12 | Systems thinking for environmental responsibility

FRITJOF CAPRA, WERNER ULRICH

The three readings in this chapter are extracts relating to systems thinking and its potential for framing what matters in environmental responsibility. What is systems thinking? How is it done? What’s more, why is it frequently invoked as a helpful way of addressing environmental issues? There are two key features of systems thinking that take constructive framing to a level where we might take responsibility for our framing devices. First is an appreciation of the interrelationships and interdependencies between all entities. Second is the awareness that systems are human conceptual constructs, and so systems thinking necessarily invites and celebrates contrasting perspectives on issues. Fritjof Capra, an American physicist, writer and environmental activist, is a passionate advocate of systems thinking in promoting (i) a more holistic/ecological worldview and (ii) the need for a change in values through taking on a new perspective – adopting what he calls a new paradigm. The two readings from Capra convey these basic ideas on systems thinking respectively.

But the two systems ideas prompt questions. First, how far can any framing device claim to be comprehensive or holistic – incorporating every interrelationship and interdependence? Second, while advocating a new paradigm based on a present understanding of life and society, what basis is there for claiming this as being the ‘right’ view, or universal and timeless? Paradigms, like systems, are ultimately frameworks, determined culturally by time and place. Systems thinking ought to be a way of making our inevitable framing devices explicit and open to critique and transformation.

The third reading in this chapter comes from a critical systems philosopher from Switzerland with experience in government planning. In extracts from a revised paper by Werner Ulrich, homage is paid to his mentor – another great systems philosopher, C. W. Churchman. Ulrich outlines a third important feature of systems thinking: an essential critical dimension to address our continual responsibility in making claims of being ‘holistic’ and/or practising...
Reading 12a: Fritjof Capra, The web of life

Chapter 1: Deep ecology – a new paradigm

[...] The more we study the major problems of our time, the more we come to realize that they cannot be understood in isolation. They are systemic problems, which means that they are interconnected and interdependent. For example, stabilizing world population will only be possible when poverty is reduced worldwide. The extinction of animal and plant species on a massive scale will continue as long as the Southern Hemisphere is burdened by massive debts. Scarcities of resources and environmental degradation combine with rapidly expanding populations to lead to the breakdown of local communities, and to the ethnic and tribal violence that has become the main characteristic of the post-Cold War era.

Ultimately, these problems must be seen as just different facets of one single crisis, which is largely a crisis of perception. It derives from the fact that most of us, and especially our large social institutions, subscribe to the concepts of an outdated worldview, a perception of reality inadequate for dealing with our overpopulated, globally interconnected world.

There are solutions to the major problems of our time; some of them even simple. But they require a radical shift in our perceptions, our thinking, our values. And, indeed, we are now at the beginning of such a fundamental change of worldview in science and society, a change of paradigms as radical as the Copernican Revolution. But this realization has not yet dawned on most of our political leaders. The recognition that a profound change of perception and thinking is needed if we are to survive has not yet reached most of our corporate leaders either, nor the administrators and professors of our large universities. [..]

The paradigm that is now receding has dominated our culture for several hundred years, during which it has shaped our modern Western society and has significantly influenced the rest of the world. This paradigm consists of a number of entrenched ideas and values, among them the view of the universe as a mechanical system composed of elementary building-blocks, the view of the human body as a machine,
the view of life in society as a competitive struggle for existence, the belief in unlimited material progress to be achieved through economic and technological growth, and – last, not least – the belief that a society in which the female is everywhere subsumed under the male is one that follows a basic law of nature. [...] 

Chapter 2: From the parts to the whole

[...] The emergence of systems thinking was a profound revolution in the history of Western scientific thought. The belief that in every complex system the behaviour of the whole can be understood entirely from the properties of its parts is central to the Cartesian paradigm. This was Descartes’ celebrated method of analytic thinking, which has been an essential characteristic of modern scientific thought. In the analytic, or reductionist, approach, the parts themselves cannot be analysed any further, except by reducing them to still smaller parts. Indeed, Western science has been progressing in that way, and at each step there has been a level of fundamental constituents that could not be analysed any further.

The great shock of twentieth-century science has been that systems cannot be understood by analysis. The properties of the parts are not intrinsic properties, but can be understood only within the context of the larger whole. Thus the relationship between the parts and the whole has been reversed. In the systems approach, the properties of the parts can be understood only from the organization of the whole. Accordingly, systems thinking does not concentrate on basic building-blocks but rather on basic principles of organization. Systems thinking is ‘contextual’, which is the opposite of analytical thinking. Analysis means taking something apart in order to understand it; systems thinking means putting it into the context of a larger whole. [...] 

Chapter 3: Systems theories

[...] It is perhaps worthwhile to summarize the key characteristics of systems thinking at this point. The first, and most general, criterion is the shift from the parts to the whole. Living systems are integrated wholes whose properties cannot be reduced to those of smaller parts. Their essential, or ‘systemic’, properties are properties of the whole, which none of the parts have. They arise from the ‘organizing relations’ of the parts, i.e. from a configuration of ordered relationships that is characteristic of that particular class of organisms, or systems. Systemic properties are destroyed when a system is dissected into isolated elements.

Another key criterion of systems thinking is the ability to shift one’s attention back and forth between systems levels. Throughout the living world, we find systems nesting within other systems, and by applying
the same concepts to different systems levels – e.g. the concept of stress to an organism, a city, or an economy – we can often gain important insights. On the other hand, we also have to recognize that, in general, different systems levels represent levels of differing complexity. At each level the observed phenomena exhibit properties that do not exist at lower levels. The systemic properties of a particular level are called ‘emergent’ properties, since they emerge at that particular level.

In the shift from mechanistic thinking to systems thinking, the relationship between the parts and the whole has been reversed. Cartesian science believed that in any complex system, the behaviour of the whole could be analysed in terms of the properties of its parts. Systems science shows that living systems cannot be understood by analysis. The properties of the parts are not intrinsic properties, but can be understood only within the context of the larger whole. Thus systems thinking is ‘contextual’ thinking; and since explaining things in terms of their context means explaining them in terms of their environment, we can also say that all systems thinking is environmental thinking.

Ultimately – as quantum physics showed so dramatically – there are no parts at all. What we call a part is merely a pattern in an inseparable web of relationships [...]