On boundaries and disciplines: constructing a set of key systems thinkers

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Abstract

Over the past four years, the Open University has been working on an internal project of systems scholarship, called 'Systems Thinkers'. We have examined the life and work of fifty key thinkers, held discussions on their significance, and are in the process of writing a book and a postgraduate course about these thinkers. This work has raised many interesting questions about the boundaries of systems as an intellectual and practical discipline. In this paper, we will discuss some of these questions, asking what it means to be a discipline and how to establish its boundaries.

Introduction

For the last four years, we have led an internal project within the Systems Department of the Open University (OU), on the key thinkers in the development of systems thinking and practice. The Systems Department has a history of some 35 years in systems teaching and research; more than 30,000 students have taken its distance-learning courses. The department has developed a form of systems teaching that is somewhat different from that found elsewhere, with a strong focus on diagrams (Lane and Morris, 2001). While the courses, especially at the undergraduate level, have a general focus on human systems (at the postgraduate level there is greater specialisation, in information systems and environmental decision-making) the department is based not in a business school but in the Faculty of Technology.

The variety of courses within the OU drawing on systems thinking – both within the Systems Department and in a number of other departments which have some of their roots in the Systems Department – has led to a number of different interpretations of Systems. In particular, some of the key concepts and techniques are taught subtly differently across different courses, which could lead to potential confusion for students. (The Open University operates a largely modular structure to its teaching, so that students have a considerable amount of choice, and students frequently take courses from a number of different departments within their programme of study.) Therefore, in 1998 the department launched a 'metaproject' to unify the way systems concepts and techniques were taught across its courses (Ramage, 2001). The output from this metaproject included three study packs – on key systems concepts, diagramming techniques, and modelling – which are used in a number of different courses (Lane, 2000a,b; Morris and Chapman, 2000). Although these packs have not been as widely read as earlier OU summaries of systems ideas (e.g. Beishon and Peters, 1972; Carter et al., 1984), they form the OU's current attempt to define its understanding of core systems concepts and techniques. A parallel text that was originally envisaged to these three study packs was a guide to the key systems thinkers throughout history, with extracts from their work, but for a variety of reasons this was never completed.

It was this background that led us, early in 2002, to begin work on key thinkers in Systems. We decided that our approach would be two-fold: we would write a book on some of the key thinkers, while running a study group for members of the Systems Department on the thinkers. The book is still in preparation – it will give a biographical summary and extract from the work of about 30 thinkers. The study group, however, is complete: it ran fortnightly from the beginning of 2003 to the middle of 2005. We considered the work of just over 50 thinkers, selecting a reading that would typify their work and issuing it to colleagues in advance of the discussion. Attendances at study group sessions varied, but we managed to retain colleagues' interest for this prolonged period, in itself an achievement, and numbers were still healthy by the end of the group's operations. We started by running an online study group in parallel with the departmental group, and gained a good amount of international interest and some participation, but this group did not really take off and became dormant after about a year.

The process details of the study group, and the reasons behind these, go beyond the scope of this paper, but it is worth noting that the two current authors took different roles in both the selection of readings and in the study group. Ramage took a leading role in choosing the readings, while Shipp tended to be the first person to read the texts and comment on their suitability for the study group. Shipp also was the main designer of the process, and ran the online study group while that was operating, although we alternated chairing of the departmental study group sessions.

Clearly the members of the study group and the potential readers of the book have different needs, and that affected the choice of some of the readings presented to the study group. However, our perception was that the same set of authors would be relevant in either case – but that we would be able to have a larger set for the study group, given the space limitations of the book and the need to try out various authors for potential inclusion in the book.

It was within this context that we selected authors for our set of key systems thinkers, as discussed below. The rest of the paper will proceed by first discussing our initial criteria for inclusion in the list of authors; followed by a discussion of some specific issues around inclusion and exclusion of various groups, with a comparison with the choices of others who have conducted related pieces of work; and finally some consideration of the lessons for Systems as an intellectual discipline from this work. An appendix gives brief details of the work of our selected thinkers.

Defining the boundary

Before describing our criteria for the boundary, one thing must be clear. We were not seeking to produce any sort of canonical list of 'great systems thinkers'. Any such list would be flawed and necessarily incomplete. It is also hardly the place of a single group of academics in one department to produce such a list – it would have to arise from a widespread effort, somewhat in the way that the collection edited by Midgley (2003), which we shall discuss later, has done. Of course, something like a quasi-canon can be identified in an emergent way, by examining various histories and textbooks, collections of Systems articles, online lists of major authors, etc., and producing a synthesis of the authors found most frequently in such places. But even such a listing would be partial and subject to much questioning.

Our goal was rather to produce a set of thinkers which would be useful and interesting to our target audiences. In the first place, this meant our departmental colleagues in the study group. Next, it meant our students on OU courses in Systems (both current and future courses), for whom the book will provide a richer background in the field's thinkers than the already-discussed pragmatic emphasis of

our courses. Next, we were very aware of the wide range of fields which have derived some of their major concepts from one or more forms of systems thinking but which do not encompass further developments in other forms of systems thinking, or which are not bringing their own insights into other areas of Systems. An important audience for the book, therefore, were readers who were familiar with one strand of systems thinking but not of other developments which might also be useful to their work.

Two further issues clearly affected the nature of our choice. First, there was a space limitation: we were advised by potential publishers that to include more than 30 authors would make the book unmanageably large. The study group, meeting fortnightly, was constrained only by our colleagues' time and interest (and our own as organisers), and in the end we discussed 52 authors. The second issue concerns our clear choice to focus on individual *authors* rather than specific articles, schools of thought, or approaches, and to consider the whole range of the author's work rather than a single paper.

Our basic criteria for inclusion, then, were that an author:

1. must have explicitly identified themselves with the Systems traditions, by citing the works of previous authors within those traditions and/or working directly with earlier thinkers;
2. must have advanced Systems concepts through their work and/or advanced another field through their application of Systems concepts;
3. must have expressed their ideas in print.

The first criterion is the most important. It required us to be explicit about our definition of 'Systems traditions'. We took two major schools of thought as our starting point – general systems theory (GST) and cybernetics. Each has a clear single figure who can be identified as its founder (Ludwig von Bertalanffy and Norbert Wiener, respectively), as well as many other significant figures in their early days; 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, 1946-53). There are few bodies of thought within systems thinking that cannot be explicitly traced back to one or the other of these traditions. There are two clear exceptions. 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 clear 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, 1995) – 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 this 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 advanced the field of Systems, or applied Systems 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 field. How this criterion should be applied is very difficult, and of course its use is highly subjective. It is fair to say that the majority of those who have made significant contributions to Systems have simultaneously applied their contributions to other fields, although in a small number of

cases the authors were sufficiently strongly self-identified with Systems (or one of its parts) that their main contribution has largely been within Systems.

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 only include academics – there are a number of practitioners on our list who participated in the Systems intellectual community but wrote their ideas in a form others could use. It certainly does not only include academic-style writing: many of the authors we found most helpful in the study group are those who have written for a more popular audience. However, it does exclude those practitioners who have not written up their work outside of the form of reports. It is worth remarking that although our criterion talks about expressing ideas in print, in practice that also includes translation into English – neither of us, nor the study group, can fluently read other languages. Clearly this leads to a certain Anglo-American bias, which we have discussed further below.

These criteria led us to the following list of 52 key thinkers who we discussed in the study group (Table 1), whose work is briefly summarised in the Appendix to this paper. We will address some of the issues of inclusion and exclusion in the following section, but a few remarks are in order about the authors in this table. First, they are all single authors. This is in several cases unfair – a number of the authors listed worked with a co-author on one or more of their major works (e.g. Humberto Maturana with Francisco Varela) but we have chosen only the author we perceived to be of wider importance. Second, in two cases we chose excellent commentaries that described something else – in one case the Macy Conferences (Heims, 1993), in the other the wide field of family systems therapy which we chose not to consider in greater depth (Jones, 1993). Third, a few of the authors were selected because they were important or enjoyable to members of the study group, rather than because we necessarily considered them as key thinkers – this includes some recent authors, still working, who may become regarded as key thinkers in the future.

Ackoff, Russell	Argyris, Chris	Ashby, Ross	Bateson, Gregory
Bateson, Mary Catherine	Bawden, Richard	Beer, Stafford	Boulding, Kenneth
Capra, Fritjof	Checkland, Peter	Churchman, C. West	Eden, Colin
Emery, Fred	Flood, Bob	Forrester, Jay	Gell-Mann, Murray
Heims, Steven	Holling, C.S.	Jackson, Michael	Jenkins, Gwilym
Jones, Elsa	Kahane, Adam	Kauffman, Stuart	Kolb, David
Kumar, Satish	Laing, R.D.	Lewin, Kurt	Lovelock, James
Luhmann, Niklaus	Macy, Joanna	Maturana, Humberto	McCulloch, Warren
Mead, Margaret	Meadows, Donella	Miller, Eric	Miller, James G.
Mitroff, Ian	Mulgan, Geoff	Odum, Howard	Parsons, Talcott
Pask, Gordon	Rapoport, Anatol	Schön, Donald	Senge, Peter
Spedding, Colin	Stacey, Ralph	Trist, Eric	Ulrich, Werner
Vickers, Geoffrey	Von Bertalanffy, Ludwig	Von Foerster, Heinz	Wiener, Norbert

Table 1: List of 52 key systems thinkers discussed in study group

As we have remarked above, we have been clear from the start that the book would have a smaller set of authors than the study group. The authors that we have chosen not to include in the book are for a variety of reasons, many discussed earlier. They centre around our experience that when we read the authors in the study group, we felt that they did not quite meet the criteria previously stated, or their contribution did not feel as significant as those we have included, or in a few cases they were too difficult to read. We have also added in one author (Ilya Prigogine) who is a major thinker but was passed over for the study group due to difficulty in finding a suitable reading to discuss; and added an author (Paul Watzlawick) as a representative of family systems therapy. While some of the exclusions were clear from our own feelings or those of the study group, many were very difficult.

Two cases of major thinkers best known outside Systems, and who might draw readers into the book in the way we have hoped, are interesting to contrast. We chose to include Margaret Mead because, as well as being a highly interesting and influential author, she had a strong personal and institutional allegiance to the Systems movement (she was a participant in the Macy conferences and a founder of the American Society for Cybernetics). In her own writing, we struggled to find many explicit uses of systems concepts and techniques, although there is a clear sense of holism through much of her work. By contrast, we chose to exclude R.D. Laing, who can be seen to be influenced to a strong extent by certain systems authors (notably Gregory Bateson), and is also very interesting and influential, but was scarcely part of the Systems movement, and did not describe Systems as being especially a stronger influence on his work than a number of other perspectives (such as existentialism).

Ackoff, Russell	Argyris, Chris	Ashby, Ross
Bateson, Gregory	Bateson, Mary Catherine	Beer, Stafford
Boulding, Kenneth	Checkland, Peter	Churchman, C. West
Forrester, Jay	Jackson, Michael	Jenkins, Gwilym
Kauffman, Stuart	Lovelock, James	Luhmann, Niklaus
Maturana, Humberto	McCulloch, Warren	Mead, Margaret
Meadows, Donella	Odum, Howard	Prigogine, Ilya
Schön, Donald	Senge, Peter	Trist, Eric
Ulrich, Werner	Vickers, Geoffrey	Von Bertalanffy, Ludwig
Von Foerster, Heinz	Watzlawick, Paul	Wiener, Norbert

Table 2: List of 30 key systems thinkers for likely inclusion in book

At this point, we should offer our apologies. Most readers of this paper will be able to name a number of important thinkers who do not appear in Table 1, or who we excluded from Table 2, and they may feel annoyed about this absence. We can, of course, name many thinkers who could have been added to the list. While we have described our major criteria, much of our choice was ultimately subjective, and down to our own interests and knowledge. We certainly mean no offence to anyone whose favourite thinkers have been excluded, and again repeat that neither list is intended to be any sort of canon. In the following section we discuss specific reasons for exclusion in more detail.

Inclusions and exclusions

Some issues in boundary setting arise clearly from the choices we have discussed above, but are worth discussing in further detail. First, our identified starting point of Systems 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 20th century who take a clearly holistic line, in some cases explicitly discussing their work in terms of systems, such as Alexander Bogdanov, Jan Smuts and Kurt Lewin; and philosophers with a clear influence on 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 "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.

A trickier issue, but much the same conclusion, 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, it is clear that Gestalt psychology arose prior to the founding of Systems, and thus is best thought of as a strongly-related precursor rather than explicitly part of the Systems movement. The same is true of the work of the Gestalt-influenced thinker Kurt Lewin, present at the first two Macy conferences and who can be seen as the originator of a number of issues of great relevance to systems thinking including action research, the popular use of the term 'feedback' (as described by Mead, 1964, p.272), the founding of the field of organisational development, and (via Kolb) the concept of learning as a cyclical process. Again, however, Lewin's work occurs just before the explicit founding of Systems as a discipline (he died in 1947) so despite his great relevance we have reluctantly excluded him.

A further group of excluded but parallel thinkers can be seen even in the time since the explicit founding of Systems as a discipline. There are a number of thinkers who can be clearly seen to have a holistic perspective, and who write in terms related to those of Systems, but who neither self-identify as part of the Systems movement nor cite major Systems thinkers within their work. In this respect we are thinking of authors such as Arthur Koestler, Jean Piaget and E.F. Schumacher. Many have had an influence on Systems work, such as the use by Checkland (1988) of Koestler's term 'holon'. Indeed, Koestler chaired a conference that essentially covered themes of GST in the life sciences, at which both Ludwig von Bertalanffy and Jean Piaget were present (Koestler and Smythies, 1969). We have already discussed R.D. Laing as being in the same category. Our justification for excluding these thinkers again rests upon their lack of explicit identification with Systems, and it is fair to say that none of Koestler, Piaget, Schumacher or Laing are generally described by others as systems thinkers. In many ways, though, the discipline is poorer for their exclusion, as they have much that is interesting to teach us, in a way that is highly compatible with the systems thinkers we have listed but which goes beyond them.

We have already discussed the fact that our criteria exclude certain kinds of practitioners – those who have not chosen to describe their methods, ideas or applications in written form in such a way that the discipline is advanced. This is not to say that such practitioners do not advance the discipline, and excluding them also creates a gap – much work within Systems is grounded in the cyclical relationship between theory and practice.

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 our lists (both Tables 1 and 2 contain only 10% women), but this clearly reflects the history of Systems as a discipline, which as

with many scientific disciplines has been male-dominated. We made a decision not to hide this fact by weakening our criteria to include more female writers. There are many women currently doing highly interesting and important work in Systems, so it is to be hoped that this balance may be different in future work.

It is also clear that most of our thinkers are either from North America or Europe (largely the UK), and indeed that most of the mainland European thinkers have worked in North America (given the history of intellectual migration from central Europe in the 1930s and 1940s, these form an important group of early systems thinkers). This partly reflects our need 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 discipline of Systems would be richer for hearing their voices, but this is not something we have been able to do in this work.

It is interesting 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 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".

Issues of discipline

We have discussed in this paper our reasons for selecting a particular set of systems thinkers for inclusion in our study group and book. Our discussion has largely been centred around questions of boundary – how widely we should draw a boundary around the field of Systems, and which thinkers are thus included as part of the system and which exist within the environment of the field.

Our discussion also raises issues of what we mean to consider Systems as an intellectual discipline. Given that the boundary, both in terms of its definition and in terms of what should be included or excluded by it, is clearly contested, does it make sense to refer to Systems as a discipline at all? Similar questions have been extensively discussed within the field of information systems, which has considerable problems with its self-identity as a unified discipline. They are summarised by Jones (1997) who distinguishes between two meanings of 'discipline': "the normative definition of discipline [which] emphasises the existence of established rules … [sometimes] also referred to as a paradigm" (p.98) and "the descriptive definition of discipline … the question here is not whether there is necessarily a common perspective, but what is included under the banner of IS, however diverse the practices may be in terms of their philosophical stance" (p.99). Our choice in this work has been closer to the second definition than the first – to include anyone who has self-identified as a systems thinker, notwithstanding the space limitations. In choosing to exclude those who have not self-identified in this way, we have not tried to construct a normative definition, but rather to express the collection self-understanding of the discipline.

However, one curious feature of the discipline that we have observed is its very broad range of competing sub-disciplines, with considerable disagreement in both theory and practice between them. In many ways it might be more honest to talk of 'Systems disciplines' rather than the single 'Systems discipline'. Wenger et al. (2002) argue that the three essential elements of a community of practice are a domain of knowledge, a community of people who care about that domain, and a shared practice that the community are developing to be effective in the domain; and that to retain the identity of the community of practice, only two out of these three can change at once. Within the Systems discipline, it is clear that the domain changes rapidly – some of us have interests in management, others in information systems, others in environmental change, and so on; that there is a fairly well-defined community (through formal organisations such as UKSS and the existence of a small number of university departments of Systems). It is in the area of practice that considerable variety can be seen. A community of practice is not necessarily the same as an academic discipline, but the existence of so many different forms of systems practice does explain some of the fragmentation of the discipline.

Nonetheless, one can say that there is an effective discipline of Systems, that it has many founders and other key thinkers who are worthy of further study, and that by examining the question as to which of those key thinkers should be studied, interesting questions are raised.

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Appendix: brief descriptions of the work of the key thinkers

This appendix briefly describes the work of the thinkers included in Table 1 (from our perspective). An asterisk before the thinker's name below indicates inclusion in the book, as listed in Table 2.

*Ackoff, Russell: interactive planning method, messy systems, early interpretivist thinker

*Argyris, Chris: single/double loop learning, organisational learning, espoused theory / theory in use

*Ashby, Ross: early work on self-organising systems, law of requisite variety, homeostat

*Bateson, Gregory: anthropologist/biologist, double-bind theory, ecology of mind

*Bateson, Mary Catherine: life as improvisation, learning as adaptation

Bawden, Richard: critical learning systems, application of systems to agricultural education

*Beer, Stafford: management cybernetics, viable systems model, work in Chile with Allende

*Boulding, Kenneth: co-founder of general systems theory, economist, levels of systems & hierarchy

Capra, Fritjof: physicist, populariser and integrator of cybernetics & complexity theories

*Checkland, Peter: inventor of soft systems methodology, identified hard/soft divide

*Churchman, C. West: extended Systems approaches to include power/politics, boundary judgements

Eden, Colin: cognitive mapping, strategic options development & analysis method

Emery, Fred: socio-technical and socio-ecological approaches, participative work on futures

Flood, Bob: development of critical systems thinking, total systems intervention method

*Forrester, Jay: founder of system dynamics, applied at organisational, urban and global levels

Gell-Mann, Murray: physicist (Nobel Prize), founder of Santa Fé Institute in complexity theory

Heims, Steven: historian of science, studied Macy Conferences on cybernetics

Holling, C.S.: ecologist, studied the resilience and stability of ecosystems

*Jackson, Michael: development & analysis of critical systems thinking and its place within Systems
*Jenkins, Gwilym: codified field of systems engineering, first professor in that field in the UK
Jones, Elsa: writer & practitioner in family systems therapy
Kahane, Adam: facilitated multi-racial scenario planning work for post-apartheid South Africa
*Kauffman, Stuart: complexity theorist, edge of chaos, fitness landscapes
Kolb, David: experiential learning, four-stage learning cycle, learning styles
Kumar, Satish: editor of Resurgence magazine, pioneer of peace, simple living & ecology
Laing, R.D.: radical psychiatrist, phenomenology & existentialism
Lewin, Kurt: Gestalt psychologist, founder of action research & organisational development
*Lovelock, James: founder of Gaia theory of Earth as a self-regulating system
*Luhmann, Niklaus: theorist of social systems, especially using autopoiesis and social networks
Macy, Joanna: deep ecology, 'the work that connects', facilitating transformative group experiences
*Maturana, Humberto: biology of cognition, autopoiesis
*McCulloch, Warren: neurophysiologist, chaired Macy conferences on cybernetics, neural networks
*Mead, Margaret: cultural anthropologist, involved in founding of cybernetics
*Meadows, Donella: applied system dynamics to global sustainability in 'limits to growth' project
Miller, Eric: experiential work on group relations at Tavistock Institute, psychoanalytic stance
Miller, James G.: highly systematic taxonomy of living systems, defined field of behavioural science
Mitroff, Ian: stakeholder identification and participation, multiple perspectives, crisis management
Mulgan, Geoff: theory of 'connexity', political theorist & adviser, founder of Demos think-tank
*Odum, Howard: pioneer of systems ecology, energy flow & equilibrium in ecosystems
Parsons, Talcott: sociologist, structural-functionalist approach to social systems
Pask, Gordon: cybernetician, conversation theory, focus on learning & education, flamboyant
*Prigogine, Ilya: chemist (Nobel Prize), studied systems far from equilibrium, dissipative structures
Rapoport, Anatol: mathematical biologist, conflict resolution & non-zero-sum games
*Schön, Donald: organisational learning, concept of the reflective practitioner
*Senge, Peter: populariser and developer of system dynamics applied to organisational learning
Spedding, Colin: pioneer of systems approach to agricultural development
Stacey, Ralph: complexity theory applied to organisational dynamics, complex responsive processes
*Trist, Eric: founder of the socio-technical systems approach at the Tavistock Institute
*Ulrich, Werner: critical systems heuristics, social planning
*Vickers, Geoffrey: lawyer & public sector manager, appreciative systems, phenomenological stance
*Von Bertalanffy, Ludwig: biologist, founder of general system theory, open systems
*Von Foerster, Heinz: defined and shaped second-order cybernetics, led Biological Computing Lab
*Watzlawick, Paul: family systems therapy, human (meta-)communication, paradoxes
*Wiener, Norbert: mathematician, studied feedback systems, coined the term cybernetics