Towards a Post-Luhmannian Social Systems View

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Abstract

In sociology and social sciences there has been for long a debate on whether actions and agents play the role of the explanans in sociological or social scientific explanations or structures and rules. In this contribution it will be argued that introducing the concept of self-organisation that relates agency and systems enables the divide between both strains of thought to be rendered obsolescent.

This reconceptualization of the central issue in social science in terms of self-organization is able to resort to and integrate important ideas and insights of recent attempts to overcome the dichotomy in social theory which do not explicitly refer to an evolutionary systems theory of society. However, it differs fundamentally from the Luhmannian type of approaching social systems while being consistent with various other perspectives on evolutionary systems inside and outside the human realm — in particular, with Bertalanffy's General System Theory.

Keywords: grand social theory, information society, individuals and society, social self-organisation, sociogenesis, subsystems hierarchy, co-operation

1 Why a grand theory at all?

Social research, if empirical, needs and is impossible without theories. According to the saying that there is nothing more practical than a good theory, theoretically grounded insights have the potential of broad and deep impacts. More often as not, the underlying theories are not made explicit and may hinder the application to a greater range of cases. Also, non-reflection of underlying theories may make the results gained, willingly or not, open to arbitrary use or instrumental for partial interests. A critical stance in social research is not possible without unearthing the hidden assumptions. Therefore it is advantageous to make explicit what is implicit.

A grand social theory makes explicit general implications on the nature and development of society. This is important, because every talking about specific societal issues implies assumptions on a general level whether spoken out or not.

A grand social theory offers – like any theory – a heuristic function: it guides theorising on the middle-range level and concrete empirical research while being open to modifications according to feedback from the specific level. There is a dialectic between the general and the specific which is fruitful for both sides and research at large.

In opposition to, and in the aftermath of, postmodern de-theorising society, there have been but few efforts to adhere to or regain the claim of general theory in sociological and historical thinking. Among them there are the following.

1. Those which do not intend to resolve the core of the problem of how individuals and society relate, whilst having a broad spectrum of societal issues in mind – three German threads in sociology, each of them making up a certain deficiency in the other:

> 1.1. The first is connected to the name of Habermas (1984, 1987, 1989); he postulates a chasm between life-world and social system, but in taking care of the freedom of the individual, he is skeptical about the system-like nature of society; this thread stands in the tradition of the Enlightenment, values reason highly and states that modernity is not yet accomplished.

> 1.2. The second dates back to 1984 when Niklas Luhmann published his book on social systems, claiming to make use of the so-called theory of autopoietic machines which Chilean neurophysiologists Maturana and Varela had developed and apply this theory to society; this is a thread which – though having culminated so far in the two-volume, one-thousand-plus page publication "Die Gesellschaft der Gesellschaft" (1997) – has only recently met with a favorable reception in the Anglo-Saxon world of sociology; a thread which, on the one hand, is characterized by a sophisticated terminology but, on the other, is reproached for lacking practical consequences.

> 1.3. The third began in 1986 with Ulrich Beck's famous book "Die Risikogesellschaft" in which he introduced the idea of a different modernity, and which was followed by a number of publications leading up to his special book series, Edition Zweite Moderne with Suhrkamp (see e.g. Beck 1997); a thread, however, that is seductive in its comprehensive political approach and its pragmatics, but less in its theoretical coherence.

2. Those intentionally attempting to overcome the chasm between agency and structure, including the following:

2.1. The works of Bourdieu (e.g. 1977, 1990, 1993, 1994, 1996) and three Anglo-Saxon sociologists: Alexander (e.g. 1995), Giddens (his most famous work being The Constitution of Society, where he outlines his so-called Theory of Structuration, which was published in 1984 and in German in 1988), and Mouzelis (1995) belong to this group of thinking. All of them deal with duality or dialectic in contrast to dualism.

2.2. Writings of scholars who do not have a sociological but rather an interdisciplinary background and refer to the self-organization paradigm in one way or another: the three-volume work of the Dutch expert in International Relations, Johan K. De Vree (1990), who develops a system-theoretical approach, starting with thermodynamical considerations, and by doing so avoids the fundamental shortcoming of cutting society free from the material-energetic world (a mistake which Luhmann makes), has to be mentioned here, as well as the information-science trilogy written by Tom Stonier (1990, 1992, 1995), a biologist and, finally, Professor Emeritus for science and society at the University of Bradford, who offers an evolutionary perspective of societal development up to the information age. Both of them had been active in the Foundations of Information Science community when it started a decade ago. In addition there are several approaches which aim at theories of a global brain (e.g. the Principia Cybernetica Project group around Francis Heylighen, see for instance 1995 or 1997, from a cybernetics point of view) or a collective intelligence (Lévy 1997 – in French 1994 –, from a philosophical point of view) or draw parallels between super-organisms and mankind (Stock 1993) or between biotic and cultural developments in general (see e.g. the living systems theory of James Grier Miller from 1978 and the article Miller/Miller 1992 or Peter Corning's Synergism Hypothesis from 1983) or share an evolutionary perspective without referring to biology (e.g. Malaska 1991, Artigiani 1991).

Thus, there is a lasting trend towards rethinking society in recent decades fueled by attempts to grasp society in the information age.

2 Why a social systems view?

On the one hand not only the most industrialized countries, but also less developed countries, are subject to transformation processes in the sphere of the technological organization of society, due to the development and diffusion of modern technologies which are supported and furthered by national and regional policies which set up a tremendous number of technology-advancement programmes. These policies are still

confined to a view that looks upon technology as an independent factor of societal development.

On the other hand there has been growing awareness that technological determinism is too myopic, since the belief in technological progress which *per se* entails social progress has diminished. Development in technology is not accompanied by an equally rapid growth in scientific insight, let alone foresight, as to the impacts of technology on levels of society other than that of technological organization. Attempts to observe and understand the basic nature of this change are still second place. The public use of the notion of "information society" has been reduced to denoting a society in which applications of modern information and communication technologies are widely spread in order to facilitate the handling of entity-like "information". Data, however, is not the *ultima ratio* of this new society to come, nor even is knowledge, regardless of its quantity, as the recently EU-wide hype of knowledge-based economy and society suggests. It is wisdom which may make the emerging society a "wise society" that is capable of coping with the challenges arising from its own development. A scientific understanding of this new form of society has not had time to develop. There is not yet a "science of the information society". Nevertheless, it seems an idea whose time has come.

There are three criterions along which each scientific endeavour can be assessed: aims, scope, and tools. Aims means that each research has a certain task to fulfil, namely, to contribute to solving problems arising from practice. Scope refers to the domain, that is, the constitution of the object of investigation led by theoretical deliberation. And tools denote the ways and means of the approach, to wit, the methods used to mediate between empirical data and theories. The discussion of each criterion advocates systemic thinking to be most appropriate for contemporary social science.

As to the first criterion, a science of the information society would have to serve the practical purpose of meeting the demand for governance which has been rising exorbitantly; this is because the gap between the necessity to tackle global problematics (which sets at risk the survival of humanity) and the (im)possibility of acting in face of tendencies of fragmentation, heterogenization and desintegration, has been widening. Attempting to come to grips with these problems is not possible without trying to steer society, for these very problems turn out to be basically problems of governing of society in that the old forms of control and regulation have proven obsolescent, and so new forms are needed. That is, a science of the information society should provide society with a means of enhancing its problem-solving capacity regarding the challenges it is confronted with.

Thus, coming to the second criterion, theorizing the underlying processes and structures of all malfunctions in the sociosphere, ecosphere and

technosphere that continue to aggravate the global challenges belongs to the domain of a science of the information society. Insofar as disparities in the development of the relations amongst humans, between humans and nature and between humans and technology build obstacles to keeping society as a whole on a stable, steady path of development, they constitute the very object of inquiry.

And since the investigation has to comprise as wide a range of matter as this, a science of the information society cannot, with reference to the third criterion, afford to neglect any methodological means of study which might be fruitful and elucidating. Likewise it must not fail in putting the puzzle of findings together and in synthesizing the manifold analyses, thus transcending the borders of disciplines and aiming at the unity of science by a unifying approach without subjecting any thinking to uniformity.

Governance, global challenges, and "anything goes, if it works" are predestined for being tackled in a systemic perspective. Governance is clearly a case for social cybernetic thinking, global challenges are complex problems that require thinking in complexity, and a transversal approach is where systems methodologies are competent.

Thus, information society needs a social systems view. However, a social systems view is needed that includes considerations of practical matters and hence agency.

3 Why self-organisation?

There are different schools of systemic and evolutionary thinking applied to the realm of society. They go hand-in-hand with the positivistic, interpretivist, postmodern, and critical paradigms in sociology.

Each general sociological theory revolves around a central theme which is known today as the dualism of agency and structure (see Reckwitz 1997). The answer to how to relate individuals and society makes the paradigms of grand social theory distinct from each other.

One possible answer to that question is individualism (see Tab. 1). Theories belonging to that kind of conceptualisation methodologically, ontologically and ethically give priority to individual action and related phenomena and postulate that societal facts and related phenomena are to be logically derived from the individual ones, are in a modular way built up by the latter ones and do not inhere values different from values on the individual level. The way of thinking underlying individualism is reductionism and makes it positivistic. Societal phenomena are reduced to phenomena on the individual level. Knowledge of individual phenomena is necessitated by and suffices for getting knowledge of phenomena on the society level, the second results from the first. The most well-known example for individualism is rational-choice theory in economics. The

whole paradigm often is labeled action theory or subject theory. Agent-based modeling methods may suit this approach.

Contrary to individualism, there is "societalism". This is the tradition that goes back to Emile Durkheim who insisted on the autonomous existence of social facts. Recent representatives of this variety are functionalist and structuralist theories. Starting point is dealing with social facts or social functions or social structures which is deemed necessary and sufficient to describe, explain or predict what is going on on the individual level. Instead of being reductionist, this way of thinking extrapolates or projects phenomena which are found on a higher level onto a lower level where these phenomena cannot be found. Insofar as it stresses some whole to be examined in order to understand phenomena, it is interpretivism. Several systemic approaches belong to that category.

Another solution offered similar to the previous one is to grant autonomous existence to phenomena of individuals and society respectively. Here individuals are cut free from societies and vice versa. In distinction to the monism of the two answers above, it is dualism, en vogue in postmodern thinking. Niklas Luhmann's theory of social systems, e.g., is dualistic since his social systems (subsystems of society) are made up of communications only while the psychic systems (individuals) belong to the environment of the social ones.

		how to relate...	
		individuals...	and society
positivism	*individualism:* action theory	necessary and sufficient	resulting
interpretivism	*"societalism":* structuralism	resulting	necessary and sufficient
post-modernism	*individual–society dualism:* Luhmann	independent	
critical thinking	*individual–society dialectic:* theory of self-organisation	interdependent (society emerges from, and shapes, in turn, individuals)	

Table 1: Paradigms of Grand Social Theory implications

Taking up the strands in sociological reasoning that focus on interdisciplinary themes and problems of contemporary information society while appreciating the valuable contributions of the remaining strands of a grand social theory, elaborating on a theory of social self-organisation promises a more thorough solution to the key problem of sociological theory. Considering self-organisation brings the interests of the stakeholders to the fore and makes research critical, since interests are open to the discourse.

The dialectical relationship between agency and structure being a process whose products freeze into structure, which in turn influences further processes of action as it enables them and constrains them at the same time, can easily be retheorised in terms of a feed-forward and feed-back loop between society as a (supra-)system, and individuals or systems of individuals as elements or (sub-)systems: a loop that does not mediate strictly deterministic causations, but allows for the emergence of new qualities instead (see Fig. 1, Hofkirchner 1998).
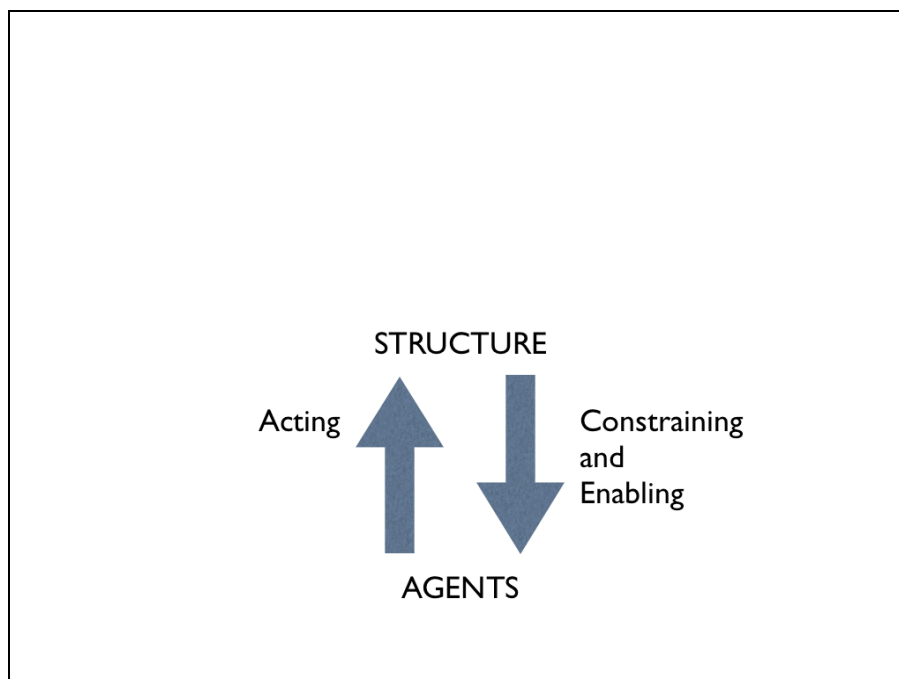
STRUCTURE

Acting

Constraining and Enabling

AGENTS

Fig. 1: Self-Organisation

Societal structures emerge from individual actions and individual actions are shaped by societal structures. There are two levels. At the micro-level the elements of the system, namely actors, are located. They carry out actions, and by the interplay of the fluctuating individual actions, they design fairly stable relations among them which gain a relative independence from the interactions. Structures like that emerge thus on a macro-level, where they exist in their own right insofar as they, in turn, influence the actors. On the one hand, they constrain the individual agency by setting conditions that limit the scope of possibilities to act and,

on the other, just by doing so provide it with the potential for realising options it would not otherwise have. The impact of the structures is a constraining and enabling one (these terms are introduced by Giddens). In so far as the structures do not cause directly, and therefore cannot determine completely whether or not these options will be realised, for the actions are mediated by the individual actors, dominance cannot control the outcome, either. The structures are inscribed in the individual actors by an endless process of socialisation and enculturation, but the engrams which are produced in the individuals serve as informational tools for the anticipation and construction of ever new actions which may or may not reproduce the structures. Either way, interaction reflects upon the conditions of its own emergence and may consciously be directed at the structures in order to maintain or alter them. In this sense only, that is, because in their recursive actions the actors refer to the structures, these structures play the dominant role in this relation of bottom-up and top-down causation. Nevertheless none of the relations in this causal cycle leads to plain results. Each influence has consequences which due to the inherent indeterminacy cannot be foreseen. By this, and only by this, qualitative change is possible.

Thus, individuals and society are interdependent (none of them can be understood without the other), they oppose each other (none of them is fully understandable by understanding the other), and they build a hierarchy (society plays the dominant role). They form parts and a whole which is a dialectical relationship. Dialectics is said to apply whenever two correlates build a mutually dependent relationship between themselves as opposites in an asymmetrical way.

In this context, Luhmann's theory of social systems seems to point to what constitutes the macro-level in our diagram only, to what is termed structure, while our approach gives a bigger picture and can be looked upon as an extension and complementation of his ideas.

4 Why Post-Luhmannian?

Luhmann's theory has given to posterity pathbreaking insights, among them the notions of identity and difference, double contingency, reducing complexity, differentiation, last but not least his strong conviction that information is not something laying plain in the environment of systems waiting for being taken up but (the result of) a constructive activity of the systems themselves. Nevertheless, there are shortcomings due to his uncritical and therefore affirmative political position regarding the relationship observation of society versus intervention in society. I will discuss three of them:
   • the detachedness of social systems from the physical world,
   • the reification of communication,
   • and the free floating of social systems.

4.1 Why go beyond operational closure?

By overstressing the operational closure of social systems Luhmann cuts free sociality from physicality. In doing so he misses an evolutionary account of sociogenesis which is a necessary underpinning of considering social change. He arrived at his concept by making use of an analogy between the biotic and the social realm. This analogy, however, is questionable. It is rather an evolutionary process by which society unfolds from the kingdom of animals. This is the reason why it has something in common with the biotic realm while being at the same time distinct from the latter.

Evolutionary systems theory – a term coined by Ervin Laszlo (1987), Vilmos Csanyi (1989) and Susantha Goonatilake (1991) – as a theory about evolving systems and as a theory that is the result of the merger of systems theory and evolutionary theory which nowadays not only applies to biotic and human or social systems but also to physical systems, that is, to the cosmos itself (Layzer 1990, Smolin 1995), is the most recent elaboration of General System Theory of which Ludwig von Bertalanffy is known as one founder (Hofkirchner 2005). It revolves around the notion of self-organisation. It provides a transdisciplinary framework for consilience throughout science thereby positioning social science within the orchestra of disciplines.

The core of evolutionary systems theory is a stage model. It is a phase model and a layer model in one. The stage model of evolutionary systems is based upon the principle of emergentism and the principle of asymmetrism. Emergence takes place in transitions in which by the interaction of proto-elements systems are produced. Asymmetry describes the suprasystem hierarchies in which subsystems are encapsulated.

The shift from one phase to a subsequent phase is tantamount to a shift onto a new layer. The new system includes this additional layer. It encapsulates what previously were autonomous systems as subsystems and shapes them to reflect the dominance relation. However, the newly formed system will always depend on the functioning of its subsystems. When they cease to support the system, it will break down.

Regarding the aspect of becoming, of process and evolution, the universe and its constituents are considered open in the sense that future is not predestinate. Systems realise possibilities of further development, and, when the carrying-out of system-specific functions reaches its limits, they may or may not switch over to a higher level of organisation and thus to a new quality of existence in form of a metasystem. Emergentism holds that the old is only the necessary condition for the new, i.e. the new cannot come into existence unless the old provides the preconditions for the start of the new. But the new is not completely determined by the old. There is a degree of freedom in the new that cannot be reduced.

Regarding the aspect of being, of structure and systemic hierarchy, the entities of the universe are essentially "holons" (as Arthur Koestler described, e.g. 1989). That is to say, as a rule, the systems have subordinate subsystems and are themselves components of suprasystems. Together they form a layered structure in which the systems that arose in later stages of the evolution process are found on higher levels, the older systems on lower levels. Asymmetrism holds that the parts are only the necessary condition for the whole, that is, without parts there is no whole, but the parts alone do not necessitate the existence of the whole. The whole, being not completely determined by its parts, does in turn not completely determine its parts. An irreducible degree of freedom resides in the whole as well as in the parts.

We have to distinguish between different levels of self-organisation, i.e. self-organisation has aspects that are common to all types of systems as well as aspects that are particular to each concrete type of system. So self-organisation is related to a dialectic of difference and identity (see Fig. 2).

In physicochemical systems, self-organisation means the spontaneous emergence of order in a system that is far from its thermal equilibrium. If a certain threshold of a specific control parameter is crossed, fluctuations intensify and order emerges. The Bénard convection-cells are an example. This process of self-organisation in physicochemical systems is called dissipation because low-entropic energy is imported from the environment of the system and high-entropic energy is exported from the system. This enables the system to gain order, energy carrying high entropy is dissipated.

In living systems, self-organisation refers to the autopoiesis of such systems. That is, they can maintain themselves by reproducing their parts and hence the unity of the system permanently. An autopoietic system can maintain and reproduce itself and it can set up its own borders. All living systems are autopoeitic ones. Autopoiesis functions on the basis of dissipation.

In a social system, self-organisation refers to the so-called re-creation (Jantsch 1992) of such a system. Re-creation means that social systems do not only have the capacity to modify themselves (as dissipative systems do) and to maintain themselves (as autopoietic systems do), but they also have the capacity to re-invent themselves, to shape themselves, to produce a specific character by which the individuals that are parts of a social system can strive to realize themselves in a more or less self-determined way.
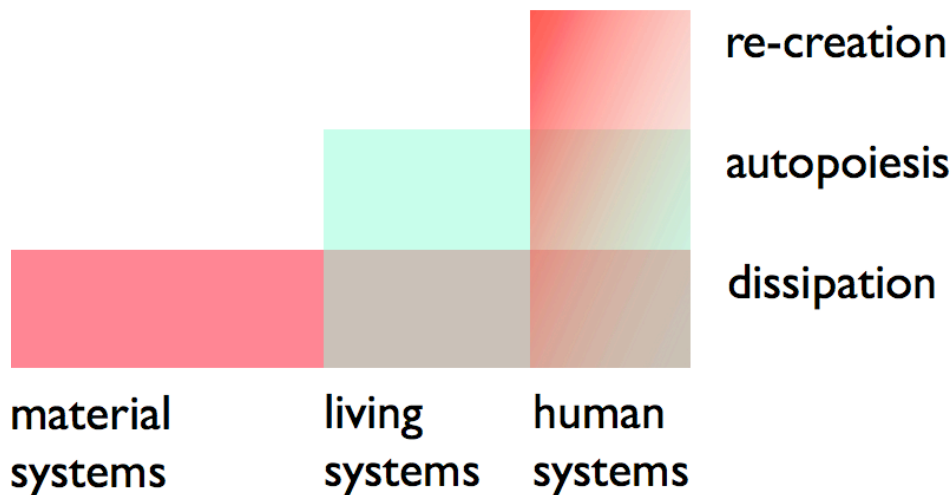
Fig. 2: Evolutionary systems stage model

That is to say, systems at the evolutionary stage of human society are just another – but new – way of metabolism nonhuman living systems carry out (just as systems at the evolutionary stage of living beings are another way of making use of energy that nonliving material systems do). It is the specifics of that way sociality is about. But it would narrow the possibilities of understanding to neglect the roots of socialty.

According to the granularity within each stage a number of further stages may be identified. Thus – within the stage of social systems – information society can be understood as cyberspace emerging from social space – a task yet to be done.

4.2 Why go beyond communication?

All (human-level) communication processes take place by virtue of social systems, but not every process that takes place by virtue of social systems is communication. There is co-operation, too. Furthermore, co-operation is the decisive feature which shapes communication. To Luhmann successful communication, that is, understanding, is a miracle, though, admittedly, it happens every day. If we take into consideration downward causation, then it is not a miracle at all. Understanding is necessitated by co-operative processes.

The relationship of communication and co-operation can be revealed by analysing system phases and system levels. The phases are characteristic of the meta-system transition, which causes the system to materialise in a supra-system hierarchy of different levels (see Hofkirchner/Stockinger 2003).

1. In the first phase of each meta-system transition, there is only a multitude of entities, which later on will become elements of the system to be formed. In this phase they cannot be addressed as elements because there is no system yet. They do not have bindings to each other at all. This pre-elementary phase, seen from the angle of the system to emerge, may be called individual phase.
2. Only in the second phase these entities begin to develop relations among themselves, they interact with each other. But this interactive relationship is not durable, not stable, can vanish according to the changing activities of the entities involved. In this intermediate phase, processes may still be reversible. Let's call it interactional phase.
3. It is in a third phase that a system is formed in the course of interaction. Durable, stable relations are established among the entities which by then turn into elements of just this system. This integrational phase makes the changes irreversible. A new system emerges.

If we consider the original entities as systems themselves, the emerging system can be called meta-system.

After the emergence of the meta-system three different levels remain which remind of the previous transition and express a hierarchy, seen from the point of view of the supra-system:

1. An intra-systemic level focussing exclusively on the internal processes of a system that is a constituent of the supra-system;
2. an inter-systemic level focussing on the interrelations of these constituent systems,
3. and a supra-systemic level focussing on the supra-system that is built by the constituents.

These three levels may also be called individual, interactional, and integrational levels. Hierarchy means that the higher one shapes the lower level though the higher, in turn, depends on the lower one.

Now, information generation can be classified along these dimensions, characterised by phases and levels.

1. What is going on in the individual phase resp. on the individual level in terms of information processes turns out as cognitive process. Cognition is the internal generation of information.

2. What is going on in the interactional phase resp. on the interactional level in terms of information processes is nothing else than communicative processes. Communication is the interfacial generation of information.
3. And what is going on in the integrational phase resp. on the integrational level in terms of information processes may be denoted as co-operative processes. Co-operation is the external generation of information.

Thus, climbing up the ladder, complexity seems to increase unless the interdependence state is overcome by an integration state. By that very act complexity is reduced to a new simplicity. And, climbing up the ladder, novel qualities emerge that shed their light on the qualities of the layers below. That is to say, cognition is a necessary condition for communication and communication is a necessary condition for co-operation, while, given a system of systems, co-operation of these very systems shapes their communication, which, in turn, shapes the cognition in each of them. In this way, cognition, communication and co-operation are mutually conditioned.

The internal generation of information is that act of self-organisation by which a system internally builds up a new order triggered by something, which is not the system. It can be visualised in three steps:
- a system acts on something
- this something bounces back
- a new system order emerges that takes into account the specific action and the specific reaction.

These steps can be characterised as assimilation – non-affordance – accommodation (assimilation and accommodation being terms introduced by J. Piaget (1976, 1980) and affordance a term coined by J. J. Gibson (1950, 1966, 1979)). Assimilation is the informational or semiosic aspect of subjection. Affordance means the degree to which the object affords being subjected, non-affordance the degree to which it does not. Finally, accommodation is what happens informationally or semiosically if the subject adapts to the object. Accommodation takes precedence over the next round of trying to subject the object. Cognitive information arises.

The interfacial generation of information takes place between at least two interacting (co-)systems. The basic steps are:
- a system shows a new order
- it acts on another system
- this other system shows the build-up of a new order taking into account the specific order and the specific action of the first system.

The new order of the second system may then be the point of departure of an action of the second system on the first one, which may in turn self-organise. These steps tie up with the information–message–understanding distinction N. Luhmann gave (1984). Communicative information arises.

The external generation of information is a process in which a critical number (beyond a certain degree of complexity) of (co-)systems participate in the production of a common external. The steps can be seen like this:

- systems combine
- a new order is established on a higher level
- this higher level channels the action of the systems in the direction of asserting the new order.

These steps are in line with the Luhmannian categories of variation–selection–stabilisation (1997). Co-operative information arises.

There is much evidence on communication being a factor not to be neglected when explaining cognition, but less awareness of the fact that the same holds for the relationship between co-operation and communication. It's co-operation that accomplishes the leap in quality and makes society social. It's co-operation that gives sense to communication. Focussing on communication alone – that is, as if not influenced by co-operation – misses the central feature of social systems where synergetic effects come up. Co-operation accounts for human sociability with work and division of labour and related memes for joint action, which is distinct from prehuman biotic organicity. It sets the stage for communication that accounts for human languageability with tuning-in and convergence of the members of society by mutual action for co-operative reasons which is different from prehuman biotic signalability. Human communication, in turn, sets the stage for human consciousness with ideas for pro-action which is distinct from prehuman biotic psyche.

This is just a brief sketch of a framework that might give heuristical hints for further research.

4.3 Why go beyond functional differentiation?

It is a commonplace to differentiate between subsystems of society like technology, ecology, economy, politics, culture. In Luhmann's theory they are independent systems located, so to say, on the same level.

Self-organising systems, however, may form a nested hierarchy. According to the view supported here, the build-up of order by using free energy which is characteristic of the most simple physical self-organising system differentiates in the concatenation of two self-organising cycles in which structures and functions respectively are produced in biotic systems.

With the advent of human systems, this two-levelled architecture is seen to give way to a three-levelled architecture in which self-organisation cycles that produce means, ways and goals form encapsulated systems.

Thus, at a first glance, you can distinguish three main spheres that form the layers of a hierarchical society system: the technosphere is enclosed by the ecosphere and the ecosphere by the sociosphere (see Fig. 3, Hofkirchner/Fuchs 2003, Fuchs/Hofkirchner 2005).
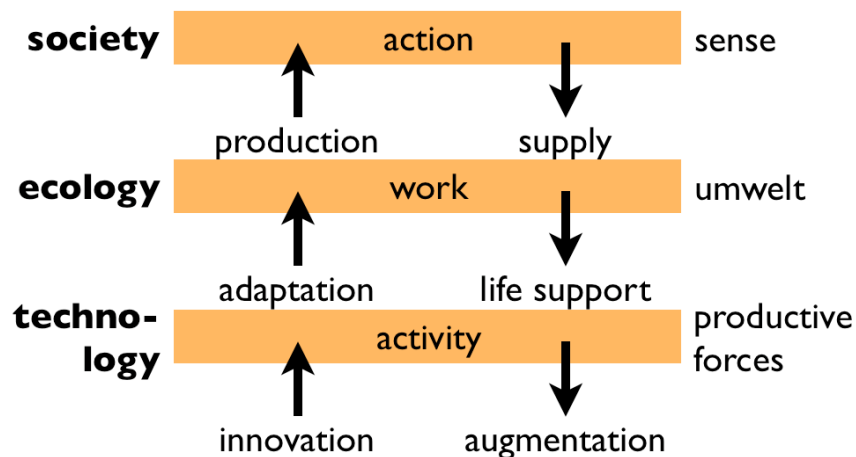

Fig. 3: Social subsystems, granularity 1

The technosphere is the sphere in which means are produced, that is, in which human beings are active in innovating and applying scientific-technological tools in the course of social life. A means is a medium, in that it mediates between the starting point and the desired result, regardless of what sort of action is involved. An infrastructure of tools, methods and capabilities which comprise the overall forces of the socially living humans is the base of human systems. Technology is to augment the actors that take the role of productive forces in that they produce something when they aim at something. The technosphere is the sphere in which the actors of society carry out their instrumental activities. Instrumental activities are the use of technologies as well as the creation of new technologies.

The ecosphere is the sphere in which ways are produced, that is, in which human beings work, in other words, where they use their tools, methods and capabilities to adapt nature to themselves in order to survive and construct an umwelt, where they objectify the life-support conditions of nature and appropriate nature to assure them of life support. Human living beings restructure nature in order to be able to appropriate it in the way they require. Contrary to all the other life forms on our planet, humans are able to consciously design their metabolism and to produce their *umwelt* whenever nature itself is not capable of reproducing itself for the sake of humans.

The sociosphere as a whole is the sphere in which goals are produced. It's the sphere in which human beings perform social actions. Here they constitute what makes sense to them and realise it. Sense is then another of the higher qualities brought forth by the specific self-organisation of human systems. In fact, it is the result that constitutes the differentia specifica to nonhuman biotic systems. Tangibles and intangibles (goods, be they material or immaterial) are produced and consumed. Every social being is called to co-design the collective in which the supply of the goods is provided.

Upon closer scrutiny, the constitution and realisation of sense can be differentiated further. Usually economy, politics and culture are the realms in which sense is produced by social actions. Thus the sociosphere is the sphere in which the actors as social beings construe social relations concerning resources (economy), regularities (polity) and rules (culture). They dispose over resources, decide on life conditions that form regularities of the living together and define rules like norms and values (see Fig. 4, Hofkirchner/Fuchs 2003, Fuchs/Hofkirchner 2005).

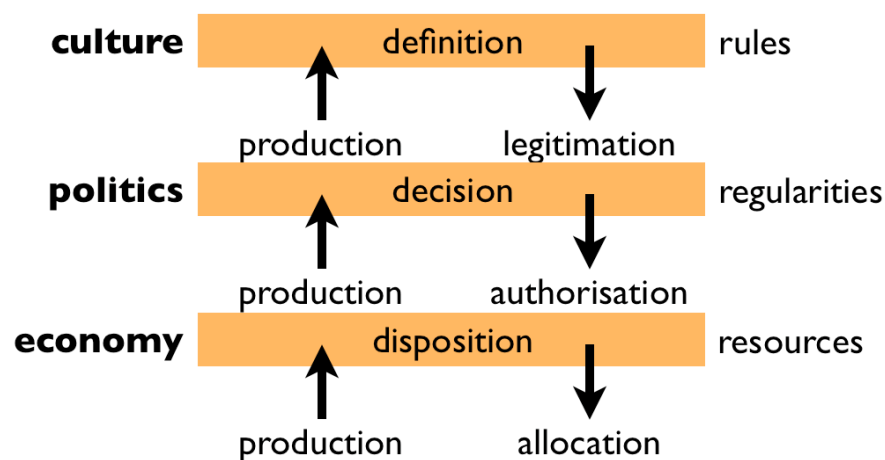| **culture** | definition | rules |
	production legitimation	
politics	decision	regularities
	production authorisation	
economy	disposition	resources
	production allocation	

Fig. 4: Social subsystems, granularity 2

Economy means a dual process of production and allocation. Material resources that are vital to society are produced by making use of the system of productive forces. On the other hand, resources are utilised in order to ensure the preservation of the members of society in a process of allocation of economic goods. The social relationships that emerge here and channel the self-preservation of the actors are property relations – property being the disposition of resources. According to the power of disposition resources are allocated to the actors, that is, goods are distributed to them.

Politics deals with decisions which refer to the way life conditions are set (including how economic resources are being used and how they are distributed). Decisions are made on the basis of available resources in order to assure the functioning of society. Politics is about power, namely, power of decision. The disposal of means of power represents regularities of how actors pursue interests. By resorting to power actors are authorised to determine themselves.

Culture can be seen as the subsystem of society in which ideas, views, social norms, and social values are defined within the framework of habits, ways of life, traditions, and social practice. Culture encompasses a dual process of defining the rules and being legitimised by observing the rules. On the one hand social norms, values, ethics and morals are constituted and differentiated in relation to decisions already reached. On the other hand, social norms legitimise acts of the members of society. It is the field of discourse in which the actors can express themselves as long as they happen to gain influence by sharing the power to define the rules.

The architecture of society, then, is made up of a series of encapsulated systems each of which is a manifestation of the basic cycle of agency and structure described above. That is to say, in each social subsystem individuals as members of society play a certain role – as technological, ecological, or social agents, or as economic, political, or cultural agents. They constitute the motor of each cycle. And the roles they play depend on each other in a certain way – the power of definition brings about the power of decision, the power of decision brings about the power of disposition, and social action brings about work that brings about technical activity, each of the latter being an instantiation of the former as well as the basis on which the former depends. It goes without saying, however, that these mutual relationships are not strict deterministic but less-than-strict-deterministic as to allow for non-compliance and thus social change. It is a hope that by conceptualising social systems as encapsulated subsystems of society a deeper understanding of the mutual relationships might be reached.

References:

Alexander, Jeffrey C. (1995): Fin de Siècle Social Theory. Relativism, Reduction, and the Problem of Reason. London etc.

Artigiani, Robert (1991): Social Evolution. A Nonequilibrium Systems Model. In: Laszlo, Ervin (ed.): The New Evolutionary Paradigm. New York etc.

Beck, Ulrich (1986): Die Risikogesellschaft. Frankfurt

Beck, Ulrich (1997): Perspektiven der Weltgesellschaft. Frankfurt

Bell, Daniel (1973): The Coming of Post-Industrial Society. New York

Bourdieu, Pierre (1977): Outline of a Theory of Practice. Cambridge etc.

Bourdieu, Pierre (1990): The Logic of Practice. Cambridge

Bourdieu, Pierre (1993): Sociology in Question. London etc.

Bourdieu, Pierre (1994): In Other Words. Oxford

Bourdieu, Pierre (1996): Distinction. London

Corning, Peter A. (1983): The Synergism Hypothesis. A Theory of Progressive Evolution. New York

Csanyi, V. (1989): Evolutionary systems and society. A general theory of life, mind and culture. Duke University Press, Durham

De Vree, Johan K. (1990): Order and Disorder in the Human Universe. The Foundations of Behavioral and Social Science. 3 vols. Bilthoven

Fuchs, C., Hofkirchner, W. (2005): The Dialectic of Bottom-up and Top-down Emergence in Social Systems. In: tripleC 3/2, 28–50

Gibson, James J. (1950): *The perception of the visual world*. Boston: Houghton Mifflin

Gibson, James J. (1966): *The senses considered as perceptual systems*. Boston: Houghton Mifflin

Gibson, James J. (1979): *The ecological approach to visual perception*. Boston: Houghton Mifflin

Giddens, Anthony (1984): The Constitution of Society. Cambridge

Goonatilake, S. (1991): The evolution of information. Lineages in gene, culture and artefact. Pinter, London

Habermas, Jürgen (1971): Towards the Rational Society. London

Habermas, Jürgen (1979): Communication and the Evolution of Society. Boston

Habermas, Jürgen (1984): The Theory of Communicative Action. Vol. 1: Reason and the Rationalization of Society. Boston

Habermas, Jürgen (1987): The Theory of Communicative Action. Vol. 2: Lifeworld and System. Cambridge

Habermas, Jürgen (1989): The Structural Transformation of the Public Sphere. Cambridge

Heylighen, Francis (1995): Selection of Organization at the Social Level. Obstacles and facilitators of metasystem transitions. In: World Futures, Special Issue "The Quantum of Evolution: toward a theory of metasystem transitions"

Heylighen, Francis (1997): Towards a Gloabal Brain. Integrating Individuals into the World-Wide Electronic Network. In: Brandes, Uta/Neumann, Claudia (eds.): Der Sinn der Sinne. Göttingen

Hofkirchner, W.(1998): Emergence and the Logic of Explanation – An Argument for the Unity of Science. In: Acta Polytechnica Scandinavica, Mathematics, Computing and Management in Engineering Series 91, 23–30

Hofkirchner, W. (2005): Ludwig von Bertalanffy. Forerunner of Evolutionary Systems Theory. In: Gu, J., Chroust, G. (eds.), The New Role of Systems Sciences For a Knowledge-based Society, Proceedings of the First World Congress of the International Federation for Systems Research, Kobe, Japan, CD-ROM (ISBN 4-903092-02-X), 6

Hofkirchner, W., Fuchs, C. (2003): The Architecture of the Information Society. In: Wilby, J., Allen, J.K. (Eds.), Proceedings of the 47th Annual Conference, ISSS (The International Society of the Systems Sciences), ISBN 0-9740735-1-2 (CD-ROM), 10

Hofkirchner, W., Stockinger, G. (2003): Towards a Unified Theory of Information. In: 404nOtF0und, VoL. 1 (3), N. 24, Jan.

Jantsch, Erich (1992): Die Selbstorganisation des Universums. München etc.

Koestler, A. (1989): The Ghost in the Machine. Arkana Books

Laszlo, E. (1987): Evolution – The Grand Synthesis. New Science Library, Boston

Layzer, D. (1990): Cosmogenesis, The Growth of Order in the Universe, Oxford University Press, New York 1990

Lévy, Pierre (1997): Collective Intelligence. Mankind's Emerging World in Cyberspace. New York, Plenum Trade

Luhmann, Niklas (1984): Soziale Systeme. Frankfurt

Luhmann, Niklas (1997): Die Gesellschaft der Gesellschaft. Frankfurt

Malaska, Pentti (1991): Economic and Social Evolution. The Transformational Dynamics Approach. In: Laszlo, Ervin (ed.): The New Evolutionary Paradigm. New York etc.

Miller, James Grier (1978): Living Systems. New York

Miller, James Grier/Miller, Jessie L. (1992): Applications of Living Systems Theory. In: Levine, Ralph L./Fitzgerald, Hiram E. (eds): Analysis of Dynamic Psychological Systems. New York

Mouzelis, Nicos (1995): Sociological Theory. What went wrong? Diagnosis and Remedies. London etc.

Piaget, J. (1970): Genetic Epistemology. W.W. Norton and Co., New York

Reckwitz, Andreas (1997): Struktur. Zur sozialwissenschaftlichen Analyse von Regeln und Regelmäßigkeiten. Opladen

Smolin, L. (1997): The Life of the Cosmos, Oxford University Press, New York

Stock, Gregory (1993): Metaman. The Merging of Humans and Machines into a Global Superorganism. New York

Stonier, Tom (1990): Information and the Internal Structure of the Universe. An Exploration into Information Physics. Berlin etc.

Stonier, Tom (1992): Beyond Information. The Natural History of Intelligence. Berlin etc.

Stonier, Tom (1997): Information and Meaning. An Evolutionary Perspective. Berlin etc.