

# Chapter 5

## The Meaning of System: Towards a Complexity Orientation in Systems Thinking

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### ABSTRACT

*This article reviews the generic meaning of ‘system’ and complements more conventional system notions with a system perception based on recent complexity theory. With system as the core concept of systems theory, its actual meaning is not just of theoretical interest but is highly relevant also for systems practice. It is argued that complexity theory and thinking with reference to Luhmann a.o. ought to be recognised and paid attention to by the systems community. Overall, it is found that a complexity orientation may contribute to extend and enrich the explanatory power of current systems theory when used to complex real-world problems. As regards systems practice it is found that selective use and combination of five presented research approaches (functionalist, interpretive, emancipatory, postmodern and complexity) which function as different but complementing ‘epistemic lenses’ in a process described as constructive circularity, may strengthen the exploration and learning efforts in systems-based intervention.*

### INTRODUCTION

This article presents some views on the generic meaning of ‘system’, the influence of complexity on systems thinking and different epistemic ways of obtaining systems-based insights as a basis for sense-making and intervention in real-world, complex problems. The article is disposed as follows: After this introduction, the development of systems science is set out as three waves. Although perceived as consecutive waves they all represent ways of systems thinking that are today concurrently used, i.e. with the waves not to be seen as superseding each other. The first wave represents a functionalist research orientation, the second wave an interpretive orientation, while the still unfolding third wave is tentatively defined by collectively pointing towards emancipatory, postmodern and complexity research orientations. In this article special focus is on the complexity research orientation, which can be seen to counterbalance the simplicity oriented type of systems thinking represented first and foremost by the functionalist research orientation.

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In the next section, complex adaptive systems (CAS) are used to exemplify conventional and well-known types of systems thinking, while complex, heterarchically evolving subworld systems (CHESS) are set out as an expression of a more recent complexity-based perception. In this respect the theories of the French sociologist Edgar Morin and the German sociologist Niklas Luhmann give the background for the suggested third-wave complexity orientation, while the work of the American brothers Hubert and Stuart Dreyfus, a philosopher and an operations researcher respectively, provides a learning model which among other things sheds light on the important concept of ‘subworld’. This concerns the accumulative build-up of team knowledge around a specific intervention. Altering of holistic, systemic perceptions lay behind this knowledge accumulation.

As regards systems thinking it is found that CAS can be perceived as representing a kind of ‘social physics’, while CHESS is more like a kind of ‘social topology’. Where CAS uses metaphors and concepts that relate to flows of material, energy and information, CHESS uses metaphors that help to pay attention to many-dimensional surfaces and intersecting edges that, among other things, can bring forward issues about smooth as well as more disruptive changes in the overall systemic perceptions of a complex problem. It is found that the systems topology view may help inform the identified system notion relating to the complexity orientation with a focus on the difference in complexity along system demarcations. These findings are related to Luhmann’s theoretical work on social systems where system/environment distinctions are a main concern as described later.

## THE THREE WAVES OF SYSTEMS SCIENCE

In recent reviews of the development of systems science, a staged development has been recognised (Midgley, 2000). There seems to be a kind of agreement that a first wave covered by a fifty-year period ending around 1980 can be viewed as an expression of a functionalist approach, while a second wave, among others introduced by researchers such as Ackoff and Checkland, unfolded in the 1980s taking a mainly interpretive research orientation. The period from the 1990s until the present day is characterised by more uncertainty as concerns the wave categorisation. At least, however, what has been termed emancipatory and postmodern approaches candidate as important research orientations to feature a current third wave. Furthermore, recent ideas stemming from complexity research are found to be relevant in this context. Today the approaches are used concurrently when seeking to make sense of complex problems; thus the waves and their approaches have not superseded each other but have successively contributed to expanding and enriching systems thinking, see also (Stowell & Welsh, 2012).

The third wave of systems science is based on the previous functionalist and interpretive orientations, which – quoted from *Systems Approaches to Management* by Jackson – can be characterised as follows:

*From the functionalist perspective the theories ... [the functionalist systems thinkers] produce and test, using the scientific method, clearly relate to some real-world outside of discourse. Moreover, because of the understanding they gain about the nature of reality, functionalists believe that they possess expertise that can be employed to ensure efficiency and efficacy through an enhanced capability to predict and control. As a result they see themselves contributing both to an increase in knowledge and to the progressive improvement of the human condition.*

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