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Teaching Transdisciplinarity: The Case of ICTs and Society

A spectre is haunting the disciplines of common science – the spectre of transdisciplinarity. It is a challenge to the traditional classification of science. It is a reflection of the fact that the problems societies are facing today are so complex as to transcend the borders of single disciplinary accounts.

Since the beginning of the 1990ies i have been teaching what is called in German "Informatik und Gesellschaft" (literal translation: "informatics and society"). It is about the societal embeddedness of computing. It is technology assessment of computer applications when looking at so-called impacts of computer applications on society and it is design of technology (in German "Technikgestaltung": the social shaping of technology) when focussing at the implications of the results of this assessment for computer science which altogether forms a feedback loop.

Since I started teaching in the field, there has been a discussion on the self-understanding of the field. And this discussion has not come to an end, but grown by incorporating related fields with different labels: social informatics, new media studies, internet research, information society studies, socially embedded computing etc. etc. In a network I founded two years ago we coined the term "information and communication technologies (ICTs) and society" to denominate all those scientific endeavours that focus on the relation of ICTs, computers and Internet, on the one hand, and society, on the other, irrespective of where they originated from or seem to belong to, be it computer science or information science, be it science and technology studies or sociology of technology, be it communication studies.

One position is it is a subfield of informatics. When the study of informatics was introduced in Austria by the Austrian computer pioneer Heinz Zemanek, "informatics" was understood so as to include a social touch in contradistinction to mere or pure "computer science". Thus it seems to make sense to include the explicit mentioning of social issues as a subfield, or better as kind of a teaching, research and development principle that is inherent to every facet of informatics whatever informatics is said to be.

Another interpretation is to consider it as something that in German is called "Bindestrichwissenschaft" (literal translation: "hyphen science"; it is meant that two independent fields are connected by a junction like a hyphen or in our case with an "and") which has a bad connotation. Hard core computer scientists would never accept that field as belonging to computer science or as being a science at all or as legitimate body of knowledge that computer science might consult. If it is a conjunction of a rather engineering or technological science and a rather social science, the status of that conjunction is in question: does the result account for the first or the second part, or maybe for none of them alone but both? In the first case social science would be reduced to a technological one, in the second case a technological science would be subsumed under a social one – both options in a way imperialistic options. A third option is the interdisciplinary one: technological science and social science work together but don't

undergo a fundamental change themselves. The researchers from each side reach out to those from the other side but stay unchanged.

If the field in question is defined as a feedback loop between technology assessment and design of technology to and fro, between assessment and design of ICTs, then neither a monodisciplinary nor an inter- or multidisciplinary approach suffices. What is needed is a transdisciplinary approach. Transdisciplinarity comes into play when each discipline is engaged in the collaborative undertaking of constructing a common base of methods and concepts and tasks, of which its own methods and concepts and tasks can be understood as kind of instantiations. The transdiscipline is located on a metalevel that affects the levels at hand in that the metalevel makes the latter linked to each other. The metalevel provides the bridges between them. Transdisciplinarity does thereby not mean the abolishment of disciplinary knowledge but the gradual, stepwise establishment of a metalevel by generalisation and the gradual, stepwise adaptation of the disciplinary knowledge by specification – a never-ending process. This process might even be iterated and yield ever new metalevels after the metalevels already produced. And it is system theory and cybernetics that by its systems terminology present a transdisciplinary world view that is apt for building bridges between disciplines, for connecting in a soft way the knowledge on lower levels by translating/transforming them into knowledge on higher levels.

The field of ICTs and Society is best seen as such a transdiscipline. According to that, I have been elaborating on a systemic, systematic framework in which ICTs and Society might find its transdisciplinary substantiation/sublation.

It might be characterised in three ways: in the way it defines its overall aim, in the way it defines its subject, and in the way it defines its methodology.

First, how might it define its overall aim?

It is my conviction that ICTS and Society like any science has to take responsibility for the global challenges humanity is facing. Thus ICTs have to support society in coping with the challenges. I cast the normative vision of the “Global Sustainable Information Society” (GSIS). By a GSIS I understand a society that is (1) capable of making use of knowledge for (2) fighting the dangers of breakdown due to anthropogenic causes (3) on a global scale. That is, I suggest the most universal value to be met by a good society be sustainability that denotes a society’s ability to perpetuate its own development. I, furthermore, suggest that sustainability be broken down into (1) social compatibility (“Sozialverträglichkeit”) which is inclusiveness and fairness – to be broken down, in turn, into equality in cultural terms, political freedom and solidarity as to economy –, (2) environmental compatibilty (“Umweltverträglichkeit”) and (3) technological compatibility by which I mean a balanced relationship of new with old technologies – to be broken down, again, into usefulness, usability, effectivity, reliability, security, safety and other values. The main argument is that not only a society that exploits nature (as was found with reduced notions of sustainability) but also a society that does not meet the criterion of social compatibility because of the exclusion of (e.g. information) have nots (which is a conceptualisation of the non-environmental pillars of sustainability more to the point) or a society that does not abide by technology assessment (which is a feature not so widely reflected) will in the long run break down and not qualify for being sustainable.

The GSIS vision makes ICTS and Society normative. The here and now is measured against a possible – and for the survival of mankind necessary – better future.

This transcendence of science towards society is commonly known as "mode 2 knowledge production" as Helga Nowotny et al. put it. In our context, it means participatory design of social, environmental and technological systems because reorganisation and the build-up of world society have to include the agents that are able to change the world and come to grips with the global problematique.

Second, how might ICTs and Society define its subject?

According to the GSIS vision, the subject of ICTs and Society is every condition that is critical with respect to the implementation of a GSIS, that is, the working of the social, environmental and technological systems and their interplay insofar it has to be improved in order to yield a GSIS. Such a stance it what I call a "Critical Information Society Theory" (CIST). Given that contemporary society undergoes a critical phase of evolution – marked by global challenges – which might end up in devolution, I conceive of this phase in system theoretical terms: there is a bifurcation between a breakthrough towards a stable path of societal development that is based upon a novel principle of organisation of society, on the one hand, and a breakdown of the system at all, on the other. This is what I call the Great Bifurcation. Furthermore, since information, in system theoretical terms as well, is defined as that which is functional for the orderliness of the system in question, it is the inherent potential of ICTs to facilitate the generation of innovative information that might enable society to trigger its re-organisation onto the sustainable path provided by the Great Bifurcation.

A CIST might be based upon a proper idea of the interplay of science and technology, on the one hand, and society, on the other. Technology is then defined as a social system – termed "technosocial" system –, by which it is clear that designing technology means designing social systems in the sense of system theorist B. H. Banathy. The relationship of technology and society is therefore a relationship of mutual shaping and makes the case for a "Critical Design Theory" (CDT).

A critical theory of designing (techno-)social systems requires a critical theory of social systems. My understanding of social systems as self-organising systems turns a social systems theory in a "Critical Social Systems Theory" (CSST) as I have come to term my approach in recent years. Already back in 1998 I started to apply a systems view that is compatible with the findings in self-organisation research in a naturalist sense to social systems and published a first sketch of how to reconcile natural science thinking and social science. The core of this is a basic model of a macro- and a microstructure mediated via agency and downward causation by constraints and enablers. At the same time this basic model of social self-organisation is an attempt of reconciling different approaches in social theory like structuralist or functionalist ones ("Systemtheorie") and the actors' perspective ("Handlungstheorie"). So a CSST includes actors as part of the social system to give actors a standing for the designing of social, technological or environmental systems.

A critical theory of social systems is facilitated by a theory of systems at all that revolves around self-organisation. We called this kind of unified theory of self-organisation, in

extension of the meaning it had worldwide until the Konrad Lorenz Institute for Evolution and Cognition Research Seminar in 1995, "Evolutionary Systems Theory" (EST) to comprise open, dynamical, nonlinear, complex, evolving and hierarchical systems. I consider EST as the today successor of General System Theory of Ludwig von Bertalanffy, Anatol Rapoport and Kenneth Boulding. I developed principles of an Evolutionary Systems Methodology, of Evolutionary Systems Modeling, and of Evolutionary Systems Design.

A "Unified Theory of Information" (UTI) which might be one of several transdisciplinary foundations of designing ICTs for a GSIS, might itself be considered part of, or based upon, an EST. Information is sometimes said to be a building block of the universe as fundamental as matter and energy. According to the information concept I try to formulate, information is that which is functional for the orderliness of whatever system and is able to decrease the frictions that might occur in the course of the functioning of the system in question. Hence my thesis that it is the inherent potential of ICTs to facilitate the generation of innovative information that might enable society to trigger its re-organisation onto a sustainable path, thereby forming a wise society rather than a knowledge society.

A theory of evolutionary as well as information-generating systems might have philosophical implications. I developed the stance of "Praxio-Onto-Epistemology" (POE) by which I added the issue of norms and values as something worth stressing on the onto-epistemological approach so far coined by Hans Jörg Sandkühler and shaped by Rainer E. Zimmermann. It is a systems philosophy, philosophy of information and social philosophy in one. As it has to lay the foundation for critical thinking, that is, for dealing with the contradiction between the real and the better possible and for conceptualising contradictions, it includes dialectical thinking.

Thus the transdisciplinary framework for ICTS and Society is made up of a multi-leveled scaffolding of a CIST, CSST, CDT, EST, UTI, and POE, all of which make use of system terminology.

Third, how might ICTS and Society define its methodology?

It is not some specific methods which are to be favoured by excluding other specific methods. It is my conviction that every approach has strengths and weaknesses and that it is possible to combine them in a system we are able to construct. This way of thinking was applied when Flood and Jackson in 1991 dealing with the variety of approaches in the systems movement came up with their so-called System of Systems Methodologies which they called "complementarism" and, after slight modification in the tradition of their critical systems thinking, was, e.g., termed "discordant pluralism" by Gregory in 1996. The important point is that it does not mean that anything goes. A discourse needs to be established about which methodology is suitable under which circumstances. It is a way to recognise the legitimacy of each position but at the same time it might render illegitimate some elements of any position. By that it applies a system-theoretical principle itself – the principle of "Unity through diversity". "Unity through diversity" – the title of the Festschrift for Ludwig von Bertalanffy – is acknowledged to be the leitmotif of Ludwig von Bertalanffy's thinking. French system philosopher Edgar Morin is talking of *unitas multiplex*. It means understanding disjunctive, reductive thought by exercising thought that distinguishes and connects at the same time. Both variety and

unity are achievable. A system of approaches can yield as much cohesion as is needed to prevent the approaches from falling apart and can allow for as much a range of approaches as is possible to investigate the subject matter from different perspectives. So what is intended here is the joint construction of such a system of different approaches coming from technological, natural or social and human sciences, from formal sciences and philosophy as well which allows for the application of methodologies that are composed in different ways so as to suit the requirements of the subject and the aim.

Given such a framework, teaching ICTs and Society means teaching a systems view. The objective of courses for early stage researchers in the field is to level students of different disciplines up to enable them to share a common understanding. At the University of Salzburg I held every year a basic master course in transdisciplinarity and systems thinking offered to students of communication science and computer science but open for students of all faculties. The course was made up of two parts, a 2 hours per week lecture in winter semester called "Transdisciplinary Foundations for Communication Studies and Computer Science I: Philosophy and Science of Complexity", and a 2 hours per week lecture in summer semester called "Transdisciplinary Foundations for Communication Studies and Computer Science II: Social Science".

The course discussed the following topics (the first three items in the first part, the second three in the second part):

- The Self
- Self-Organisation
- Self-Organisation and Information
- Social Self-Organisation
- Technosocial Self-Organisation
- The Self-Organisation of the Information Society

In particular, the following subtopics were discussed:

- The Self:
  - Ways of Thinking
  - Weltanschauung
  - The New Paradigm
- Self-Organisation:
  - Systems Design
  - Systems Dynamics and Systems Architecture
  - Systems Methodology
- Self-Organisation and Information:
  - Cognition
  - Communication
  - Cooperation
- Social Self-Organisation:
  - Social Systems
  - The Evolution of Cooperation
  - Designing Cooperation
- Technosocial Self-Organisation:
  - Technosocial Systems
  - The Evolution of Technosocial Formations
  - Designing Technosocial Formations

- The Self-Organisation of the Information Society:
    - Information Society Concepts
    - The Great Bifurcation
    - Antagonisms

This course was obligatory for those attending the doctoral school in the field of ICTs and Society. It represented the necessary foundation for any other course more special and for choosing the approach to the topic of one's dissertation work.