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Critical systems thinking and practice: what has been done and what needs doing

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Abstract

Critical systems thinking and practice began in the 1980s and is now an established part of the systems thinking tradition. Nearly 40 years later, it is possible to look back at what it has achieved in its lifetime and at what still needs doing if it is to fulfil its potential. To reach its conclusions, this review considers both the theory and principles underpinning the approach and the translation of those into practice.

Keywords: systems thinking, critical systems thinking, critical systems practice

Introduction

The first section of the paper looks at the origins and initial development of critical systems thinking (CST). This requires a brief account of the state of systems thinking in the early 1980s. From that, it is possible to discern some reasons for the emergence of the approach. Its further development is then traced until 1991. By that time, it had become formalized around a set of four commitments, to which it has largely remained true, and work was underway on how the ideas could be translated into critical systems practice. A second section considers contemporary CST. This provides an account of how it views its commitments today. What has been achieved forms part of the narrative. A section at the end discusses some further theoretical work that needs doing if CST is to progress. Section three outlines critical systems practice, a multimethodology for putting CST into action, and provides an example of its use. The section ends with thoughts on what has been done and what more needs to be done to ensure that critical systems practice is successful and widely used by practitioners. A conclusion considers the current position of critical systems thinking and practice in the systems movement and what it has to offer to the management sciences generally.

1 The Origins and Early Development of Critical Systems Thinking (CST)

Systems thinking, as an identifiable transdiscipline, established itself in the 1940s and 1950s based on the pioneering work of Ludwig von Bertalanffy in general system theory and Norbert Wiener in cybernetics. Its *raison d'être* was understanding systems of 'organized complexity' (Weaver, 1948) that could not be grasped using the traditional methods of the physical sciences.

Organized complexity is the norm in the real-world of policymakers, decisionmakers, and managers, and the systems approach seemed to offer the help they needed. Methodologies, such as systems analysis and systems engineering, were developed which sought to translate its findings into practice[1]. These proved to be helpful in many situations. The 1950s and 1960s saw significant success using them in the fields of aerospace, defence, and space exploration. Over time, however, it became clear that there are lots of other situations in which they simply cannot cope (Checkland, 1978). The failed attempts to apply systems analysis to problems of information management, crime, welfare, transportation, and waste management, in California in the 1960s, provided a salutary lesson (Hoos, 1974).

During the 1970s, the early methodologies were subject to sustained critique and their weaknesses were revealed. New systems methodologies were developed designed to overcome the weaknesses and extend the scope of the systems approach (see Jackson, 2000, 2019). Forrester's system dynamics introduced feedback thinking and computer simulation into management science. Beer's viable system model was offered as a response to 'exceedingly complex probabilistic' systems. Churchman and Ackoff, in the US, and Checkland, in the UK, developed soft systems approaches more attuned to the multiple perspectives and politics found in social systems. The originators trumpeted their methodologies and models as the way forward for systems thinking and pointed to examples of successful application. But the 1960s and 1970s was a period of political turmoil and radical thinking. Parsons' sociological systems theory was labelled ultra-conservative and, because it was the best-known systems approach, this led to systems thinking generally coming under suspicion. Management science had its own radicals who labelled Ackoff's soft systems thinking as 'reformist' and called for a 'workers science' (e.g. Rosenhead, 1976). The plethora of different approaches in management science led some to ask whether there was a 'Kuhnian crisis' in the discipline (Dando & Bennett, 1981). It was argued that the dominant paradigm, as exemplified by systems analysis and systems engineering, had broken down but no alternative had as yet succeeded in mustering sufficient support to replace it.

It was into this world that CST^2 was born. The primary inspiration, outside systems thinking, for taking the field in a critical direction, was the work of the Frankfurt School, especially that of Habermas (Horkheimer, 1937; Habermas, 1970, 1974, 1984). The Frankfurt School of social theorists were committed, as neatly summarized by Finlayson (2005), to interdisciplinarity, a dialectical understanding of the relationship between theory and society, respect for traditional methods of enquiry but only in the right context, and a critique of society with a view to transforming it for the better. All these characteristics became embedded in CST.

It began in the 1980s with three strands that became intertwined. First, Mingers (1980, 1984) and Jackson (1982a, 1985), building on Checkland's (1978) critique of the limitations imposed on 'hard systems thinking' (systems analysis, systems engineering) by its functionalism, argued that the practical effectiveness of soft systems thinking was similarly constrained by its theoretical assumptions; in this case drawn from the interpretive sociological paradigm. They called for an

extensive critical appraisal, based upon Habermas' work, of the social theory underpinning all the various applied systems approaches.

The second strand advocated complementarism and pluralism in systems practice. Looking at the variety of systems methodologies, Jackson and Keys (1984) decided to explore the relationships between them in order to better understand their respective strengths and weaknesses and assist practitioners choose an appropriate methodology for an intervention. They created the 'System of Systems Methodologies' (SOSM) which classified methodologies according to their ability to deal with the difficulties posed by system complexity and different perspectives among stakeholders. This demonstrated that alternative systems approaches had different strengths and could be seen as complementary rather than in competition. A little later (Jackson, 1987), I examined four developmental strategies for systems thinking – isolationism, imperialism, pragmatism, and pluralism. Based upon Habermas' (1970) theory of different 'human interests' (technical, practical, and emancipatory), I argued that pluralism offered the best opportunities for successful future development. Pluralism would respect the strengths of the different versions of systems thinking, encourage their theoretical development, and suggest how they could be appropriately fitted to the variety of problem situations.

A third strand resulted from the desire to extend systems thinking to respond to the radical change agenda. At the time of constructing the SOSM, Jackson and Keys acknowledged that relationships between stakeholders could be 'coercive' but were not aware of any systems methodologies that responded to this possibility. This led to an explicit demand for a 'critical approach' that would take account of coercive problem situations (Jackson 1982b, 1985) and support those disadvantaged by systems designs. This demand, for 'emancipatory systems thinking', seemed to be met when Ulrich's (1983) 'critical systems heuristics' was discovered. Although this was an independently developed strand of systems thinking, drawing on the work of Kant, Churchman, and Habermas, it seemed to meet the requirements of coercive contexts. It was arguably capable of providing guidelines for action on behalf of disadvantaged stakeholders.

CST came to prominence in 1991 with the publication of three books – *Critical Systems Thinking: Directed Readings* (Flood & Jackson, eds.), *Systems Methodology for the Management Sciences* (Jackson), and *Creative Problem Solving: Total Systems Intervention* (Flood & Jackson). This upsurge in activity was due, in no small part, to Bob Flood's impact after he joined Paul Keys and me at Hull. The first was a collection of papers, accompanied by a commentary, which

traced the origins and outlined the major themes of the approach. It highlighted the contributions of authors such as Flood, Fuenmayor, Jackson, Mingers, Oliga and Ulrich. The second responded to the early call for a critique of all the major systems methodologies from the perspective of social theory, made the case for critical systems thinking, and sought to demonstrate that it could take the lead in enriching theory and practice in the management sciences. The third book was the first attempt to show how CST could be used in practice. Flood and Jackson offered the ambitious 'Total Systems Intervention' (TSI) metamethodology as an attempt to pragmatize, but not compromise, the theory underpinning critical systems thinking. TSI claimed to be able to organize and employ, in an appropriate manner, all the different systems methodologies, according to their strengths and weaknesses, in the service of a general project of improving complex organizational and societal systems. The work of Habermas (1970, 1974, 1984) again provided the theoretical backdrop.

Since 1991, critical systems thinking has been taken in somewhat different directions by Flood (1995, 1999; Flood & Room, eds, 1996), Jackson (2000, 2003, 2019), Mingers (2006, 2014), and Midgley (2000). Nevertheless, it retains a strong identity and continues to explore some common themes.

2 Contemporary Critical Systems Thinking[3]

Critical systems thinking (CST) has shown a consistent commitment to *systems thinking*, *critical awareness*, *pluralism*, and *improvemen*t. It is for this reason that we can discuss contemporary CST, and its achievements, in terms of these four themes.

Systems thinking and complexity theory agree that the modern world exhibits VUCA characteristics – volatility, uncertainty, complexity, and ambiguity. Mingers (2006, p. 201), drawing upon Habermas, calls it 'multi-dimensional'. It consists of a 'complex interaction of substantively different elements'; some physical and material, some socially constituted such as cultures and power structures, and others personal such as beliefs, values, fears, and emotions. In Snowden and Boone's (2007) terms, we face 'complex domains' of unknown unknowns and 'chaotic domains' of unknowables. Things are in constant flux, nothing is predictable, and 'black swan' events occur with increasing frequency. Kay and King (2020) represent it as a world of 'radical uncertainty' in which we simply do not know how to act.

There are, in systems thinking and complexity theory, two different reactions to this diagnosis, which we can understand using Morin's (2006) distinction between 'restricted complexity' and 'general complexity'. Those who treat it as a case of restricted complexity continue to refine particular computational modelling techniques through which, they believe, they can explain complex systems. This is true of those in system dynamics who build computer simulation models of real-world system behaviour and seek to validate them scientifically. It is true of those who conduct 'agent-based modelling' of complex adaptive systems, seeking to explain the behaviour of the whole in terms of the rules of interaction of the agents that constitute the system. Morin accepts that the 'restricted complexity' viewpoint encourages advances in formalization, modelling and interdisciplinary working but regards it as remaining 'within the epistemology of classical science', searching for hidden laws behind the appearances. He sees the 'simplifying visions' to which it gives rise as not only reductionist but also potentially dangerous:

> We must remember the ravages that simplifying visions have caused, not only in the intellectual world, but in life (Morin, 2008, p.57).

According to Morin, it is essential to understand that we are confronted by a case of 'general complexity'. General complexity produces what Rittel and Webber call 'wicked problems', which are intractable for decision-makers:

> The planner who works with open systems is caught up in the ambiguity of their causal webs. Moreover, his would-be solutions are confounded by a still further set of dilemmas posed by the growing pluralism of the contemporary publics, whose valuation of his proposals are judged against an array of different and contradicting scales (Rittel & Webber, 1981, p.99).

General complexity resists universal truth. All attempts to model it are partial and, therefore, the fundamental problem of general complexity 'is epistemological, cognitive, paradigmatic' (Morin, 2006); concerned with the ways we seek to understand and manage the complexity.

It is an achievement of CST, in my view, that it has embraced and developed Morin's concept of general complexity. It regards it as impossible for any systems or complexity theory approach to provide the kind of prior understanding of complex adaptive systems that would allow intervention on the basis of explanation, prediction, and control. The nature of complex adaptive systems is 'unknowable' in this sense. In each case, an informed exploration of the problem situation needs to be undertaken. CST recommends using a variety of systems approaches and learning which are most useful, and what improvements are possible, in the particular context of intervention. Meadows is supportive when she

concludes that no paradigm is right and that the pre-eminent leverage point for bringing about desirable change.

….is to keep oneself unattached in the arena of paradigms, to stay flexible, to realize that *no* paradigm is 'true', that everyone, including the one that sweetly shapes your own worldview, is tremendously limited (Meadows, 2008, p.164, italics in the original).

This requires a willingness to engage with complex problem situations using a range of systems approaches based on different paradigms. Of course, this will include taking advantage of those more attuned to restricted complexity, but only with a clear appreciation of their limitations.

Informed use of the different systems approaches requires a *critical awareness* of systems theories and methodologies to see how they frame the world and seek to change it. Critical awareness is the second commitment of CST. Strong support for such 'second-order' critique comes from Luhmann and Morin. In Luhmann's view, social theory must give up its quest for ontological certainty and become the study of how first-order observers observe. Such second-order observation represents a shift from ontology to epistemology. Instead of trying to uphold claims about the nature of social reality, sociologists should concentrate on how different social theories construct societal issues and problems from the 'distinctions' they employ. Using second-order observation, we are able to understand how the first-order theory we are studying observes, and what it sees and does not see:

Second-order observation is observation of an observer with a view to that which he cannot see....we become interested in the distinctions with which the observed observer works, and in how he divides up the world, and in what he considers important (or not) in which situations (Luhmann, 2013, p. 112).

This requires making the fundamental distinctions employed by theories as clear as possible. Morin, reflecting on the 'complex thinking' necessary in an age of 'hyper-complexity', advocates a similar shift in orientation:

Here we have an absolute requirement which allows us to distinguish between a more simple mode of thinking – where one believes one possesses the truth – and complex knowing which demands a self-observing (and I would add, self-criticizing) turn on the part of the observer – conceiver (Morin, 2008, p. 92).

CST has always prioritized critical awareness or second-order analysis. It recognises, following Churchman, that it is impossible for any systems approach to understand the whole system. In *The Design of Inquiring Systems* (1971), Churchman argues that each of five designs for acquiring useful knowledge (derived from Leibniz, Locke, Kant, Hegel, and Singer) is incomplete in itself,

resting upon assumptions that cannot be proved using its own logic. Ulrich (1983) offers a way forward for systems thinkers. The ideal standard of whole system design should be used as a spur to reflection on the lack of comprehensiveness of any existing or proposed design. CST directs the analysis to existing systems approaches and methodologies and conducts a 'second-order' critique, often using social theory, of the assumptions they make about social reality and how to intervene successfully to improve it. It is to its credit that it has largely completed this job with regard to existing systems methodologies. Recently (Jackson, 2019), I built on this work and undertook a comprehensive second-order critique of ten well-established systems methodologies to show what aspects of complexity they give priority to in examining and seeking to improve problem situations.

Critical awareness furnishes CST with an appreciation of the theoretical distinctions made by the various systems approaches it has in its armoury. It has also sought, following the Frankfurt School, to understand the dialectical relationship between different systems methodologies and society (Horkheimer, 1937; Jackson, 2019). CST has never regarded systems methodologies as 'innocent'. They emerge from particular social and economic circumstances and, in turn, contribute to maintaining or changing them. The implications should be taken into account. In addition, it is essential, as Midgley (1994, 2000) and Stephens (2013) have argued, to extend critical awareness to incorporate an 'ecological awareness' of how different systems approaches, and the designs they produce, impact the natural world and the environment[4].

The third commitment of CST follows from the finding of critical awareness that all the different systems approaches are partial. They see the world differently and recommend intervening in problem situations in a wide variety of ways. To have any chance of managing the multi-dimensional complexity of the VUCA world, and dealing with 'wicked problems', CST has had to embrace *pluralism* and 'multimethodological' practice (Mingers & Brocklesby, 1997). In short, it has had to learn how to use the different systems approaches together in ways that maximise the strengths and compensate for the weaknesses of each of them. To this end, it has succeeded in constructing an 'ideal-type' of pluralistic practice.

The first requirement specified by the ideal-type is that pluralism is 'multimethod'. It should encourage flexibility in the use of the widest variety of methods, models, tools, and techniques in any intervention. This enables practitioners to respond to the uniqueness of problem situations and the exigencies they throw up during an intervention. It can require the 'partitioning' of methodologies into their parts and

combining parts from different methodologies in an intervention, as was first proposed by Midgley (1990). However, multiple methods could all be used in the service of one methodology. A genuinely pluralist approach must, therefore, be 'multimethodological' as well as multimethod. The multidimensionality of problem situations requires that systems practitioners operate with different methodologies reflecting different theories about the nature of the social world and how to change it. The third requirement follows. Pluralism must be 'multiparadigm'. To achieve a comprehensive approach to a problem situation, we have to bring to bear methodologies that reflect the widest possible range of different paradigms - functionalist, interpretive, radical change, and others.

A final requirement of genuine pluralism is that we seek to employ it at all stages of an intervention. This is what Pollack (2009) calls 'parallel' rather than 'serial' use of different systems approaches. It is tempting to adopt a serial approach and allocate different methodologies to the various phases of an intervention because they seem most suitable to that phase. Mingers (1992) notes that some information systems researchers advocate using Checkland's 'soft systems methodology' at the beginning of a study, to reconcile multiple perceptions, before proceeding with structured design methods. But there is no theoretical justification for such a course of action. From the subjectivist position, issues of culture, politics, and power cannot simply be made to disappear at the beginning of a project, never to be seen again. They will remain as a crucial backdrop in any intervention and must be attended to continuously as it progresses.

Of course, what is an ideal-type of pluralism in theory turns into an impossible dream once we try to apply it in practice. Nevertheless, I consider its construction as one of the greatest achievements of CST. As we shall see in the next section, ways forward have been developed that allow the practitioner to adhere more closely to the ideal than might seem possible from initial inspection. Minimally, the ideal-type provides a critical standard that allows the practitioner to be reflective about how and why they are falling short of the ideal in a particular intervention and the consequences that might follow.

The final commitment of CST is to bring about *improvement* in the real-world. It is not an exercise conducted just to satisfy academic interests. It must be carried out in the context of application to meet the needs of users and other stakeholders. From its very beginnings, employing methodologies such as systems analysis and systems engineering, the emphasis in systems practice has been on meeting the requirements of clients. CST draws on this experience while insisting that, in line

with its embrace of pluralism, the meaning of improvement must be broadened to embrace the concerns of the greater variety of systems approaches now available. It cannot just be about increased efficiency and efficacy but also, for example, effectiveness (are we doing the right things), mutual understanding, resilience, anti-fragility, empowerment, and sustainability. In particular, although CST has tempered the hyperbole associated with its early calls for 'emancipation', it still regards putting fairness and empowerment on the agenda of systems thinkers as one of its major achievements and continues to insist that such matters receive constant attention.

We should consider what CST still needs to do. There is an important theoretical question that needs resolving. In the early days (e.g. Flood & Jackson, 1991), CST presented itself as a 'metaparadigm', basing its pluralism upon Habermas' theory of human interests. It saw itself as standing above the paradigms and picking out appropriate methodologies according to the particular human interests - technical, practical, emancipatory – to be served. Tsoukas (1992) was the first to point out that CST could not rely on Habermas' theory to dissolve the arguments between the paradigms. This is because they constitute different realities and, therefore, seek to provide answers to all three human interests. If CST cannot stand above the paradigms, as now seems obvious, then the solution seems either to declare CST as a paradigm in its own right or to search for a paradigm that already embraces CST's commitments. Midgley (2000) chooses the first option and suggests a 'process paradigm' which he feels can offer a home for other paradigms without distorting them too much and, therefore, uphold pluralism. This is not a view that positivists, interpretivists, or Marxists would share. Mingers (2014) feels that 'critical realism' is a paradigm ready-made for critical systems thinking because, in his view, it is pluralist in terms of both ontology and epistemology. Unfortunately, far from being a paradigm that is welcoming of other theories, critical realism occupies quite a restricted space in social theory. Other traditions refuse its embrace and object to being used as means to meet critical realism's ends.

I have resisted 'one paradigm pluralism' on the basis that it is self-contradictory. Instead, I have sought to build on W. Gregory's (1996) argument in favour of 'discordant pluralism' and present CST as a framework enabling critique of each paradigm on the basis of the assumptions of all the others (Jackson, 2000, 2019). CST accepts that paradigms are based on incompatible philosophical assumptions and that they cannot be integrated without something being lost. It needs to manage paradigms, not by aspiring to metaparadigmatic status or creating a separate

paradigm, but by using them critically. Paradigms have to confront one another. Critique is managed *between* the paradigms. No paradigm is allowed to escape unquestioned because it is continually challenged by the alternative theoretical rationales offered by other paradigms. CST no longer aspires to metaparadigmatic status or to its own paradigm. We are not required to step outside, and stand above, existing paradigms or invent a new one. CST's job, instead, is to protect paradigm diversity and encourage critique between the paradigms at all stages of an intervention, from initial exploration of the problem situation to evaluation of the results.

I found support (Jackson, 2000, 2019) for this position in Morgan's (1983, ed.) notion of 'reflective conversation' between paradigms, and in Luhmann's (2013) second-order thinking, which insists that we can only shift 'between that which one sees and that which one does not see'. More recently (Jackson, 2020), I have drawn upon the work of Lakoff and Johnson (1980) and Pepper (1942). According to the former, our conceptual systems are dominated and structured by metaphors. Different metaphors present the world differently, revealing some things and suppressing others. We need to operate with a range of metaphors:

> Metaphor is one of our most important tools for trying to comprehend partially what cannot be comprehended totally (Lakoff & Johnson, 1980, p. 193).

And, if these are inconsistent, then so much the better:

> To operate only in terms of a consistent set of metaphors is to hide many aspects of reality. Successfully functioning in our daily lives seems to require a constant shifting of metaphors. The use of many metaphors that are inconsistent with one another seems necessary for us if we are to comprehend the details of our daily existence (Lakoff & Johnson, 1980, p.221).

According to Pepper, there are four 'world hypotheses' which, over time, have proved useful to the human species in finding its way in the world – 'formism', 'mechanism', 'contextualism', and 'organicism'. There is no higher truth to legislate over them. The only legitimate critics of world hypotheses are other world hypotheses. We need to keep them distinct so that they can act as checks on each other:

> We need all world hypotheses, so far as they are adequate, for mutual comparison and correction of interpretative bias (Pepper, 1942, p. 101).

Lakoff and Johnson label their approach a 'pragmatic theory' in the tradition of Pierce, James, and Dewey. It is to pragmatism, I believe, that CST must look to find a philosophy that justifies the ontological and epistemological flexibility it

needs. This is a position promoted by Zhu (2011). That said, Pepper also began his investigations as a pragmatist:

But I soon came to the conclusion that pragmatism was just one more theory, probably no better nor any worse than the other two [materialism and idealism] (1942, p. viii).

If Pepper is correct, then CST may be no better off with pragmatism than with process philosophy or critical realism. The debate goes on and the research must continue.

3 Contemporary Critical Systems Practice[5]

Critical systems practice (CSP) sets out how the four commitments of critical systems thinking can be applied in practice. I can find no better way of expressing the overall shift in 'problem-solving mentality' required, to understand CSP, than Lakoff and Johnson's comparison of the 'puzzle' and 'chemical' metaphors applied to problems. At present, they argue, we mostly conceptualise and deal with problems using the puzzle metaphor

……in which problems are PUZZLES for which, typically, there is a correct solution – and, once solved, they are solved forever. The PROBLEMS ARE PUZZLES metaphor characterizes our present reality (Lakoff & Johnson, 1980, pp. 144-145, upper case in the original).

Adopting a 'chemical metaphor', they argue, would create a different reality in which human problems were seen and addressed differently:

To live by the CHEMICAL metaphor would be to accept it as a fact that no problem ever disappears forever. Rather than direct your energies toward solving your problems once and for all, you would direct your energies toward finding out what catalysts will dissolve your most pressing problems for the longest time without precipitating worse ones. The reappearance of a problem is viewed as a natural occurrence rather than a failure on your part to find "the right way to solve it" (Lakoff & Johnson, 1980, p.144, upper case in the original).

CSP has 4 main stages (**EPIC**) and some sub-stages:

- Stage 1: **E**xplore the problem situation
    - View it from a variety of systemic perspectives
    - Identify primary and secondary issues
- Stage 2: **P**roduce an appropriate intervention strategy

  - Appreciate the variety of systems approaches
  - Choose appropriate systems methodologies
  - Choose appropriate systems models and methods
  - Structure, schedule and set objectives for the intervention

- Stage 3: **I**ntervene flexibly

- Stage 4: **C**heck on progress

  - Evaluate the improvements achieved
  - Reflect on the systems approaches used
  - Discuss and agree next steps

These are shown in Figure 1. and are discussed in turn.

Stage 1, Explore (the problem situation),

The intervention is likely to begin when a crisis, or a feeling that 'things could be better', provokes a call for action. After examining the issues they are confronting, decision-makers may come to the conclusion that they are interconnected, that there is no obvious boundary to their problem, and that any action will have wide ramifications. They are engaged with a complex problem situation. It is not easy to untangle and get to grips with such problem situations because they exhibit VUCA characteristics – volatility, uncertainty, complexity, and ambiguity. This is often compounded by stakeholder conflict. Complex problem situations constitute what Ackoff calls 'messes':

> We are almost never confronted with separable problems but with situations that consist of complex systems of strongly interacting problems. I call such systems of problems messes (Ackoff, 1999, p.13).

They give rise to 'wicked problems'. No one systems approach can understand them as 'a whole'. Attempts to model them are always partial. It is essential to be realistic about this, and proceed to learn about the complexity by exploring them through a variety of different lenses. CSP argues that a rich appreciation of complex problem situations can be achieved by making use of the lenses provided by some well-tested 'systemic perspectives'.

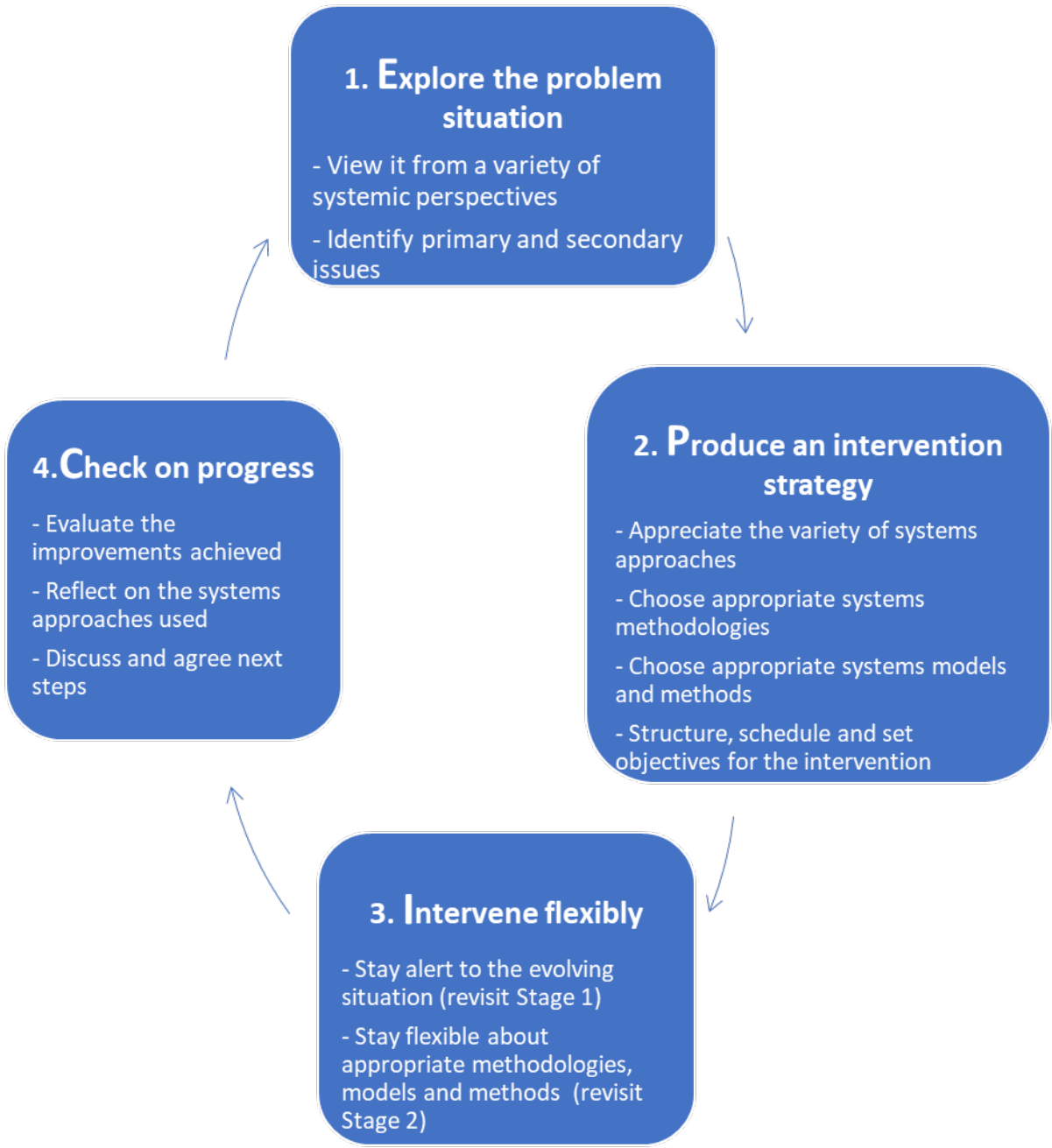

Fig.1: The 4 EPIC stages of critical systems practice

- View it from a variety of systemic perspectives

Systemic perspectives are not metaphors that are employed at random to yield a moment's insight. They are structured, interlinked sets of ideas, making up cohesive wholes. This ensures that they can be kept distinct from one another, they can provide deep interrogations of a problem situation, and can produce learning. Each must be well-tested and together they should constitute a comprehensive set. I have derived them from Pepper's 'world hypotheses', and from the sociological paradigms and metaphors that have been found useful in organization theory and systems thinking. They are summaries of what Pepper refers to as 'successes of cognition' and the 'creative discoveries of generations'; and what Lakoff and Johnson identify as 'experiential gestalts' that have enabled us to have coherent encounters with reality and provided for successful functioning in our physical and cultural worlds (see Jackson, 2020). As far as possible though, to aid practitioners, they are expressed in everyday language and employ concepts in common usage.

Five systemic perspectives have demonstrated a capacity to provide significant insight into complex problem situations and appear to cover the ground – 'machine', 'organism', 'cultural/political', 'societal/environmental', and 'interrelationships'. Using them enables us to make suggestions about where failings are occurring and how things can be improved:

- Machine – is there an agreed goal, are the necessary parts well connected together to achieve the goal, and are the necessary components to hand or easily obtainable? The machine is judged on whether it demonstrates efficacy (is well organized to achieve its purpose) and efficiency (does so with minimum use of resources)
- Organism – is the system viable, are the sub-systems functioning well, with their own autonomy but still serving the whole, and is the whole adaptive to the environment, resilient in the face of shocks, and capable of learning? The organism is judged on whether its semi-autonomous parts are well co-ordinated and controlled, and whether the system is 'anti-fragile' (Taleb, 2013) in the face of its turbulent environment
- Cultural/political - is there agreement that the system is doing the right things (effectiveness), has this been subject to challenge (not emerged from groupthink), and are there processes for dealing with conflict? This systemic perspective is not used as an exemplar. Rather, it alerts

practitioners to look out for a variety of cultural and political factors that may require attention in the problem situation

- Societal/environmental – have the interests of all stakeholders (including those of the marginalised and future generations) been considered, and have sustainability and environmental issues received sufficient attention? This systemic perspective is used to identify neglected stakeholders, discrimination, and inequality, and to argue that interventions should take into account the lot of the disadvantaged and the consequences for the environment
- Interrelationships – can we identify chains of mutual causality in the problem situation and leverage points for bringing about change? The issues identified by the other systemic perspectives will, of course, be interrelated. Although the VUCA world of general complexity forestalls the exact mathematical modelling of these, it may occasionally be possible to identify important linkages which offer leverage points for achieving improvement and/or suggest unintended consequences that might ensue from proposed actions.

The different systemic perspectives provide breadth and depth to the exploration of the problem situation. Each reveals new matters worthy of attention and may provide a different explanation as to why the issues of concern have arisen. For example, major projects are usefully viewed as machines designed to achieve a purpose, organisms evolving over time, systems in which conflicts have to be managed and accommodations reached, systems that might have negative consequences for some stakeholders and the environment, and systems of interrelated causal factors. The different systemic perspectives will often provide conflicting information and explanations, and this is particularly helpful in gaining a full appreciation of the complexity involved and in supporting informed decision making.

Other creativity-enhancing devices can be employed in support of an exploration using the systemic perspectives. ‘Rich Pictures’ (see Checkland & Scholes, 1990) make a good companion. For example, participants could be asked to draw a Rich Picture of the problem situation as a failing machine; or what the system would be like if it paid attention to the concerns of the societal/environmental perspective.

- Identify primary and secondary issues

The first stage ends when the decision-makers, and other stakeholders involved, conclude that they can identify the 'primary' and 'secondary' issues in the complex problem situation they are confronting. The primary issues are those that seem to need most urgent attention – perhaps they appear to get to the heart of the matter and scream out at the participants. The secondary issues are, on the practical grounds that we cannot do everything at once, ruled out for immediate action. Nevertheless, CSP insists, they must be kept in mind and may assume greater importance, later in the intervention, if a fresh run through the **Explore** stage brings them to the fore. Once there is agreement on the primary and secondary issues, Stage 2 of the multimethodology can begin.

Stage 2, Produce (an appropriate intervention strategy)

- Appreciate the variety of systems approaches

It is necessary to know the difference between *systems methodologies, systems models*, and *systems methods*.

Systems methodologies translate theoretical hypotheses about the nature of problem situations, and how they can be improved, into practical action. There are a number of systems methodologies available, each based upon different assumptions about the world and how best to intervene in it. Together they can recognise and respond to the range of issues surfaced during the exploration of the problem situation. If you know just one or two, you are restricting your perspective on what issues are important and how they should be dealt with. Examples of well-established systems methodologies are:

- Systems Engineering
- The Vanguard Method
- Viable Systems Diagnosis and Design
- Interactive Planning
- Strategic Assumption Surfacing and Testing
- Soft Systems Methodology
- Critical Systems Heuristics
- System Dynamics

Systems models seek to capture the essence of a situation in a way that makes it easier to understand and manipulate. Examples are:

- Computer Simulation
- Flow Charts
- Viable System Model
- Rich Pictures
- Conceptual Models
- Causal Loop Diagrams
- Stock and Flow Diagrams

Systems methods are procedures which, if used correctly, will deliver a desired outcome. Examples are:

- Critical Path Analysis
- Capability Charts
- Assumption Analysis
- Idealized Design
- CATWOE Analysis
- Boundary Questions
- System Archetypes

To produce an intervention strategy, it is essential to start by choosing an appropriate systems methodology or methodologies. This is the crucial first step to informed intervention. Methodologies guide the intervention in the most appropriate way to ensure the primary issues are addressed. Systems models and methods are best considered later. Their role is to support the chosen methodologies and attune them to specific characteristics of the problem situation.

- Choose appropriate systems methodologies

We now need to know what the different systems methodologies are good at in order to choose appropriate ones to address the primary issues identified in the problem situation. One convenient way of gaining this 'critical awareness' is to consider what systemic perspectives they privilege and, therefore, what issues they prioritise. Broadly:

- Systems Engineering (SE) and The Vanguard Method (VM) reflect the machine perspective. SE prioritizes achieving a predefined goal by organising the various parts and components (machines, materials, money, people) in the most efficient way. VM prioritizes establishing customer purpose and designing a process, free from waste, to ensure that the purpose is met (efficacy)

- Viable Systems Diagnosis and Design reflects the organism perspective. It considers whether the sub-systems, either in an organisational or multi-agency setting, are capable of responding to their own sub-environments while performing well to support the whole, and whether the system is capable of adapting to and proactively shaping its environment. It is concerned with the features that enable viable systems to respond to threats and opportunities; evolving, learning, and thriving in the face of turbulence

- Interactive Planning (IP), Strategic Assumption Surfacing and Testing (SAST), and Soft Systems Methodology (SSM) respond to issues highlighted by the cultural/political perspective. IP seeks to enable participants to reach agreement on a desirable future (its concern is effectiveness – doing the right things) and suggests how they can get there from where they are now. SAST challenges groupthink by unearthing and examining the assumptions underlying a favoured strategy. SSM facilitates a learning process during which participants achieve better mutual understanding and are able to reach accommodations about feasible and desirable change

- Critical Systems Heuristics can be used to address issues raised by the societal/environmental perspective. It can reveal how a systems design might privilege the interests of some stakeholders over others and give a voice to those disadvantaged by power relationships. It can help people think through what systems designs ought to look like from a variety of stakeholder perspectives (including those of ‘representatives’ of the environment and future generations)

- System Dynamics tries to identify the important causal relationships, expressed through feedback and feedforward loops, that determine system

behaviour over time. This allows the possible effects of an intervention to be understood.

This awareness of the strengths of the different systems methodologies can easily be linked back to the issues raised during problem exploration, and can be used to inform the choice of methodologies to address those issues. For example, if the primary issues were predominantly revealed by the cultural/political systemic perspective, then a methodology prioritizing those issues will be an appropriate choice. There are other means of enhancing critical awareness of the strengths and weaknesses of the different systems methodologies (see Jackson, 2019). For example, the 'System of Systems Methodologies' illustrates the historical development and relationships between the various systems approaches.

- Choose appropriate systems models and methods

Once agreement has been reached on what systems methodology, or methodologies, to employ at the start of the intervention, it is time to decide on the systems models and methods to use. Some models and methods have been tailored to support particular methodologies and it would be perverse not to take advantage of this. For example, the Viable System Model in support of Viable Systems Diagnosis and Design; Rich Pictures and CATWOE analysis with Soft Systems Methodology. Nevertheless, it is good to keep an open mind. The criteria for choice should be that the models and methods can be used in support of the principles of the guiding methodologies and are suitable and helpful in the problem context. Models and methods that originate from outside the systems thinking tradition should also be considered.

- Structure, schedule, and set objectives for the intervention

Exploration of a complex problem situation always reveals a host of issues. For example, the Covid-19 pandemic threw up materials, staffing, process, structural, cultural, and inequality issues, all of which confronted decision makers at the same time. This indicates the need to use many methodologies in parallel. However, doing this can cause confusion, lead to much upheaval, and be beyond the resources available. In normal circumstances, it is better to start with the methodology

(possibly two) that addresses the greatest number of primary issues. As the intervention proceeds, the problem situation changes and other issues come to the fore, we need to be sufficiently alert to bring different methodologies into play. Similar considerations apply to the choice of models and methods. Maximum flexibility should be embraced to cleave to the requirements of the problem situation. The intervention strategy can now be designed and scheduled. Precise objectives and specific measures of success of the scheduled intervention must be determined. The intervention can then start.

Stage 3, Intervene (flexibly)

The intervention can begin by following the steps indicated in the methodology or methodologies chosen to start the process. In the best-case scenario, that methodology, and associated models and methods, will resolve all the issues. After all, the paradigms on which the methodologies are based claim to be of unlimited scope. More likely, however, the problem situation will simply have changed, new priorities will have come to the fore, and new primary and secondary issues surfaced. The key to successful intervention with CSP is to remain alert to these changes, not least to those occurring as a result of the intervention itself. This must be accompanied by flexibility in the choice and use of the systems methodologies, models, and methods. Stages 1 and 2 will need to be constantly revisited during the course of the intervention. Eventually, success, failure, time constraints, or other factors, will bring the intervention to an end. It is time to check on what has been achieved and learned, and to consider what to do next.

Stage 4, Check (on progress)

- Evaluate the improvements achieved

The intervention should be evaluated according to the specific measures of success agreed in Stage 2. This is important. However, to be consistent with the CSP view of complex problem situations as multidimensional, it is necessary to ensure that the concerns of all five systemic perspectives are invoked in any evaluation. The intervention may seem successful according to the specific measures. But, viewed through alternative lenses, it might have made things worse. For example, an intervention designed to make a system more responsive to its environment, via decentralization, might have adverse consequences, from the cultural/political perspective, if the changes were poorly communicated and forced through.

Evaluation, therefore, should ask questions from the machine perspective (efficiency and efficacy); the organism perspective (viability and resilience); the cultural/political perspective (effectiveness, mutual understanding, and conflict resolution); the societal/environmental perspective (marginalised stakeholders, sustainability, and the environment); and the interrelationships perspective (what intended or unintended consequences are 'rippling' through the system).

- Reflect on the systems approaches used

Participants should reflect on what they have learned from the intervention. Exposure to the range of systemic perspectives and methodologies will have enhanced their cognitive flexibility – essential for working in a multi-methodological way to address complexity. It is important that the learning is carried forward in future work.

- Discuss and agree next steps

The evaluation, and the priorities of the decision makers, will suggest what to do next. The aim of a prolonged CSP intervention is to achieve and demonstrate improvement viewed from the range of systemic perspectives and their associated measures.

I can now provide an example of CSP in action. In this case, setting up a new business school at the University of Hull in the UK. It is short, but the interested reader can examine more detailed accounts elsewhere (Jackson, 2019, 2021). This example sees CSP used in a 'Mode 2' guise (situation rather than methodology driven – see Checkland & Scholes, 1990) to design a new system. It can also be employed in 'Mode 1' format and for diagnosis of existing problems. Briefly, Hull University Business School (HUBS) was founded in 1999 and, by 2011, had gained accreditation from the three major business school accrediting bodies – placing it in the top 1% of business schools worldwide. I was Dean during those 12 years and often used CSP to inform thought and practice. I believe that this contributed significantly to the success of HUBS.

It was important to recognize that building a new business school, in the twenty-first century, takes place in the context of 'general complexity', confronts a

multitude of interacting issues, and throws up wicked problems. Any attempt to treat the problem situation as just 'complicated' would have failed. CSP is a multimethodology suitable for general complexity. We will use the lenses of the five systemic perspectives to consider what happened in this 'intervention'.

If HUBS was to become a successful machine it would need a clear goal and the resources to pursue that goal. The initial goal was to gain recognition from the three main business school accrediting bodies. The significant resources to achieve this could only come through growing student numbers and running efficient programmes of study. From the machine perspective this demanded, for example, that student recruitment processes be streamlined, modules be shared across programmes as appropriate, and a staff workload model established. The Vanguard Method and a simple linear programming model were used at different times. The organism perspective proved particularly helpful in this greenfield situation. Using the Viable System Model, it was possible to envisage HUBS as a thriving organism, co-evolving with its environment and learning its way to becoming a top-rated business school. This perspective ensured that HUBS identified the primary activities that it wanted to direct to the market and structured itself around those activities, providing them with managerial attention and appropriate resources. Viable Systems Diagnosis and Design also focused minds on how HUBS could achieve sufficient autonomy from its host university to respond to the peculiarities of the business school market. For example, by establishing its own dedicated marketing, recruitment, finance, alumni, and business engagement operations. The cultural/political perspective promoted the need to achieve mutual understanding around mission, vision, and objectives. Frequent meetings were held to develop strategic and operational plans. The strap line 'responsible leadership for a complex world' emerged from a school open day. Decisions, for example on the workload model, were always widely debated and mandated at the School Board. There were teaching conferences, numerous social events, and a coffee expanse that became a forum for open discussion and debate, sometimes of a challenging nature. Occasionally, time was made for explicit Soft Systems Methodology (SSM) workshops to discuss and address issues that arose, such as 'the multiple pressures on staff in HUBS'. More often, SSM and Strategic Assumption Surfacing and Testing were used implicitly as informal guides to everyday action. The societal/environmental perspective had a significant impact. Business schools have multiple stakeholders and HUBS gave due attention to their expectations. An Advisory Board of stakeholders was established. Attention was given to the percentage of women in senior posts, to minority ethnic and LGBT issues, and to

preventing an academic/administrative divide. The same lens supported the argument for concessions on admissions requirements for local students suffering from economic, social, and educational disadvantage. It led to a successful campaign to ensure that the coffee outlet was 'fair trade'. HUBS was an early signatory to the 'Principles for Responsible Management Education' and was one of the first business schools to introduce an undergraduate module on business ethics. Environmental issues were seen as important and many degrees incorporated 'sustainable business' components. The interrelationships perspective meant a close eye was kept on the possible unintended consequences of initiatives. This was made easier because of the basic familiarity of many staff in the school with the tenets of system dynamics. For example, it became apparent that the 'Research Excellence Framework' imperative to recruit high performing researchers could lead to a neglect of teaching. This would be reflected in poor results in the National Student Survey, a fall in league table position, a decrease in applications and student numbers, a fall in income and, eventually, a decline in the capacity to sustain high level research. A balancing loop was needed to reinforce good teaching practice.

We can now ponder what CSP has achieved to date. Cabrera, Cabrera, and Powers note that systems thinking has become a field 'characterized by a baffling array of methods and approaches' (2015, p. 534). It can appear intimidating to practitioners. They propose a new version of systems thinking based on four underlying rules (DSRP – distinctions, systems, relationships, and perspectives) which they see as underpinning all the different systems approaches. I do not agree with this particular way forward, because I think these 'rules' are employed in essentially different ways, and usefully so, in the various systems approaches, but I do agree that it is necessary to make systems thinking more accessible. The challenge, expressed in critical systems thinking terms, is to remain true to the theory, and the four commitments, while presenting them in a form that is intelligible to non-academics and useable by practitioners. It has taken 30 years from the first attempt to say how the ideas of critical systems thinking could be operationalized (Flood & Jackson, 1991) to get to the CSP multimethodology described above. There is more work to be done but we are getting there. Much has been achieved. If I am right, the next phase of development of CSP will see it being used more widely by those not involved in its original development.

It should also be mentioned that, in this paper, I present CSP as an 'ideal-type' of the good practice necessary to put critical systems thinking into effect. I concentrate

on the philosophy and principles necessary to guide a successful systems intervention, while giving some attention to what can realistically be achieved in practice. Other researchers point to different aspects of successful critical systems practice. Ison (2017) focuses on the systems practitioner – their history, skills, and the way they engage with the problem situation. Chowdhury (2019) highlights the 'cognitive flexibility' that critical systems thinking consultants must have. Gregory, A.J., Atkins, et al. (2020) reflect on 'stakeholder identification and engagement in problem structuring interventions'. These are important research avenues and the results need to be incorporated into CSP.

Finally, it must be acknowledged that CSP is a product of the Western systems tradition. It remains to be seen how transferable it is to other cultural environments. In the Chinese context, for example, it may be more appropriate to employ a multimethodological approach with Eastern roots. Gu and Zhu's (2000) *wuli, shili, renli* (WSR) provides a good example.

Conclusion

In the systems thinking community, the argument that you need multiperspectival and multimethodological approaches to manage general, multidimensional complexity has just about been won. Critical systems thinking has not done this alone, but it has played a major part. It has provided the theoretical justification and guidance on how to apply the ideas in practice. Take up of the approach by practitioners will, in my view, now follow.

Looking more widely, I have long argued (Jackson, 1991) that critical systems thinking (CST) and critical systems practice (CSP) can provide the necessary theoretical underpinning and practical guidance for the management sciences more generally. There has been progress in project management. CST was a key input into the International Centre for Complex Project Management's (ICCPM) *Complex Project Management Competency Standards* (see version 4.1, 2012). It was also central to the design of an Executive Masters Programme in 'Complex Project Management', jointly developed by ICCPM, Queensland University of Technology, and the Defence Materiel Organization (DMO) of Australia. In health systems research, the message is gradually being heard that theory and practice is being held back by a 'restricted complexity' viewpoint and an attachment to system dynamics as the sole systems methodology (Jackson & Sambo, 2019). Attempts to spread CST and CSP to quality management (Flood, 1993; Beckford, 1998),

leadership in local governance (Hobbs, 2019), and management consultancy (Chowdhury, 2020) are encouraging. In organization theory, evaluation research, information systems, knowledge management, and logistics, despite promptings (Galliers, Mingers & Jackson, 1997; Gregory, A.J., 1996; Jackson, 1992, 1997; Jackson, 2005; Mears–Young & Jackson, 1997), the impact is less obvious. There have been faint echoes of CST in enterprise architecture, business process reengineering, organizational learning, change management, service systems science, and epidemiology. But, in all these cases, theoretical development and practical relevance remain hindered by a reliance on a limited number of systemic perspectives and systems methodologies. It is not clear why there is not greater take up of CST and CSP in the wider management sciences. All the sub-disciplines mentioned are dealing with general complexity and wicked problems. There are successful academic and professional careers to be built enhancing different branches of the management sciences, using CST to upgrade the theory and CSP as a multimethodological standard.

NOTES

1. I have left the complicated story of socio-technical systems thinking out of this account. For a history and evaluation of this systems approach, see Jackson (2019).
2. In using the phrase 'critical systems thinking', I am referring to the particular strand of systems thinking that emerged from the work described in this section. I acknowledge that the work of some earlier systems scholars, Churchman being the prime example (e.g. Churchman, 1971), was 'critically inclined'.
3. I can make a good case for the historical accuracy of my account of the origins and development of critical systems thinking, based on the literature. However, I can only offer my own interpretation of contemporary critical systems thinking. Others will have different views.
4. See Jackson (2019) for more detail on the three aspects of critical awareness - 'theoretical awareness', 'social awareness', and 'ecological awareness'.
5. The reservations expressed about my account of critical systems thinking, in Note 3., apply even more to this account of critical systems practice. My version of critical systems practice can be traced back directly to Flood and Jackson's 'total systems intervention' (1991). It has been gradually developed and this account provides the latest version. Others will differ in how they think critical systems thinking is best used in practice. This latest version has, however, benefitted from feedback from Amanda Gregory, Catherine Hobbs, Gerald Midgley, Luis Sambo, and Steven Wallis. My thanks to them.

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