Systems Thinkers

Book

Introduction

This is a book about the people who shaped an idea – that to make sense of the complexity of the world, we need to look at it in terms of wholes and relationships rather than splitting it down into its parts and looking at each in isolation. In this book we call that idea systems thinking, although others have called it by other names (such as systems theory or systems sciences). Within this idea we include a number of areas which have independent origins but have tended over time to become interlinked while retaining their distinctiveness – general systems theory, cybernetics, complexity theory and system dynamics among others.

Our focus in the book is on people and how their personalities, lives and links with each other shaped these ideas. Other books have been written on the ideas as such, describing and classifying them in various ways, presenting a history of the ideas or arguing for the importance of one perspective or another. By focusing on the creators of the ideas, and by taking a broad look at a range of areas, we aim to shed a different light on systems thinking.

The people we write about are all fascinating, although in quite different ways. Some are widely known as the originators of one or another systems approach; some are very well known within the systems community but less so outside it; while others are well known figures who are less widely acknowledged as systems thinkers. Some are associated with a particular academic discipline, such as management, sociology or environmental studies, while others ranged widely across disciplines.

Each of the 30 authors in this book is discussed in a separate chapter, comprising two parts: first, a discussion of their life and work, and second, an extract from their writing. The extract, necessarily short (just a few pages) is intended to be a 'taster' to show the author's style of writing, their concerns and interests, and to encourage you to read more of their work. In many cases, we have edited it to bring out the author's main argument, while preserving their unique voice. It is not intended as a comprehensive guide to their key ideas – it is unlikely that by reading the extract in this book, you will be able to apply the author's ideas, but we hope it will give you a sense of why the ideas are so significant, and which of the authors you might want to find out more about.

M. Ramage and K. Shipp, *Systems Thinkers,*

Defining boundaries

One of the key concepts in many approaches to systems thinking is the *boundary*: how do you define what is within the system and what is outside of it? So it is perhaps no surprise that we have spent a considerable amount of time defining our own boundaries for this book.

Our goal in the book is to describe a set of thinkers whose work has been profoundly influential, and who collectively shaped the field of systems thinking. Our choice of thinkers is personal and partial, but it has been taken with great care and consideration. Inevitably you will find some exclusions that you may find puzzling or annoying, but we believe you will find that the thinkers we have included to be interesting and thought-provoking.

We are not seeking here to produce some sort of definitive canon of 'great systems thinkers'. Any such list would be flawed and necessarily incomplete, and would have to arise from a widespread effort rather than the work of a small group.

Two constraints affecting our choice were that we limited ourselves to 30 thinkers (for reasons of space) and that we made a deliberate choice to focus on individual authors rather than specific articles, schools of thought, or approaches. Our basic criteria for inclusion were that an author:

1. Explicitly identified themselves with one or more of the major traditions in systems thinking, by citing the works of previous authors within those traditions and/or working directly with earlier thinkers
2. Advanced systems concepts through their work and/or advanced another field through their application of systems concepts
3. Expressed their ideas in print

The first criterion is the most important. It required us to be explicit about our definition of 'systems traditions'. Initially, we took two major schools of thought as our starting point – general systems theory (GST) and cybernetics. Each has a single figure who can be identified as its founder (Ludwig von Bertalanffy and Norbert Wiener, respectively), as well as a number of others who made significant contributions to the field; each also has a clear historical point of creation as an explicit movement (the founding of the Society for General Systems Research in 1956 and the Macy Conferences on Cybernetics, 1946–1953).

There are few bodies of thought within systems thinking that cannot be explicitly traced back to one or both of these traditions. There are two exceptions to this, however. First, systems engineering, which essentially arose independently of general systems theory; however it later took on much of GST's language. Second, system dynamics, which despite its intellectual similarity to cybernetics (with its focus on feedback loops), does not pay any direct homage to that field in its official histories (e.g. Forrester 2007) – however it too has gradually taken on much of the concerns and language of both cybernetics and GST.

We see complexity theory as falling within our first criterion, with its strong links both to cybernetics and GST (as well as other sources); but operational research, with its somewhat different intellectual tradition, as falling outside of it.

The second criterion is intended to be relatively loose, simply stating our intention that the author should have developed the field of systems thinking, or applied systems thinking to another field in such an innovative way that that field has been significantly advanced. We take 'advance' to imply a significant contribution to the body of knowledge. With this criterion, we are explicitly excluding those who have used systems concepts in their work, often excellently and in very interesting ways, but have not fed back into the academic field. It is fair to say that the majority of those who have made significant contributions to systems thinking have simultaneously applied their contributions to other fields, although in a small number of cases the authors were sufficiently strongly self-identified with systems thinking (or one of its parts) that their main contribution has largely been within systems thinking.

The third criterion is intended to allow us only to include those who have explicitly described their contribution in a printed form. This does not necessarily include only academics – there are a number of practitioners on our list who participated in the various intellectual communities around systems thinking but wrote their ideas in a form others could use. It certainly does not include only academic-style writing: many of the authors we found most helpful are those who have written for a more popular audience. However, it does exclude those practitioners who have not published their work.

Inclusions and exclusions

Some issues in boundary setting arise from the choices discussed above and are worth exploring in further detail. First, our identified starting point of systems thinking as the explicit statements of GST and cybernetics by von Bertalanffy and Wiener, inevitably excludes those who preceded those authors. There are a number of important thinkers from the first half of the twentieth century who take an explicitly holistic line, in some cases explicitly discussing their work in terms of systems, such as Alexander Bogdanov and Jan Smuts; and philosophers who have influenced a number of major systems thinkers, such as John Dewey and Alfred North Whitehead. The same is true of thinkers from an earlier age, such as Aristotle (who first said that "the whole is greater than the sum of the parts") and Heraclitus. While all might be considered relevant, none of these thinkers are part of the tradition that is explicitly self-identified as systems thinking.

A trickier issue arises with Gestalt psychology with its emphasis on the relationship between wholes and parts; and indeed key people within the Gestalt movement, such as Wolfgang Köhler, were present at some of the Macy conferences. Nonetheless, given that Gestalt psychology arose prior to the founding of systems thinking, it is best thought of as a strongly-related precursor rather than explicitly part of the systems 'movement'. However, we have made a different choice in the

case of the Gestalt-influenced thinker Kurt Lewin who was the originator of a number of ideas of great relevance to systems thinking including action research, the popular use of the term 'feedback', the founding of the field of organisational development, and (via Kolb) the concept of learning as a cyclical process.

A gap in this book is the absence of practitioners who have not chosen to describe their methods, ideas or applications in written form. This is not to say that such practitioners do not advance the discipline, given that much work within systems thinking is grounded in the cyclical relationship between theory and practice, but our focus in this book is on systems *thinking*, as expressed in writing.

Two other under-represented groups in our list of thinkers are women and those from outside of the Anglo-American tradition. We regret the lack of many women in this book (only three of our 30 thinkers are female), but this sadly reflects the history of systems thinking as a discipline, which as with many scientific disciplines has been male-dominated. We made a decision not to hide this fact by skewing our criteria to include more female writers. There are many women currently doing highly important work in systems thinking, so it is to be hoped that this balance may be different in future work.

Most of our thinkers are either from North America or Europe, and indeed most of the mainland European thinkers have worked in North America (many as part of the large migration by academics from central Europe in the 1930s and 1940s due to Nazi persecution and post-war hardship). Our stance partly reflects our need (due to our own limitations) for authors to have written or been translated into English, but also reflects the intellectual tradition we have considered, which largely arose in the USA with a significant British connection. There are many interesting systemic thinkers from outside this group, and the systems thinking traditions we discuss would be richer for hearing their voices, but this is not something we have been able to do in this work.

It is striking to compare our choices to those of others who have attempted a similar task, such as the three collections of papers edited by Emery (1969), Beishon and Peters (1972) and Midgley (2003). From their statements and lists of authors, we can see a fairly similar set of choices to those we have made. The historical points at which they start their collections are similar to ours and to each other – Emery includes a paper by Köhler (on open and closed systems) and Midgley includes an extract from Bogdanov's work on 'tektology' (and argues strongly in his introduction that it has as much right to appear there as von Bertalanffy's work, despite Bogdanov's weaker influence on the later systems thinking tradition); but otherwise the earliest major authors in each are von Bertalanffy and Wiener. Midgley (2003, p. xix) makes the useful point that "I do not believe it is possible to present a 'neutral' account of either systems thinking or its history … interpretation is inevitable, and what appears central or peripheral depends on the purposes and assumptions of the person or people constructing the historical narrative".

An important distinction in our approach from the collections of papers mentioned above is that we have focused on people rather than ideas or papers. This has led to some significant choices. We have included those with especially interesting

lives, and in a few cases have not included influential authors whose lives we have found less interesting. This has led us to omit certain areas important to the history of systems thinking which were not developed by clearly identifiable individuals, such as systems engineering. In a number of cases authors produced some of their most well-known works in collaboration with another author but we have chosen to focus on one of the authors – thus we write about Humberto Maturana but not Francisco Varela, about Howard Odum but not Eugene Odum, and about Eric Trist but not Fred Emery. A different book would include all of these authors.

There are many other authors we could have included in this book as well as those already mentioned, and have not, sometimes for the reasons discussed above but also simply for lack of space. These include Bela Banathy, Fritjof Capra, Bob Flood, Adam Kahane, David Kolb, Joanna Macy, James G. Miller, John Mingers, Ian Mitroff, Talcott Parsons, Gordon Pask, Anatol Rapoport and Ralph Stacey.

Groupings

We have grouped the thirty authors into seven categories (see Fig. 0.1). To some extent these groups exist simply as a device to make the book more manageable to read and understand. However they also reflect what to us are coherent groupings of authors. Some of them might be considered explicit schools of thought (such as system dynamics), while others group authors with connected ideas (such as learning systems). The choices we have made are intended to show clear connections between

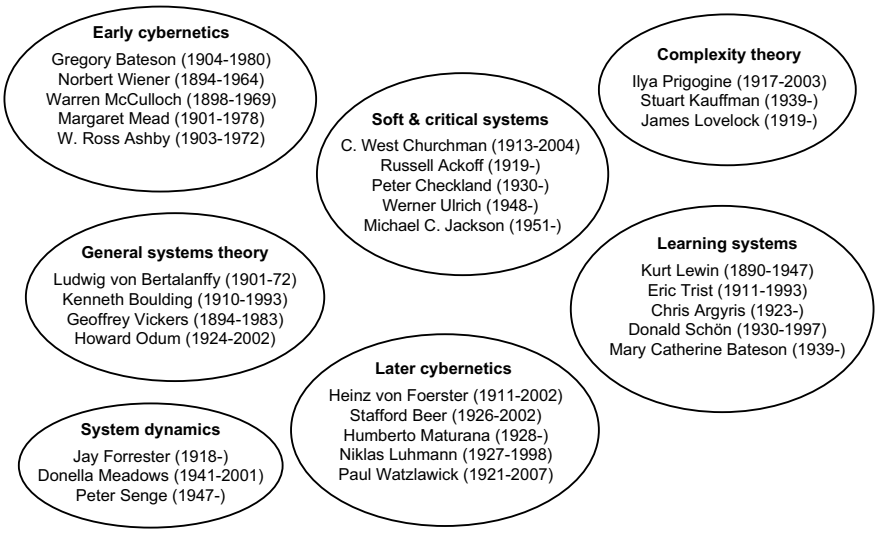

Fig. 0.1 The authors and groupings in this book

authors, and a few are deliberately unusual to provoke thought. The groupings were created from the starting point of our chosen authors, rather than schools of thought, and thus they do not represent a comprehensive guide to a particular school of thought (for example, there are many more thinkers who have contributed to general systems theory than the four we cover). The seven groupings are: early cybernetics, general systems theory, system dynamics, soft & critical systems, later cybernetics, complexity theory, and learning systems, and we will briefly introduce each in turn.

Early cybernetics is a highly influential approach based on the concepts of feedback and information, and the parallels between human and machine behaviour, applying these ideas to a wide range of disciplines. This grouping contains some of the pioneers who shaped the field of cybernetics (Gregory Bateson, Norbert Wiener, Warren McCulloch, Margaret Mead and Ross Ashby). Most of them were core participants in the Macy Conferences on Cybernetics (Ashby was not at most of these conferences, but his publication of the first textbook in the field had a deep influence). While Norbert Wiener coined the term 'cybernetics', and in many ways founded the field, we have chosen to write first about Gregory Bateson, as he represents the first flowering of cybernetics at its richest and broadest.

General systems theory is concerned with issues of open systems, emergence, boundary and hierarchy. The general systems movement championed interdisciplinarity long before it was widespread, with its goal of 'science in the service of humanity'. Our grouping contains four thinkers, two of whom can rightly be said to be the founders of general systems (Ludwig von Bertalanffy and Kenneth Boulding) and two slightly later thinkers who explicitly identified their work as being within general systems (Geoffrey Vickers and Howard Odum).

System dynamics focuses on computer modelling of systems with a high degree of feedback and circularity. It has its origins largely in the work of one man, Jay Forrester, and our grouping includes Forrester along with two of his students who have had enormous influence, Donella Meadows and Peter Senge. System dynamics is hugely important and interesting, but has been historically slightly isolated from other systems approaches; this section of the book shows some of the similarities and differences between system dynamics and other approaches.

Soft and critical systems is a highly applied approach that arises from the use of techniques from systems engineering and operational research to human systems, especially in management and public policy, and a sense of dissatisfaction with the capacity of those techniques to take account of the reality of human systems. These experiences led the thinkers in this section (C. West Churchman, Russell Ackoff, Peter Checkland, Werner Ulrich and Mike Jackson) to create a new set of methodologies that explicitly considered issues such as multiple perspectives, power and intractable problems with no simple solutions.

Later cybernetics is a grouping of several different authors who all have their roots in the work discussed in the 'early cybernetics' grouping, and thus form a second generation of cyberneticians, but who have each taken that work in somewhat different directions. The thinkers in this group are Heinz von Foerster,

Stafford Beer, Humberto Maturana, Niklas Luhmann and Paul Watzlawick. There is a considerable overlap with the 'second-order cybernetics' approach described by Heinz von Foerster – which takes into account the observer as well as the observed – but not all of the thinkers in this group sit neatly into that approach. All the thinkers in the group fall within the category we have elsewhere described as 'soft cybernetics', but so do some of the early cybernetics group, so we have chosen to describe this group in purely historical terms.

Complexity theory is an approach to the modelling of highly complicated and interconnected systems using techniques derived from the physical sciences, with a focus on self-organisation, emergence and nonlinearity. It takes inspiration both from general systems theory and cybernetics. Our grouping contains three scientists who have done crucial work in developing this approach to complex systems: Ilya Prigogine, Stuart Kauffman and James Lovelock. This grouping is slightly wider than complexity *science*, an approach initially developed at the Santa Fé Institute (where Kauffman is based); Prigogine and Lovelock take a somewhat similar approach in terms of computer modelling of complex systems and a focus on self-organisation, but the three thinkers developed their work largely independently of each other.

Learning systems is a broad group of thinkers with a common focus on the way people learn and the systems within which they learn. It begins with the important work of Kurt Lewin, who died young in the very early days of systems thinking but had a huge influence upon its developing work. The grouping continues with three thinkers who are strongly part of Lewin's tradition (as well as being influenced by other systems work) – Eric Trist, Chris Argyris and Donald Schön. The group ends with Mary Catherine Bateson, who presents one of the most refined and complete examples of a unified systems approach to learning and to life.

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