KNOWLEDGE AND SELF-PRODUCTION PROCESSES IN SOCIAL SYSTEMS

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Summary

This article explores the fundamental differences between natural (spontaneous) and human engineered (designed) social systems. While man-made systems can be sustainable, natural systems must be self-sustainable. The differences between sustainability and self-sustainability are emphasized. Social systems are viewed as being knowledge producing and knowledge renewing networks. Social systems, especially economic systems, are based on recursive interaction and communication across the networks of participating components-agents. Spontaneous social systems are *self-*

producing (autopoietic) networks while externally designed systems are only heteropoietic (producing) and often allopoietic (non-sustainable). Not all social systems are produced by social engineers or designing agents. Most effective and lasting networks are self-produced and self-sustainable. Self-producing systems or networks are called *autopoietic systems*. Autopoietic systems are governed and coordinated by internally embedded rules of behavior or rules of conduct (their organization) rather than by external commands, orders or instructions. *Organization and structure* of a system are two distinct and crucial categories that should not be confused or confounded. *Organization refers to the network of rules of coordination.* Organization drives the structure, structure follows organization. Organizationally closed systems are self-renewing; organizationally open systems are self-limiting. Self-organizing and self-managing systems, like spontaneously emerging and self-renewing cooperative networks, must be *organizationally closed* but informationally open to their environment. There are no "closed" (i.e. isolated, non-communicating) systems. Autopoietic social systems are organizationally closed and structurally open - self-renewing corporations and networks - are structurally coupled with their environment. This phenomenon of self-production can be observed in living systems. Although all living systems are autopoietic, not all autopoietic systems are living. However, all autopoietic systems must be social systems. In other words, all autopoietic, and therefore all biological (living) systems, are social systems. Because system organization is a circularly closed network of process-coordinating rules, then *system knowledge* (and its linguistic embedding) is defined as *purposeful coordination of action*. Knowledge producing systems are based on action and thus fundamentally different from data or information producing systems. Sustainability and self-sustainability are directly related to system organization and its self-production (autopoiesis). *Self-sustainable* systems are autopoietic and must therefore be organized for autopoiesis. Allopoietic systems necessarily deplete their environment. Self-sustainable systems must maintain their ability to coordinate their own actions - producing knowledge.

1. Introduction

Social systems are essentially knowledge producing and knowledge renewing networks. Knowledge production lies at the very core of all human systems and is therefore instrumental to their self-production, systems change and self-renewal. In this article we link the theory of knowledge production with the self-production (autopoiesis) and self-sustainability of social systems.

In current global information age, it is important to establish the differences between information and knowledge, information and data and knowledge and wisdom. Without such distinctions and proper definitions, the New Economy cannot be properly understood and its knowledge managed. We shall understand knowledge to be purposeful coordination of action and information as a symbolic description of action. This brings action, change, doing and performing into the center of social self-production.

New organizational patterns are not hierarchies but *networks*. Networks are predominantly rules-based rather than authority-based social orders. Rules of behavior

and conduct, rather than commands and orders, are producing, maintaining and renewing network systemic cohesiveness.

To initiate, maintain and manage networks or network corporations requires a different set of skills, techniques and practices than those for traditional hierarchies. *Autopoiesis* offers the new theory of system self-production. In the world of global competition, it is increasingly less important what products systems produce and increasingly more important how systems produce *themselves* (i.e., how do they renew their own ability and capacity to produce). *Catalysis of action*, rather than just management, is the requisite coordination skill in networks. Autopoiesis is the organizational theory of networks.

2. Social Systems

Social systems, particularly economic systems, are based on interaction and communication of components-agents. These agents, through their interaction, engage in coordinated and recursive action, producing knowledge as a requisite input for their subsequent action. Economic agents themselves are defined and produced only through their participation in social networks. They can have sole existence outside the networks that produced them. In reverse, through their interaction, these agents continually produce and reproduce the very networks that produced them. Social systems are self-producing (autopoietic) networks.

We can define social systems as renewable, self-producing networks characterized by internal (rather than external) coordination of individual action brought about by communication among network temporary agents-members. The key words are *coordination*, *communication*, and limited *lifespan* of individual agents.

Coordinated behavior includes both cooperation and competition (and all forms of conflict). Actions of predation, altruism, and self-interest are examples of different modes of coordination. Communication is physically, chemically, visually, linguistically, or symbolically induced deformation (or in-formation) of the environment - leading to individual and coordinated action in shared environment.

For example, an individual can coordinate his own actions in the environment only if they are coordinated with the actions of other participants in the shared network. In order to achieve this, one has to in-form (deform or change) the environment so that the actions of others is correspondingly modified. That is communication. As all other individuals are attempting to do the same, a *social network of coordination* emerges and, if successful, it is being "selected" and persists. Such a network improves one's ability to coordinate one's actions within the environment. Cooperation, competition, altruism, and self-interest are inseparable.

Social systems include human systems, but are not limited to them. Human beings simply in-form a specific meaning to the universal acts of coordination, communication, and birth-death processes in *general social systems*.

A group of fish thrown together by a tide wave is a passive aggregation, not a social system. A swarm of moths lured to a porch light is an active aggregation, but not a social system. A flag-pattern of athletes constructed through bullhorn-shouted commands from a coordination center is a purposeful heteropoietic aggregation, not a social system.

All of these can transform into social systems as soon as *internal* communication patterns leading to coordinated action become established. Such patterns should temporarily persist (become autonomous), even after removing the external causes or triggers. Externally induced and externally driven interaction of components is not sufficient: billiard balls interact and so do wind-blown grains of sand - they are not social systems.

Human waiting queues are often engineered and externally induced (enforced, not voluntary) interactions. To a large degree however, they do exhibit, at least temporarily, the voluntary self-organization characterized by its own specific behaviors, rules of conduct, choice of distance and modes of communication. So do schools of fish, swarms of bees, flocks of birds or packs of animals.

Any social system, in order to adapt and persist in its environment, must be capable of reshaping itself, controlling its growth, and checking the proliferation of individuals. In other words, the long-term persistence of a social system is critically dependent on harmoniously balanced birth and death processes. There can be no collective life without individual death.

Life of a social system, and thus life itself, is based on a dynamic and autopoietic harmony between birth and death processes. Life is necessarily a social phenomenon: the life of an individual cannot take place outside a social network, and the individual life itself must be socially embodied at the level of its components.

2.1. Free-market "Invisibility"

Free markets are spontaneously "organized" (self-organized, self-produced) networks of interacting firms and agents, while individual firms often remain islands of hierarchical order and command in the churning seas of spontaneous organization. Such firms are heteropoietically (externally) constructed or designed. Such man-made systems can be concatenated into networks *ex post*, even if they are not networks themselves. Market networks are dynamic and self-adjusting, but heteropoietic networks of firms are fixed and organizationally inflexible. Market networks are self-produced (autopoietic) while firms are merely produced (heteropoietic).

Free markets are not ordered by some mysterious "invisible hand", but by very specific and highly visible *rules of conduct*. These rules of conduct form market *organization*. Short-term and invariant market organization (rules of conduct) drives the ever-changing, continually adjusting market *structures* (firms and institutions*)*.

It is not that markets are "invisible" and governments "visible" hands of social orders,

but rather that markets are autopoietic (self-producing) and governments (and firms) are heteropoietic (other-producing) agents of social orders. Free markets are *networks by definition*, continually self-producing and reshaping themselves. Current corporate networks are still mostly man-made approximations of the real self-producing, self-sustainable and self-adapting networks of the market. To overcome this limitation, network member firms have to be *internally organized* according to free-market principles and rules of conduct, forming the self-sustainable (regional, national or global) "web of webs".

Intracompany markets are triggered by social engineering, but become natural enablers of flexible, adaptive and dynamic redefinition and reengineering of intercompany linkages - of *intercompany market* networks. Firms will cease to be islands of design in the sea of market spontaneity.

2.2. Social Kinship Networks

Kinship networks provide another examples of spontaneous social orders. A kinship system constitutes an autopoietic system that is produced and maintained through the organizational rules (which could be codified) of a given society or culture. No matter what is the particular mix of its components (men, women, and children), the kinship system organizes its social domain and coordinates its social action in a spontaneous and self-perpetuating fashion. It must continually adapt to the external challenges and interferences by governments, social engineers and social reformers.

Social networks, embodying kinship systems, are not static and unchanging structures, but highly dynamic ones. Studies of kinship systems established that the distribution of different types and roles of network participants (kin, friends, neighbors, formal ties) remains relatively stable, even though the names and faces of network members keep changing. In the language of autopoiesis: It is their organization that remains stable, while their structures and components continually adapt and change. Viewing families and kinship networks as autopoietic systems could lead to new understanding of the effects of residential mobility, divorce rates, death and disease disruptions, and loss of employment.

It was F. A. Hayek who first integrated concepts of self-production into social systems. Hayek wrote that although the overall order of actions arises as the joint product of the actions of individuals, the production of the overall order is not the conscious aim of individual action. The individual will not have any knowledge of the overall order.

Consequently, the individuals in a society spontaneously assume the sort of conduct and evolve the rules, which assure their continued existence within the whole. Their conduct and rules must be compatible with the preservation of the whole. Neither the society nor the individuals could exist if they did not behave in the self-preserving manner. See *Living Systems Theory.*

2.3. Boundaries of Social Systems

In kinship social systems the boundaries are well defined. The distinction between family and non-family members is rarely ambiguous or subject to fuzzy interpretation. A definite family boundary can be established, even though it is not necessarily topological. Topological boundary is not necessary for autopoiesis, but an effective, functional boundary is. Family members are usually distinguished from their environment (from the "society at large") more sharply than any engineered or designed physical "membrane" could affect. The boundary between East and West Germans remains strong and tangible even after the dismantling of its concrete-block topological embodiment.

All social systems, like all living systems, produce, maintain, and degrade their own boundaries or membranes. These boundaries do not separate but *connect* the system with its environment. They are not just "perimeters" but functionally constitutive components of a given system. Boundaries range from phospholipid bilayers, globular proteins, osmotic precipitates, and electric potentials, through cell layers, tissues, skins, metabolic barriers, and peripheral neural synapses, to laterally or upwardly dispersed boundaries of territorial markers, lines of scrimmage, social castes, secret initiation rites, and possessions of information, power, or money.

Social systems are physical systems because their components realize the network of productions in the physical domain (their components are cells, termites, lions, adult humans, employees, members, etc.). Computer simulations of autopoietic systems show that topological boundaries become visible to humans only when the minute rates of production processes are finely adjusted and harmonized. In other words, the underlying organization of processes has to be "tuned up". Otherwise, human observer might not be able to "see" or recognize any "topological" boundary. Yet, the organization remains functional and invariant and autopoiesis continues even if human observers do not see any boundary - the system remains autopoietic.

3. Autopoiesis (Self-Production) of Networks

With the advancement of Internet, telework, telecommunications and remote knowledge sharing, we are witnesses to the emergence of distributed, self-produced and self-renewing networks or ecosocieties, interdependent communities of businesses, individuals and groups. Many social networks emerge spontaneously, i.e., produce themselves through the rules-driven, recursive interaction of their own components. Not all social systems are machine-like or mechanistic contrivances produced by external agents, designed, controlled, planned, predicted, engineered and reengineered incessantly. Most new networks are self-produced and self-sustainable.

For example, consider the development of open-source software, like Linux operating system. Once the software core was "seeded" on the Internet, it started functioning as a catalyst for further programming action of many persons, who contributed their own ideas, effort and improvements, sharing their work freely with one another. With no centralized metadesigner, Linux has emerged as a spontaneous joint creation of thousands of people, spawning a worldwide community of Linux providers and users.

Self-producing networks amount to communication and action-based *ecosocieties* (or

ecocommunities), self-sustainable in their environment, coordinating their own action, creating their own language, making sense of their surroundings, interpreting its signals and producing survival-enhancing decisions.

The process of self-production is called *autopoiesis*, contrasting with heteropoiesis (production of the "other"). Self-producing systems or networks are referred to as *autopoietic systems*. Autopoiesis or self-production can take place when there are autonomous individuals or agents interacting and communicating in a specific environment according to specific organizational *rules of conduct and interaction*. On a lower level, also biological (living) systems are similarly autopoietic, based on coordination and communication of their components.

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Biographical Sketch

Milan Zeleny, Professor of Management Systems, Fordham University, New York, recently published *Handbook of Information Technology in Business*, for Thomson International, and *New Frontiers of Decision Making for the Information Technology Era*, for World Scientific. Current books-in-progress include Knowledge of Enterprise: Knowledge Management for Business Action; Social Autopoiesis: Self-Production of the New Economy of Networks; Human Systems Management: Essays on Knowledge, Management and Systems. Has served as the Editor-in Chief of *Human Systems Management*, the international journal. Previously published books include *Multiple Criteria Decision Making* (McGraw-Hill), *Linear Multiobjective Programming* (Springer-Verlag), *Autopoiesis, Dissipative Structures and Spontaneous Social Orders* (Westview Press), *MCDM-Past Decades and Future Trends* (JAI Press), *Autopoiesis: A Theory of Living Organization* (Elsevier North Holland), *Uncertain Prospects Ranking and Portfolio Analysis* (Verlag Anton Hain), *Multiple Criteria Decision Making* (University of So. Carolina Press), *Multiple Criteria Decision Making: Kyoto 1975* (Springer-Verlag) and others. Author of some 350 papers and articles, ranging from operations research, cybernetics and general systems, to economics, history of science, total quality management, and simulation of autopoiesis and artificial life

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