur and can inform our knowledge of how these practices affect sustainability. More specifically, humankind’s actions have tacit, deep ecological implications at the global level for supporting and sustaining living systems on earth, or for ensuring their extinction. People, in the collective, with the capacity for communicating and acting meaningfully and working interdependently, can learn to change their daily behavior in ways that are crucial for sustaining the diversity of life on earth.

The theory of living systems is used as an analogue for understanding the delicate and inseparable ways in which all forms of life are connected. Moreover, living systems theory provides the means of understanding the implications of these interconnections among all living things and underscores the idea that component parts of a system are self-similar and inseparable from the whole. In addition, the notion of social autopoiesis is explained and offered as a metaphor and means of understanding how living organisms or systems change and develop. It is speculated that the self-referential (autopoietic) nature of social systems arises in and is inseparable from the environment in which it occurs and as such, two primary kinds of change, culture, and leadership are discussed as processes in relation to the development of living systems. Living systems theory and the concept of social autopoiesis, then, form a framework through which our understanding of sustainability may be enhanced.

Case examples are presented as illustrative of the concepts explored in this article and are used to make inference to the relevance of these concepts to the broader topic related to this work—Global Life Systems and Human Development. The implications of the ideas and concepts explored are related to sustainability. Specifically, it is espoused that the biosocial nature of human systems is a means through which natural resources, diversity and quality of life of living systems are sustained at the global level.

1. Understanding Our World

"Intelligence operates when the mind sees the whole, the endless whole -- not my country, my problems, my little gods, my meditations. It sees the whole implication of living. And this quality of intelligence has its own tremendous energy." -- Jiddu Krishnamurti, 1996 --

Physical and quantitative theories and sciences with their characteristic reductionism offer valuable yet often limited perspectives in understanding the nature and interdependence of living systems at the global level. When applied to social systems, quantitative theories can depict complex, dynamic, and often paradoxical human practices as predictable, unidimensional and mechanistic. Such a depiction may not fully represent the intricacies of human behavior, and it also tends to reduce complex multidimensional processes to more simplistic cause and effect relationships. These cause and effect relationships can engender tangible but limited “solutions” to environmental and conservation problems that often fall short of their advertised promise.

In contrast, emerging post-modern theories and frameworks rooted in biology and

applied to the social sciences offer alternative means for learning how to think in holistic ways and act more globally and interdependently about existing life support systems. More specifically, holistic approaches for understanding how human development and change occur in relationship to the environment may enhance our appreciation for and means of sustaining the biological diversity of the earth's living systems, perhaps at a time in history when sustainability is most urgently needed. The theory of living systems and the concept of social autopoiesis discussed herein provide a framework for exploring alternative ways to conceptualize environmental issues and their concomitant challenges and serve as a means through which our understanding of sustainable development may be enhanced.

2. Global Interdependence

In order to learn how to sustain the development of the whole of humankind, individual human minds develop new mental models that can be used for representing worldviews in innovative ways. One way that knowledge of a global view of the world can be enhanced is through the use of systems thinking, from which emerges the concept of global interdependence. Two broad views of systems exist. The mechanistic view of systems and the world has, since the time of Descartes, defined systems as closed and fixed machines, where the output of systems can be controlled. More recently, the emerging organic view of systems and the world defines systems as open to external influences, evolving and life-like, where the actions of one component, part, or subsystem influence the actions of other parts in interdependent ways.

2.1 General Systems Theory

At the level of philosophy rather than quantitative science, and following the general systems theory of Ludwig von Bertalanffy, scientists and social scientists have often viewed and studied organizations, nations of the world, and the earthly globe metaphorically as a whole system comprised of components or subsystems. In fact, in a way similar to that of metaphor, the form of analogic reasoning has often and increasingly been used throughout the 20th Century to assist in understanding the complexity of modern industrial and social organizations. The movement into the 21st Century toward the post-modern, post-industrial era has witnessed the increased use of forms of systems theory in improving humankind's limited understanding of the complexities of technological and information advances.

In essence, systems consist of subsystems, which contribute to maintenance of the larger system. Systems are often viewed in the abstract, such as social systems appearing as a whole society, and can be bounded and separated by certain geographical or geological barriers, like rivers, mountain ranges, or even whole oceans. A system can also be perceived as "separate" or different because of its ideology or political beliefs, different cultural traditions, and even by differing economic policies. For instance, many of the economies of Western World nations function economically as a capitalist system like that found in the United States of America and the United Kingdom, while others, in contrast, have functioned economically as a socialist system, like that of the United Soviet Socialist Republic heretofore. Moreover, systems are often viewed from a biological paradigm, which some systems theorists and proponents say is a major,

strategic view of systems and organizations that has been neglected and appears vital to the sustainment of life at various levels on earth.

Thus, in the framework of global sustainable development as well as in the particular context of human resources and their development, an improved understanding of global life systems and human development seems to be possible through the use of systems thinking. By using systems thinking and viewing humankind holistically at the global level rather than as separate, disparate systems, humankind collectively may indeed be able to, as Krishnamurti asserts, 'operate intelligently' in cooperative or interdependent ways. Kurt Lewin is credited with the observation that there is nothing as practical as a good theory. Human beings operate from theories of our own selection, sometimes intelligently, sometimes not so. Two mental models or theories seem particularly well-suited for representing, understanding, and sustaining life, and being in human systems with evident capacities and competencies for realizing and manifesting global interdependence -- living systems and autopoiesis.

2.1.1 Living Systems Theory (LST)

Living Systems Theory (LST) is an interdisciplinary approach to understanding and explaining the complexity and implicate relationships of the process and structure of life in human systems. It represents sixty-five years of writing collaboration between Dr. and Mrs. James Grier Miller and was developed by an interdisciplinary group of scientists rather than from an isolated discipline. According to Miller, LST is "an integrated conceptual approach to the study of biological and social living systems, the technologies associated with them, and the ecological systems of which they are all parts."

One of the strengths of the Miller conceptualization of LST is that clear distinctions are made among eight levels of living systems resulting from biosocial evolution. Using these clear distinctions as a mental model, one can begin to represent and understand the interdependent nature and complexity of life in human systems on earth. Each succeeding level of system is composed principally of systems at the level below, in other words, organs are composed of cells, organisms of organs, and so on. Within each level of system there are twenty critical subsystems, from which requirements for matter, energy, and information are met and without which these systems cannot survive. One of the most valuable and meaningful characteristics of LST is that it is not reductionist. In other words, because higher level systems have emergent structures and properties not present at lower levels, emergent innovative processes provide increased complexity that makes the whole system greater than the sum of its parts. Table 1 portrays these levels of living systems.

Levels of Living Systems	Common Words or Labels Used for Levels of Living Systems
SUPRANATIONAL	Global, Earth, World, Planet
SOCIETY	United Kingdom, Japan, Bangladesh, Argentina
COMMUNITY	Government, Non-government (NGO), Private Industry, Geographical, Regional, Economic, Ideological

ORGANIZATION	Federal Agency, Red Cross, UN, Shell Oil, Coca Cola
GROUP	Team, Department, Family
ORGANISM	Individual, Roberto, Shirley, Kazuko, Ghandi
ORGAN	Heart, Eye, Ear, Lungs, Liver, Stomach, Brain
CELL	White/Red Blood, Muscular, Nerve, Bone (Over 200 types)

Table 1: Miller's Eight Levels of Living Systems

Living Systems Theory also conceptualizes the various levels including societies in concrete ways, unlike some more abstracted theories of social systems. For instance, in the cases of animal systems or individual humans or organisms, the process of learning is reflected in two stages. The first stage of learning is the associator subsystem and the second stage of learning is the memory subsystem. These specific stages of learning are strategic aspects of change and transformation and are closely related to the case studies on global interdependence and biosocial systems that follow herein.

In social action systems like societies, LST attends to the fact that each particular society has its own way of processing information for every meaningful aspect of life. In the context of global sustainable development of human resources, the elements of culture that form and sustain an interrelated whole with shared or recognizable themes and behavior patterns in each society must be blended or integrated with those of other societies if global interdependence and cooperative action are to be achieved.

The cooperation of diverse national cultures, societies, communities, organizations and groups representing diverse subcultures presents a significant challenge for interdependent action at the global level. Knowledge of biosocial systems and the various systems of living and biological diversity is increasing. For instance, Rowan Martin reports that Article 2 of the Convention on Biological Diversity (CBD) defines biological diversity as "The variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems."

Assuming the diversity and complexity of the human species alone, innovative approaches for thinking together creatively and effective processes for developing global understandings and collective knowledge are sorely needed and beginning to emerge. For instance, dialogic leadership and thinking of culture as process are means for realizing global interdependence. Brief descriptions of these concepts are presented in the case study research described in sections that follow (see subsections 2.2 and 3.3 below).

Finally, a great deal of isolated research in the disciplines of psychology, sociology, and anthropology has contributed to humankind's understanding of global phenomena, albeit often in reductionist ways. Living Systems Theory pulls these often fragmented or particularistic views of the world together, creating a useful mental model or framework for applying systems thinking to global interdependence. Significantly, in this model,

Miller points out that inputs and outputs of both matter-energy *and* information "are essential for living systems" at all levels.

In the context of human resource systems and their development, then, just as LST informs our understanding of organizations and social systems in ways and levels heretofore unexplored, the theory of Autopoiesis has emerged from the biological paradigm to enrich humankind's understanding of the interdependent nature of organic or living systems at different levels. The next section introduces autopoiesis and the biology of cognition.

2.1.2 Autopoiesis in Human Systems

Two doctors from Chile, Humberto Maturana and Francisco Varela, developed the fundamentals of autopoiesis. In 1970 Maturana produced his seminal thinking on the biology of cognition, striving to answer the questions "*What is cognition as a function?*" and "*What is cognition as a process?*" In other words, how do we know, what does it mean to gather information, and how does the living organization give rise to cognition in general and self-cognition in particular? These questions have significant implications for the development of human resources and global sustainable development in particular.

Three years later Maturana teamed up with Francisco Varela to produce an equally seminal body of knowledge on the topic of Autopoiesis: *The Organization of the Living*. Like Miller, their work around living systems is not about analysis, but synthesis. Similar to Miller, their work on autopoiesis does more than interrelate disciplines, it actually transcends them. Maturana's & Varela's purpose was to try to understand living systems and their organization in relation to their whole character or unitary identity.

These two paradigm pioneers concluded that autopoiesis is what is necessary and also sufficient for characterizing (see identity in glossary) the organization of living systems. In the case study of autopoiesis in a social system (see subsection 2.2 below), Croswell referred directly to Maturana,

Varela, and their colleague Uribe to operationally define an autopoietic organization as a unity by a network of productions of components which

1. participate recursively in the same network of productions of components which produced these components, and
2. realize the network of productions as a unity in the space in which the components exist.

In other words, living systems (a unity) self-reproduce (at various levels). An organism like the human body (individual) reproduces cells and organs (components) that replicate itself. The critical variable is the homeostasis of "*the system's own organization.*" [Here 'organization' is viewed as process or a verb, not a level of system or noun as in LST.]

Put yet another way, and at a higher level in terms of Miller's levels of living systems,

organisms (individuals) comprise groups (create teams) that constitute and conserve or sustain development of the next higher level or suprasystem -- a living system at the organization level. Seen from this perspective, Maturana's and Varela's synthesis of biology, cybernetics, psychology, and cognition as described in autopoiesis can be useful as a mental model for explaining and understanding how living systems survive at various levels and develop the capacity for sustaining life on earth.

Time and space do not permit a sufficient exposition of the rich and informative details of autopoiesis and LST within this article. However, several profound and tacit meanings blossom from within the biological paradigm of systems, concepts which emerge to inform humankind's thinking about living systems. Before turning to conclusions of research drawn from the case studies of autopoiesis in a living, social system, two specific autopoietic concepts clearly inform our understanding of global interdependence and biosocial systems. They are learning and communication, presented next.

2.1.2.1 Learning

In LST, Miller posits that learning has been sorted and studied more extensively than any other psychological process. The autopoietic definition of learning as a biological construct clearly can inform systems thinking that strives to focus on human resources and their development. Maturana and Varela in essence said that the biology of learning is more than merely knowing something, it is a process consisting in the transformation of the behavior of an organism through its experiences that serves the function of sustaining or maintaining the whole organism as a living system. Learning is more than knowing, it involves purposeful action. In other words, an individual (or living system) that changes its behavior patterns (action) through any kind of experience can be said to be in the process of learning. What may be implied is that only transformation of behavior (change in actions) constitutes learning. Here, the discrimination between learning and knowing is clarified. In living systems, learning is a process that implies action. In knowing, action or transformation in behavior may not be implied.

In a similar way in his seminal work on leadership and culture, Edgar Schein posits that learning consists of individuals who are situated in groups within organizations whose behavior is transformed. The behavior is transformed either through "problem-solving" or "pain/anxiety avoidance" experiences so that the organization as a whole can maintain the boundaries (basic circularity) necessary for continued survival. It is easy to draw parallels and use these understandings of learning as metaphors for learning at higher levels of living systems, for instance at the society level and even at the supranational or global level.

2.1.2.2 Communication

In their more recent thinking, Maturana and Varela call communication the coordinated behaviors that are mutually triggered among the members of a social unity. This autopoietic or biological understanding of communication has profound implications for living systems at all levels, and its implicate meaning clarifies, enhances and informs Miller's more narrow understanding of communication as simply the most general form

of information flow.

On the other hand, Miller clarifies the central importance and value of meaning. He said that a system takes information and assigns meaning (significance) to it so that it can be used during systemic processing. In other words, meaning constitutes change in a system's processes. This change is evoked by significant information, often from associations (learning) made to information drawn from previous experiences with it. It appears, then, that the meaning of information and its communication (see glossary) may be closely linked to autopoietic or biological learning and processes of changing behavior patterns. The case study that immediately follows affirmed that leadership in social collectivities or living systems is indeed very much about creating and building conversations of collectively *shared* meaning during communication processes.

In other words, the biology of communication in living systems implies much more than a simple transfer of information. Communication can be viewed as a behavior pattern that reproduces or fails to reproduce the process and structure of living systems or cultures at all levels, including societies, communities, organizations, and groups that constitute the supranational level or global system. In fact, in Marshall Sashkin's theory of visionary leadership, communication and organization culture building both function as two of at least ten variables used by more effective leaders. The next section presents conclusions drawn from a case study of a living system or national organization, one such social action system that may be used as an analogue for understanding how living systems may go about sustaining the development of human resources at the global level.

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Bibliography

Archer, M. S. (1988). *Culture and agency: The place of culture in social theory*. New York, NY: Cambridge University Press. [The author presents two simultaneously occurring aspects of social life; "culture" and "agency" and discusses their implications vis-à-vis change].

Capra, F. (1996). *The web of life: A new scientific understanding of living systems*. New York, NY: Doubleday. [This represents a seminal synthesis for understanding the vital integrative actions of living organisms.]

Croswell, C.V. (1996). *Organizational learning in nonprofit organizations: A description of the action patterns of a professional association's governing network and leadership role in turbulent times*. Ann Arbor, MI: UMI Company (#9634624). [This represents a description of the role of leadership in organizational learning and change.]

D'Andrade, R.G. (1984). *Cultural meaning systems*. In R. A. LeVine & R. A. Shweder (Eds.), *Culture theory: Essays on mind, self, and emotion* (pp. 88-119). New York: Cambridge. [Definition of culture as

a complex set of learned meaning systems having directional, representative and affective functions].

Geertz, C. (1984). From a native's point of view: On the nature of anthropological understanding. In R. A. LeVine & R. A. Shweder (Eds.), *Culture theory: Essays on mind, self, and emotion* (pp. 123-136). New York: Cambridge. [Anthropological perspective on the study of the complexities of cultures from the point of view of those within the cultures].

Goldberger, N. R. & Veroff, J. B. (1995). What's in a name: The case for "intercultural" psychology. In N. R. Goldberger & J. B. Veroff (Eds.), *The culture and psychology reader*, (pp.3-21). New York, NY: New York University Press. [An edited work in which a wide range of readings and perspectives is presented related to the intersection of culture and psychology].

Ikeda, D. (2000). "Peace through dialogue: Thoughts on a culture of peace." *Living Buddhism*, 4, (5), 17-43. (This represents a worldview of how a global culture of peace can be created.)

Isaacs, W. (1999). *Dialogue and the art of thinking together: A pioneering approach to communicating in business and in life*. New York, NY: Currency. [This represents the seminal work on current theory, practices, and principles of dialogue as the leadership process used for creating innovation, change and development.]

Krishnamurti, J. (1996). *Total freedom: The essential Krishnamurti*. San Francisco, CA: HarperCollins. [This represents a departure from conventional thinking about theory that can inform holistic thinking and inquiry.]

Martin, R. (2000). "Biological Diversity: Divergent views on its status and diverging approaches to its conservation." In R. Bailey (Ed.). *Earth Report 2000* (pp. 203-236). New York, NY: McGraw-Hill. [Provides conclusions about reversing downward trends in biological diversity and major differences between scientists addressing problems at the global level and practitioners operating at the local (community) level.]

Maturana, H. R. & Varela, F. J. (1980). *Autopoiesis and cognition*. Boston, MA: Reidel. [A provocative discussion of the nature of living systems as autopoietic or self-referencing entities].

Maturana, H.R. & Varela, F.J. (1992). *The tree of knowledge: The biological roots of human understanding*. Boston, MA: Shambhala. [A new view of social cognition is presented in which the world we know is created through the coexisting actions of humankind].

Miller, J.G. (1995). *Living systems*. Niwot, Colorado: University Press of Colorado. [This represents seminal thinking on the eight levels of living systems.]

Morgan, G. (1986). *Images of organization*. Newbury Park, CA: Sage. [A multiple perspective approach for understanding organizations is advanced by the author with compelling implications for interpreting organizational life].

Sablo, T.A. (1997). *Autopoiesis and organizational culture: A case study*. Ann Arbor, MI: UMI Company. [The research establishes a conceptual link between the theory of autopoiesis and organizational culture. Implications regarding change and adaptations are discussed.]

Sashkin, M. (1990). *The visionary leader training guide: Leader behavior questionnaire* (3rd ed.). King of Prussia, PA: Organization Design and Development. [This represents seminal thinking on Sashkin's theory of visionary leadership and leadership effectiveness.]

Schein, E.H. (1992). *Organizational culture and leadership* (2nd ed.). San Francisco, CA: Jossey-Bass. [This represents seminal thinking on the relationship between leadership and culture in organizations.]

Schwandt, D.R. & Marquardt, M.J. (2000). *Organizational learning: From world-class theories to global best practices*. New York, NY: St. Lucie Press. [This represents current and best thinking on how organizations learn to change their performance and develop so that their long-term survivability is enhanced. New information, goal-referenced knowledge, structuring, and sense-making at the collective level are represented a critical concepts that are strategic to sustainable development.]

Senge, P.M. (1990). *The fifth discipline: The art and practice of the learning organization*. New York, NY: Doubleday. [This represents seminal work on systems thinking, dialogue, and learning organizations.]

Senge, P.M., A. Kleiner, C. Roberts, R. Ross, G. Roth, & B. Smith (1999). *The dance of change: The challenges of sustaining momentum in learning organizations*. New York, NY: Doubleday. [This represents current thinking about why it is so difficult for organizations to develop and grow and change when necessary.]

Smircich, L. (1985). Is the concept of culture a paradigm for understanding organizations and ourselves? In P. Frost, L. Moore, M. Louis, C. Lundberg, & J. Martin (Eds.). *Organizational culture* (pp. 55-72). Newbury Park, CA: Sage. [The concept of culture is presented as a paradigm for inquiry and organizations, specifically, are defined as cultural phenomena, which need to be understood in these terms].

Von Bertalanffy, L. (1968). *General system theory*. New York, NY: George Braziller. [This represents seminal work on systems thinking.]

Wheatley, M. J. (1992). *Leadership and the new science: Learning about organization from an orderly universe*. San Francisco, CA: Berrett-Koehler. [Quantum physics, chaos theory, and biology are used as means of transforming traditional models of organizations, leadership, and change].

Wheatley, M.J. & M. Kellner-Rogers (1996). *A simpler way*. San Francisco, CA: Berrett-Koehler. [This represents current thinking on self-organizing systems.]

Biographical Sketches

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Tony Sablo is the Senior Vice President of Human Resources, and is responsible for providing a full range of human resource services throughout the National Geographic Society. Immediately before joining the Society, Sablo was the Director of Human Resources and Organizational Effectiveness for Time Life Inc. Sablo holds a Doctoral degree in Education with specialization in Human Resource Development from the George Washington University where he serves periodically as Assistant Professor in the Master's degree program of the Graduate School of Education and Human Development. His dissertation research dealt with organizational culture and change.