Critical thinking and systems thinking: towards a critical literacy for systems thinking in practice

Book Section

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CRITICAL THINKING AND SYSTEMS THINKING: TOWARDS A CRITICAL LITERACY FOR SYSTEMS THINKING IN PRACTICE

Martin Reynolds*
Communication and Systems Department, The Open University, Walton Hall
Milton Keynes MK7 6AA UK

1. INTRODUCTION

> "The core aspects of systems thinking are gaining a bigger picture (going up a level of abstraction) and appreciating other people's perspectives" (Chapman 2004 p. 14)

This simple distinction made by Jake Chapman builds upon a distinction made by Richard Bawden in identifying two transitions implicit in systems thinking; one, towards holism, and another towards pluralism (Bawden 1998). The transitions speak of two worlds. One, the holistic ontological real-world 'universe' of interdependent elements, encapsulating complex interrelationships. Two, an epistemological socially constructed world of 'multiverse' (cf. Maturana and Poerksen 2004 p.38), encapsulating differing perspectives on reality. The two worlds are of course abstractions – ways of framing. This act of framing itself constitutes a third distinct critical world. This is a world where boundaries inevitably need to be made and questioned on the inevitable limitations on (i) framing reality (limits on being holistically 'universe'), and (ii) framing engagement with reality (limits on being pluralistically 'multiverse'). Whilst striving towards aspirations of holism and pluralism, this third critical dimension confers a peculiar sense of grounding, purposefulness and responsibility in systems thinking.

As Werner Ulrich shows in his seminal work *Critical Heuristics of Social Planning* (1983), the systems 'idea' as a philosophical tool can be traced back to Immanuel Kant's 1784 enlightenment treatise - *Critique of Pure Reason*. Kant uses the systems idea as an holistic concept:

> " - a whole which is prior to the determinate knowledge of the parts and which contains the conditions that determine *a priori* for every part its position and relation to the other parts. This idea accordingly postulates a complete unity in the knowledge obtained by the

* Contact Details:
Tel: +44 (0)1908 654894 (work)
Email: m.d.reynolds@open.ac.uk
Website: http://sites.google.com/site/jjntest1/Home/people/martin-reynolds-1

> understanding, by which this knowledge is to be not a mere contingent aggregate, but a *system* connected according to necessary laws" (Immanuel Kant, 1784, quoted in Ulrich, 1983 p.223; Ulrich's italics)

The systems idea as originally formulated by Kant is an abstract holistic principle used as a means for understanding 'the real world'. The Kantian *critical* interpretation of the systems idea rests on the principle that it is simply not possible to have comprehensive knowledge. In the subsequent treatise Kant "undertakes the dialectical task of making reason reflect upon its own limitations" (Ulrich, 1983:269). *Critique of Pure Reason* formulates an original critical interpretation to the systems idea. In course, the critique provides a fundamental and enduring epistemological challenge to classical comprehensive rationalism; a rationalism that assumes the possibility of comprehensive knowledge and understanding.

Werner Ulrich's critical systems heuristics is often regarded as an example of one particular tradition of systems thinking called critical systems thinking (CST).

The positivist interpretation of systems science came under critical review during the 1970s most notably through the works of C. West Churchman (1970) and Russell Ackoff (1974) in America and Peter Checkland (1979) in England (original papers reproduced in Flood and Jackson, 1991a). Checkland built on Churchman's critique, defining an alternative "soft" systems tradition, and naming the former as the "hard" systems tradition. Around the same time Werner Ulrich was also building on Churchman's work, subsequently contributing to what later came to be referred to as a "critical" systems tradition (cf. Flood & Jackson, 1991a). Contemporary systems approaches can then be classified as 'hard', 'soft', or 'critical', according to the degree to which they maintain Kant's original critical sense of the systems idea (see Figure 1).

Systems 'Type' *& philosophical origins**		**Selected Systems Approaches**
Hard Systems		
Ontology:	*realism*	• general systems theory (Bertalanfy, 1940)
Epistemology:	*positivism*	• classical 'mechanistic' cybernetics (Ashby, 1956)
Intention:	*control*	• operations research (Churchman, Ackoff & Arnoff, 1957)
		• systems engineering (Hall, 1962)
		• socio-technical systems (Trist *et al.*, 1963)
		• RAND-systems analysis (Optner, 1965)
		• system dynamics (Forrester, 1961; 1971; Meadows *et al.*, 1972; 1992; Senge, 1990)
		• organic cybernetics (Beer, 1979; Varela *et al.*, 1974)
Soft Systems		
Ontology:	*nominalism*	• Inquiring systems design (Churchman, 1971)
Epistemology:	*constructivist interpretivism*	• soft systems methodology (Checkland, 1981)
Intention:	*appreciation*	• strategic assumption surface testing (Mason & Mitroff, 1981)
		• interactive management (Ackoff, 1981)
		• cognitive mapping and strategic options development

		analysis (Eden and Ackermann, 1988)
Critical Systems		
Ontology:	*nominalism*	• critical systems heuristics (Ulrich, 1983)
Epistemology	*constructivist/ critical idealism*	• system of systems methodologies (Jackson & Keys, 1984)
Intention:	*emancipation*	• community operational research (Rosenhead, 1984) • liberating systems theory (Flood, 1990) • interpretive systemology (Fuenmayor, 1991) • total systems intervention (Jackson & Flood, 1991) • systemic intervention (Midgley, 2000)

*** Glossary of Terminology**	
Ontology	(assumptions about the nature of 'things' or 'being').
realism:	'real world' is made up of systems.
nominalism:	systems are means of re-presenting (naming) phenomena of the real world.
Epistemology	(assumptions of knowledge generation).
positivism:	validity based on 'objective' scientific method of gathering empirical facts.
constructivism:	knowledge is *socially* constructed
interpretivism:	validity based upon 'subjective' interpretations (*multiple* realities) of phenomena.
critical idealism:	phenomena (maps), as distinct from noumena (objects), are imbued with human purpose and must lay open their perspective and purpose for *critical reflection*
Intention	(primary pledge or human purpose embodied in systems approach).
control:	enables technical mastery over natural and social entities.
appreciation:	enables furthering communication and understanding between different groups.
emancipation:	enables freedom from coercive material and ideological forces.

Figure 1. An overview of systems approaches and their philosophical origins .
(Adapted from Reynolds and Holwell, 2010 p. 10)

Rather than exploring one tradition of systems thinking – CST - this chapter explores the notion of contemporary systems thinking as being implicitly critical. An argument will be made that the need for what might be called a 'systems literacy' reflects a need for the original critical idea of systems. The basis of such a literacy is a proposed framework of *systems thinking in practice* based on revised ideas of boundary critique (Ulrich and Reynolds, 2010). After describing *what* this critical literacy in systems thinking in practice looks like and entails, the question of *how* the critical kernel emerged amongst contemporary systems thinking in practice approaches is examined. This section traces the influence of critical thinking traditions on systems thinking. Finally, some views are offered on *why* attention to the critical literacy of systems thinking in practice is significant to a contemporary world beset with complex issues of change and uncertainty.

2. WHAT IS CRITICAL IN SYSTEMS THINKING IN PRACTICE?

> "Systems literacy is not just about measurement. The learning journey up the ladder of complexity—from quarks, to atoms, to molecules, to organisms, to ecosystems—will be made using judgment as much as instruments. Simulations about key scientific ideas and visualizations of complex knowledge can attract attention—but the best learning takes place when groups of people interact physically and perceptually with scientific knowledge, and with each other, in a critical spirit. The point of systems literacy is to enable collaborative action, to develop a shared vision of where we want to be." (Thackara, 2005)

"Clear systems thinking is one of the basic literacies of the modern world" commented Geoff Mulgan – a senior government advisor in the UK government's Cabinet Office during the 1990s… "not least because it offers unexpected insights that are not amenable to common sense" (Mulgan, 1997). Our common sense understanding of situations is continually and inadvertently shaped by our actions or practice. In the same way effective systems thinking is a literacy that is continually being informed, moulded and (re)shaped by ongoing practice. It is this interplay between conceptual tools and practice that resonates with the idea of systems thinking in practice as an important development in critical thinking.

The name - systems thinking in practice - suggests an important interplay between understanding and practice; systems thinking continually being informed, moulded and (re)shaped by ongoing practice. Systems thinking in practice deals with what might be considered to be the critical literacy required to be competent practitioners in supporting real world decision-making. The name provides a continual reminder of the important interplay between understanding and practice.

Systems thinking in practice involves stepping back from messy situations of complexity, change, and uncertainty, and clarifying key interrelationships and perspectives on the situation. It further requires engaging with multiple often contrasting perspectives amongst stakeholders involved with and affected by the situation so as to best direct responsible joined-up thinking with action to bring about morally justifiable improvements.

The above definition encapsulates three generalized purposeful orientations of systems thinking in practice (Reynolds & Howell, 2010 p.17):

1) Making sense of, or simplifying (in *understanding*), relationships between different entities associated with a complex situation. The prime intention is not to get some thorough comprehensive knowledge of situations, but rather to acquire a better appreciation of wider dynamics in order to improve the situation.
2) Surfacing and engaging (through *practice*) contrasting perspectives associated with complex situations. The prime intention here is not to embrace all perspectives on a predetermined problem so as to solve the problem, but rather to allow for possibilities in reshaping a problem-situation for improved possibilities of resolution.
3) Exploring and reconciling (with *responsibility*) ethical issues and power relations, both expressions of boundary issues associated with inevitable partial understandings

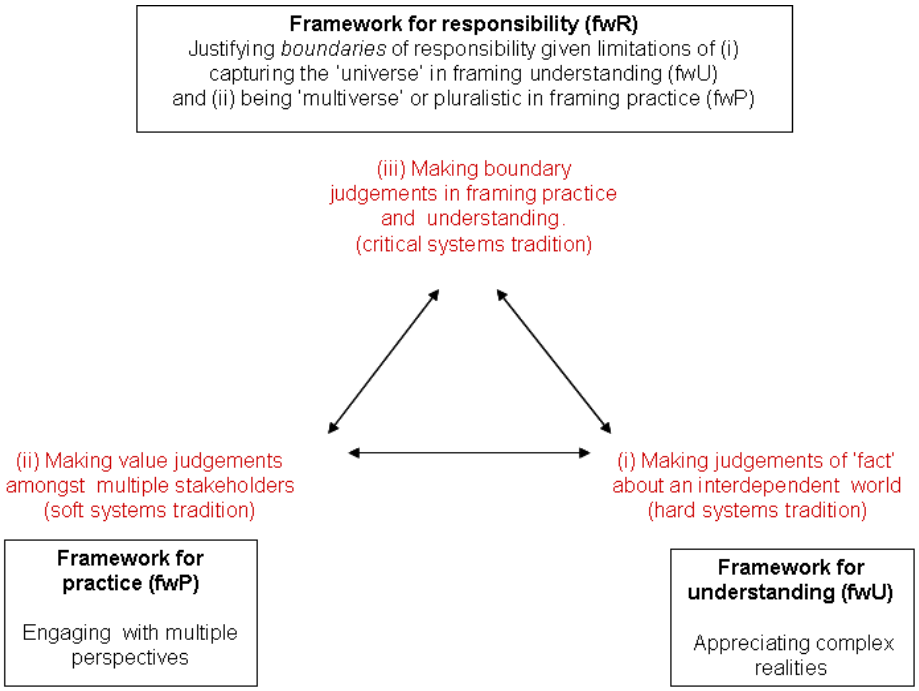
> of a situation and partiality amongst different stakeholders. The intention here is to gently disrupt, unsettle and thereby provoke new systems thinking.

An effective systems approach to managing real world complex situations embodies all three aspects of systems thinking in practice.

The criticality of systems thinking in practice can be expressed in terms of promoting continual and meaningful conversation. The 'conversation' works at two levels. One is an expression of boundary reflection, a conversation between our conceptual constructs of real world realities – constructs called 'systems' - and the actual realities being addressed. The other is an expression of boundary discourse, a conversation between people involved with and affected by the systems used to construct and engage with reality (Ulrich and Reynolds, 2010). Whereas boundary reflection is a conversation influenced by conventional critical systems thinking, boundary discourse is influenced also by traditions of social learning. Both conversations constitute what might be referred to as boundary critique, a triadic interplay between judgements of 'fact', value judgements, and boundary judgements, underpinning systems thinking in practice. Ulrich describes this interplay as an 'eternal triangle':

> "Thinking through the triangle means to consider each of its corners in the light of the other two. For example, what new facts become relevant if we expand the boundaries of the reference system or modify our value judgments? How do our valuations look if we consider new facts that refer to a modified reference system? In what way may our reference system fail to do justice to the perspective of different stakeholder groups? Any claim that does not reflect on the underpinning 'triangle' of boundary judgments, judgments of facts, and value judgments, risks claiming too much, by not disclosing its built-in selectivity" (Ulrich 2003 p.334)

Boundary critique can be described in terms of activities underpinning a framework of systems thinking in practice; constituting what has been referred to as an overall critical systems framework (Reynolds 2008a). The framework is supported by three (sub)frameworks respectively – framework for understanding (fwU), framework for practice (fwP), and a framework for responsibility (fwR) - The activities of boundary critique involve continual revising of boundary judgements (systems thinking) with judgements of 'fact' (observing) and value judgements (evaluating) (see Figure 2).



Adapted from Reynolds 2008a p.386.

Figure 2. Critical systems framework illustrating systems thinking in practice activities.

In developing this into a broader heuristic for systems thinking in practice, three complementary entities can be added: firstly, real-world *contexts* of change and uncertainty associated with a framework for understanding; secondly, people or *practitioners* involved with making change associated with a framework for practice; and thirdly, the ideas and concepts – including systems - as *tools* for effecting change associated with a framework for responsibility.

What is critical in systems thinking in practice is: (i) an appreciation that complex realities, despite good intentions with complexity sciences, can never be holistically comprehended; (ii) an acknowledgement that any perspective on a situation is laden with values that inhibit any sense of neutral engagement; and (iii) an awareness of the limitations of systems design in the light of (i) and (ii).

3. How Systems Thinking Became Critical

Systems science emerged in the 1940s and 1950s in response to clear problems of military logistics generated during World War Two. Whilst the problems addressed by variants of systems science (systems engineering, system dynamics, systems analysis and operations research) might be highly complicated in terms of involving many variables, the problem situation could nevertheless be well defined; that is, the methods would serve what Jackson and Keys (1983) would call a clearly defined "unitary purpose". A war-time consensus is likely to generate broad and common objectives.

Systems science relates to the transformation in practice in order to address issues of interrelatedness and pluralism in perspectivs. In the late 1950s, operations research (OR - outside of America the term used is 'operational' research), previously used as a means of controlling non-human (hardware) variables in weapon, computer, or space systems, was applied to the more challenging task of addressing organisational, community and societal problems. The increasingly pluralistic demands of the post-war/post-colonial era, provided new challenges for systems science techniques. In systems science, the response was *soft systems thinking* and *critical systems thinking* (see Figure 1).

The emergence of 'soft' and 'critical' systems approaches since the 1980s can best be understood as an epistemological challenge to the systems idea as described by Ulrich:

> "The systems idea as we understand it does not presuppose that we can know 'the whole system', but only that we can undertake a critical effort to reflect on the inevitable lack of comprehensiveness in our understanding and design for (social) systems. Thus the systems idea, if we do not scientistically misunderstand it, challenges us to make transparent to ourselves and to others the normative implications of our systems concepts and designs" (Ulrich, 1983 p.21).

During the Second World War the 'systems idea' acquired currency as an operational tool. Systems engineering and OR transformed the holistic idea into a methodological tool for controlling variables within the context of clearly pre-defined instrumental action. At the same time 'systems science' and Bertalanffy's 'general systems theory' translated the epistemologically critical interpretation of Kant's systems idea into an ontological realist concept of systems as actual comprehensive *representations* of 'real world' phenomena. This now pervades everyday language reference to *the* 'education system', 'health system' or 'legal system' etc. Systems as concepts assumed a social 'factual' status. The application of OR to organisational and societal problems further entrenched systems thinking into a positivist epistemological framework associated with the narrow instrumental purposes of gathering empirical 'facts'.

In seeking to identify more clearly just what the *critical* systems idea is and its relevance to contemporary systems thinking in practice literacy, three dimensions of analysis are used in critiquing each of the hard and soft systems traditions. Each of the three dimensions - contexts, practitioners, and systems as conceptual constructs - correspond to the systems thinking in practice framework introduced earlier (Figure 2).

3.1. Critique of the 'Hard' Systems Tradition

Context Matters

From the 1950s, Churchman and Ackoff were amongst the pioneers applying principles of operations research to organisational management and wider societal issues (Churchman *et.al.*, 1957). Ackoff (1981) following the lead of Churchman's critique of OR, expands on how approaches to problem-solving based upon assumptions of consensual, unitary purpose could not be applied as a tool for most social systems design, characterised more often by complexity and conflict. Complexity is not of the type that arises from some innate but growing complexity factor in institutional dynamics, but is rather derived from taking account

of conflicting *human perceptions* and *interests* involved in applied systems dynamics (cf. Ellis, 1995). The American Apollo Space Programme provides perhaps the best example of overcoming considerable technical complexity using 'hard' systems (operations) research in achieving the *goal* of putting a man on the moon. In allowing technology to be mobilised for such a *unitary* purpose, instrumental questions of 'how' resources might be deployed to achieve the objective dominated, first, practical questions concerning 'what' resources were actually available, and second, ethical questions of 'why' resource use needed to be prioritised for this mission. The powerful instrumental techniques of OR and other 'hard' system variants were effectively allowed free rein.

In contrast, Churchman and Ackoff could document the failures of OR in contexts where the purpose and purposefulness were ill-defined because of conflicting interests amongst different actors. On one level OR developed academically with the pursuit of 'modelling' techniques " - a study of the delights of algorithms; nuances of game theory; fascinating but irrelevant things that can happen in queues" (Churchman in 1979 p. 50). In instances where the instrumental force of techniques assumes an authority of its own, effectively by-passing issues of purpose, the 'irrelevance' of approaches might be transformed into a more intrusive form - what has been termed a "cybernetic technocratism" (Flood, 1990), or where, in terms of social planning, there is a propensity for the means to define the ends (Ulrich 1988a).

Practitioner Matters

Hard systems *thinking* in social science is characterised by a *positivist* epistemology wherein the systems being examined assume the status of real world objects - a *realist* ontology - in much the same way that natural 'objective' science based on empiricism treats its subject-matter (Churchman, 1970, in Flood and Jackson 1991a). Checkland (1981), Jackson (1985), Flood and Jackson (1991b) and Ellis (1995) draw attention to Burrell and Morgan's 1974 typology of four social science paradigms - *subjectivist* "radical humanism" and "interpretivism", and *objectivist* "radical structuralism" and "functionalism" - in signalling the correspondence between the "functionalist paradigm" and hard systems thinking. The paradigm claims that sociological 'models', represent actual 'systems' constituents of the real world which, once conceptually formulated can then be legitimately *engineered*. There appears to be general agreement that the enduring legacy of perceiving 'systems' in terms of a realist ontology - existing outside of human purposefulness - was strongly influenced by Bertalanffy's 'general systems theory' in the 1940s (Checkland, 1991; Jackson, 1990; Flood & Ulrich, 1991). Such theoretical underpinning promotes systems practice as an essentially *regulatory* function.

Systems Change Matters

The technical bias and positivist theoretical underpinnings of hard systems thinking lends itself to a perspective of systems as homeostatic, 'closed', and with an equilibrium to be maintained. The task of systems practice from the 'hard' perspective, as Oliga (1990) observes, is to ensure the 'stability' of such systems. Control is the management intention which systems practice is seen to serve. In narrowly focusing on goals and instrumental 'means' for achieving the goals, rather than allowing for questioning the systems' built in objectives (purpose) and underlying interests (purposefulness), social consequences of systems design are ignored (Checkland, 1981). The result of this orientation towards control

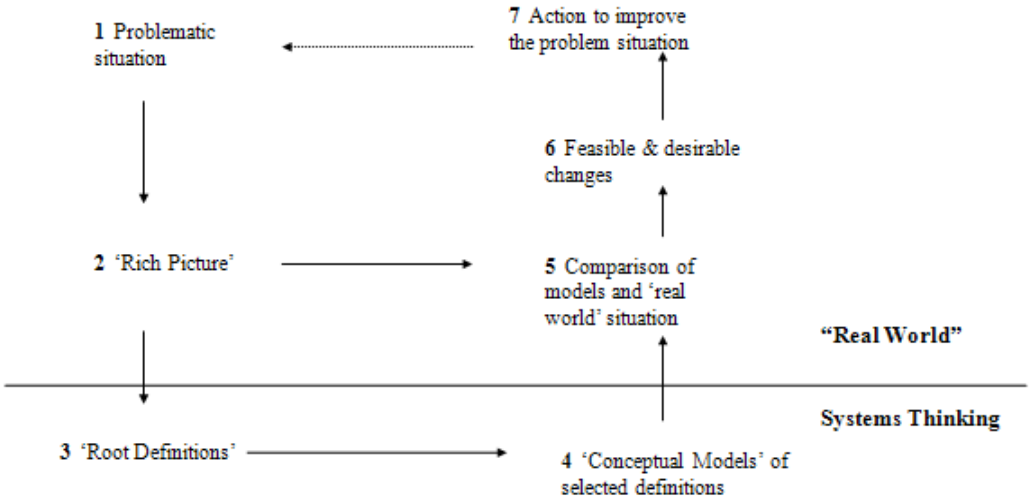
is to maintain or even accentuate existing power relations implicit in the system (Flood & Ulrich 1991).

Checkland (1978) points out how the 'hard' systems tradition promotes the 'neutral' 'value-free' image of the systems analyst. Implicitly, therefore, it would appear that institutional conservatism relates as much to stabilising the institutional practice of systems analysis (authority of the experts) as with stabilising institutional practice of client organisations being served by systems analysis.

Towards Soft Systems Approaches

From the late 1970s the three dimensions of critique were translated into two distinct systems' approaches; firstly, a *soft systems* approach that focused primarily on developing an *epistemological* challenge in the practitioner domain, and secondly, a *critical systems* approach which focused increasingly more on the *political* challenge generated in the systems change dimension. The soft systems 'interpretivist' approach attempts to; (a) provide the basis for techniques to address pluralist purposes, (b) adopt the principle of 'multiple realities' as an anti-positivist (interpretivist) theoretical framework, and (c) promote institutional change (Jackson, 1991a; Flood and Ulrich, 1990). Amongst the soft systems approaches to emerge in the 1980s (see Figure 1), Checkland's (1981) soft systems methodology (SSM), developed with colleagues at Lancaster University, is one of the best known and most enduring (case studies are particularly well documented in Checkland and Scholes, 1990).

The success of SSM might be attributed to the detailed development of methodological procedures for addressing complex human-based problem situations. These are commonly represented as an iterative learning cycle with seven stages of enquiry (Figure 3) although Checkland himself more recently describes it in terms of two parallel streams of enquiry.



Stage 1 **The `problem situation' unstructured**

The remit of intervention is identified, providing the site sometimes referred to as 'the mess'

Stage 2 **The problem-situation expressed**

Ordinarily carried out through a *rich picture*; a tool used for brainstorming ideas of the problem situation usually with the active collaboration of those involved with the system. Designed to generate the main *issues* (e.g. conflicts) and *tasks* (e.g. communication links, social or institutional norms and roles) of the system.

Stage 3 **Root definitions of relevant systems**

Systems deemed relevant to the problem situation are first conceptually identified through isolation of 'problem themes', *named* and provided with concise *root definitions*; formulated around fundamental systems questions encapsulated in the mnemonic **CATWOE**:

Customers/clients : beneficiaries of 'T'
Actors/agents: those who would do 'T'; 'experts'
Transformation ('T'): the purpose of the system
Weltanschauung (worldview): value-informed view which makes 'T' meaningful
Owner(s): decision makers who control conditions of the system
Environment: 'constraining' elements outside the system

Stage 4 **Conceptual modelling**

To encapsulate the key activities which the system must undertake in order to fulfil the requirements of the root definition. System models are expressions of ideal forms of organised activities. Derived from the root definition rather than rich picture. Used for pro-active interrogative and analytical work, rather than a contrivance at representing 'reality'.

Stage 5: **Comparative analysis**

Conceptual constructs (models) compared with the 'realities of the mess'. Carried out both *monologically*, comparing conceptual models with the 'rich picture' formulated in Stage 2, and/or, more preferably, *dialogically*, in a process of re-presenting models back to those involved with the system in order gain critical feedback.

Stage 6: **Debate changes**

The critique emerging from Stage 5 is used as the basis for a debate amongst those involved with the system, concerning the *desirability* and *feasibility* of future changes

Stage 7: **Action** to improve the situation

Implementing changes agreed upon during the Stage 6 debate or reverting back to Stage 3.

Source: adapted from Checkland, 1981.

Figure 3. Stages of Soft Systems Methodology.

A distinction between a 'logic-based stream of analysis' (represented by the 7 stage core method) and a 'stream of cultural analysis', articulated later by Checkland and Scholes (1990), precludes any assumption of a linear flow between these seven stages. The 'cultural analysis' constituent of the framework, reinforces the essential iterative nature of SSM. It is a particularly important constituent to stages 1 and 2 of the core method, providing a dialogical means towards defining relevant systems in stage 3.

3.2. Critique of 'Soft' Systems

Context Matters

Jackson (1982) questioned the ambitions of soft systems thinking as expressed in the work of Churchman, Ackoff, and Checkland, arguing that the domain of application for soft systems remains, as with hard systems, restricted. Jackson observed that soft systems can only work in conditions which allows for "genuine" debate amongst those involved. Despite many years of documented practical success there would appear also to be circumstances that mitigate against its successful deployment:

> "SSM continues to be employed uncritically in problem situations where the mobilisation of differentiated power resources by different interest groups makes genuine participation impossible" (Jackson, 1990 p. 362).

Flood and Jackson (1991b) further argue that SSM practitioners often compound this problem by advocating for SSM a status as a 'meta-methodology' incorporating hard systems as a constituent part of SSM.

Practitioner Matters

Jackson's critique of soft systems approaches are rooted in the assertion that interpretivist theory offers nothing in relation to theorising about institutional change... "It is surprising to find that at the moment no genuinely interpretive systems *theory* exists... Such a theory would have to probe the systemic nature of interpretations individuals employ in constructing the social world" (Jackson, 1982 p.18). John Oliga (1988), whilst acknowledging the achievement of soft systems approaches in having made an ontological break with empiricism, rejecting realist assumptions of there being an 'objective' world of social facts, suggests that soft systems practitioners continue to assume attaining 'objective knowledge' at the level of theory. In pursuing this point, Oliga distinguishes between 'naturalistic' and 'historic' hermeneutics; suggesting that it is the former which effectively objectifies others' realities. The validity of SSM is based upon respect for the point of view and aims of all the 'stakeholders'. However, Oliga argues that because SSM practitioners neglect the influence of social structural factors on the formation, maintenance and (it might be added) articulation of worldviews – a term introduced by Churchman (1971) in translation of the more rich

German term, Weltanschauung - they perpetuate ontological realism at the theoretical level despite having made an ontological break with empiricism at the methodological level.

The effect, referred to as "epistemological impoverishment" (Flood & Ulrich, 1991 p. 306), is to produce a theoretical stance which is relativistic and without external legitimisation. Similarly, Jackson (1991a) argues, change can only be understood in SSM via the processes of communication facilitating mutual understanding between the involved actors. This is epistemologically 'impoverished' through not being able to appreciate the 'effects of material conditions' and the incidence of 'false consciousness' on peoples' worldviews (Flood & Ulrich, 1991).

Systems Change Matters

> "What I hear Habermas arguing is that the debate at stages 5 and 6 of the soft systems methodology will be inhibited by society's structure. I think that it is in the nature of society that this will be so." (Checkland, 1981 p. 283).

> "Recommendations of soft systems thinking remain "regulative" because no attempt is made to ensure that the conditions for "genuine" debate are provided" (Jackson, 1991b p.133).

SSM does not discriminate between worldviews. According to Jackson, the methodology is therefore 'ideologically naive' since no attempt is made to relate worldviews to social relations of power effecting incidences of false consciousness.

> Put another way; "...there are no explicit directives in the theory that aim to prevent the approach from being expert driven" (Flood & Ulrich 1991p. 198). An authority is implicitly established by virtue of there being no explicit reference to theory (cf. Sangren, 1988).

Oliga (1990) maps out an architecture of power and ideology in relation to different systems practice, and examines how underlying assumptions inform institutional perspectives of 'stability' (social control) and 'change' (social transformation). Whilst hard systems thinking (as a function of positivism) typically neglects the subjective domain of 'worldviews' and focuses on relations of power as constituents of systems regulation, soft systems typically neglect the relations of power determining ideology. Oliga argues that by focusing upon either one or the other in the 'power/ideology' dialectic, both 'hard' and 'soft' traditions implicitly share a conservative view of using systems practice for social control; that is, maintaining social order in the face of actual or potential conflicts. What may appear to be institutional liberalisation, as professed by some soft systems practitioners, turns out to be ideological conservatism (a point made by Flood & Ulrich, 1991); ideology removed from relations of power.

Towards Critical Systems Approaches

To summarise the critique so far, *contextual* concerns have questioned the (in)appropriateness of systems approaches in application to diverse and often conflicting human purposes. *Practitioner* concerns have generated debate over the principles behind the social construction of knowledge in relation to the 'systems idea'. Since the 1940s with Bertalanfy's realist ontological interpretation of 'systems', considerable confusion between

the ontological and epistemological conceptualisations of systems have beleaguered the systems literature (Flood & Ulrich, 1990:186; Checkland, 1991p. 26). Finally, *systems and institutional* concerns over social/political stability and change have raised fundamental issues concerning power and ideology in relation to systems practice.

At the same time that Peter Checkland was establishing *soft systems methodology*, Werner Ulrich (1983) was formulating *critical systems heuristics* (CSH). Both addressed problems of applying 'hard' systems practice - particularly as manifest in operations research - to social affairs. Both acknowledge significant influence from Churchman (1971) who first introduced the idea, derived from his mentor Edgar A. Singer, that social systems are teleological or, in more common language, *purposeful*.

Whereas in soft system practice the original systems idea (as a *human* construct) was thought best to be reinvented through new terminology - "wholismic thinking" (Ackoff, 1981) or "holonic thinking" (Checkland, 1991) - abandoning the term 'systems thinking' to its realist ontological colonisation (*ibid* p. 27), Churchman and Ulrich significantly retain the idea of a system bounded by "*whole system judgements*"; constructs imbued with human intentionality. The use of the term "systemic" thinking and practice encapsulates and retains the meaning of the original epistemological intention of the systems idea.

In the following sub-section concepts and ideas derived from Churchman and Ulrich are traced, providing a further understanding of the idea of a critical dimension to systems thinking in practice.

3.3. Emergence of Boundary Critique

Context Matters

Churchman's characterisation of purposeful systems dealt initially with only those *involved* in the systems design. Nine conditions that must be fulfilled for a system (S) to demonstrate purposefulness were identified (derived from the philosophy of Immanuel Kant). The conditions are reproduced in summary below (adapted from Churchman, 1971 p. 43)

1) S is teleological
2) S has a measure of performance
3) There is a client whose interests are served by S
4) S has teleological components which coproduce the measure of performance of S
5) S has an environment (both social and ecological)
6) S has a decision maker who can produce changes in the measure of performance of S's components and hence changes in the measure of performance of S
7) S has a designer who influences the decision maker
8) The designer aims to maximise S's value to the client
9) There is a built in guarantee that the purpose of S defined by the designer's notion of the measure of performance can be achieved and secured

Churchman (1979 p. 79) later reordered these nine conditions into three groups of three categories; each group corresponding with a particular *social role* - client, decision maker, and planner. Each category is associated with two allied categories which Ulrich later termed *role specific concerns* and *key problems*. Reynolds later renamed these three category groups

in terms of stakeholders, stakes and stakeholding issues (Reynolds, 2007). Ulrich also identified each category group with a term reflecting the primary source of influence - *motivation*, *control*, and *expertise* - for client, decision maker, and planner ("designer") respectively (Ulrich, 1983 p. 250) (see Table 1).

Table 1. Categories of 'Involved' in a Purposeful System's Design

Churchman's 1971 nine conditions for a purposeful system	Churchman's 1979 three groups of three categories for a purposeful system	Ulrich's 1983 sources of influence informing a purposeful system
Group 1		
condition 3.	*social role*: client	sources of motivation: whose purposes are served?
condition 1.	*role specific concerns*: purpose	
condition 2.	*key problems*: measure of performance	
Group 2		
condition 6.	*social role*: decision maker	sources of control: who has the power to decide?
condition 4.	*role specific concerns*: components	
condition 5.	*key problems*: environment	
Group 3		
condition 7.	*social role*: planner/designer	sources of expertise: who has the know-how?
condition 8.	*role specific concerns*: implementation	
condition 9.	*key problems*: guarantor	

Churchman (1979 p.80) suggests a role for those *affected* by systems design, and provides a self-reflective description of an additional three categories that centre around the role of *systems philosopher*; along with the two related categories, the *enemies of the systems approach* and *significance*. It is Ulrich (1983) however who systematically distinguishes between those *involved* in a system's design and those *affected* by a systems design so as to define the latter role more concisely for social systems planning. The category of those affected by, but not involved in, systems design are designated by Ulrich as being the *witness*; those who in practical discourse will argue the case of the affected (*ibid* p. 252). The role specific concerns of the witness are conceptualised as those of *emancipation*; liberation from oppressive material conditions and false consciousness.

> "... it [emancipation] reminds us that social mapping and design is not merely a matter of instrumental orientation toward some purpose (as functionalistic "systems science" seems to assume), but that for *socially* rational planning it is essential that the planner initiate a *process of emancipatory self-reflection on the part of the affected*" (Ulrich, 1983 p. 257; original italics).

The final 'key problem' category represents the possibilities of a conflict in *worldviews* - "different visions of what social reality and human life in it ought to be" (*ibid*) - between the

involved and the affected. Consequently the "source of influence" for this category group is defined as the *source of legitimisation*. Table 2 summarises the twelve "critical-heuristic categories."

Table 2. Critical-Heuristic Categories

<table>
<tr><th colspan="3">Categories</th><th colspan="3">Dimensions of intentionality</th></tr>
<tr><td>1</td><td>Client?. Purpose?</td><td>(role)</td><td rowspan="3">Sources of motivation</td><td rowspan="6">Those involved</td><td rowspan="9">The purposeful System of concern (or context of application) on which depends the meaning of 'improvement'</td></tr>
<tr><td>2</td><td>Measure of</td><td>(concerns)</td></tr>
<tr><td>3</td><td>improvement?</td><td>(problems)</td></tr>
<tr><td>4</td><td>Decision maker?</td><td>(role)</td><td rowspan="3">Sources of control</td></tr>
<tr><td>5</td><td>Components?</td><td>(concerns)</td></tr>
<tr><td>6</td><td>Environment?</td><td>(problems)</td></tr>
<tr><td>7</td><td>Planner?</td><td>(role)</td><td rowspan="3">sources of expertise</td></tr>
<tr><td>8</td><td>Expertise?</td><td>(concerns)</td></tr>
<tr><td>9</td><td>Guarantor?</td><td>(problems)</td></tr>
<tr><td>10</td><td>Witness?</td><td>(role)</td><td rowspan="3">sources of legitimisation</td><td rowspan="3">Those affected</td></tr>
<tr><td>11</td><td>Emancipation?</td><td>(concerns)</td></tr>
<tr><td>12</td><td>Worldviews?</td><td>(problems)</td></tr>
</table>

Adapted from Ulrich, 1983:258; 1993 p.595 and 1996 p.43.

Checkland (1981) similarly uses Churchman's nine conditions of a purposeful system as a basis for formulating the CATWOE mnemonic (client, actor, transformation, worldview, owner, and environment; see Figure 2). It has been argued that Checkland uses the conditions in a functionalist manner by accepting them as given, though defined differently by different stakeholders. Consequently, Ulrich (1983 p. 247, footnote 11), for example, argues that SSM contributes (albeit unintentionally) to systems maintenance. In contrast, Churchman and Ulrich engage in challenging the conditions by asking for each condition what 'is' the actual situation in juxtaposition to what 'ought' to be the ideal situation. This engagement with the ethics of conditions - encouraging an 'is'/'ought' dialogue - and Ulrich's subsequent development of the categories associated with the 'affected' (Churchman's "systems' enemies") in juxtaposition with the 'involved' - is a key distinction between Checkland's SSM and the critical systems approach.

Churchman (1979) in *The Systems Approach and Its Enemies* describes his purposeful systems inquiry as a *process of unfolding*, though refrains from providing any precise definition. In examining his own twelve categories of 'whole systems judgements' belonging to a purposeful system, Churchman states:

> "I'll be more interested in their process of unfolding rather than in their definitions...(and).. in explaining the unfolding of meaning, I'll use imagery, and specifically the imagery of striving-force and the opposite, passive-helplessness" (Churchman, 1979 p. 80).

Unfolding as a dialectical process comes closest to any form of definition offered. Ulrich also appreciates Churchman's process of unfolding as a dialectic:

> "We call this dialectical interplay between planners ("systems rationality") and witnesses (lived social practice) the *process of unfolding*. The process of unfolding is intended to represent our critical, and practicable, solution to the problem of practical discourse" (Ulrich, 1983 p. 266, original italics).

Ulrich is describing here what in later years he would refer to as constituting the last of three steps of unfolding: first, the mapping out of the twelve categories (roles, concerns, problems) in the form of "boundary questions"; second, contrasting "actual with ideal" mapping; and third, promoting "stakeholder participation" (Ulrich, 1988a pp. 423-425).

The first step is analogous Singer's holistic concept of *sweeping in* (Churchman, 1979 p.78; Ulrich, 1988a p. 423). In CSH terms this exercise is undertaken with precise guidelines associated with what is termed the "social mapping" of the twelve boundary questions ('roles', 'role-concerns', and 'key problems') associated with sources of motivation; control, knowledge, and legitimacy; each source of influence (Table 2).[1]

Whilst *sweeping in* conjures up an endless quest for comprehensiveness, the *process of unfolding* has been described as "the critical counterpart to the sweep-in process" (*ibid*). The critical idea of the sweep-in concept is to increase the awareness and understanding of systems' dimensions and concerns from various perspectives. This is undertaken through the subsequent two steps of unfolding: firstly, through subjecting each of the twelve boundary questions to an "is" and an "ought" mode, and secondly, through subjecting the systems design (as created by those *involved*) to a wider democratic process "in which the *affected* citizens emancipate themselves from the premises and promises of experts" (Ulrich, 1983 p. 263, my italics).

The second and third 'steps' of unfolding as described by Ulrich prompt questions regarding the underlying practitioner underpinnings and systems implications of CSH.

Practitioner Matters

A feature of Ulrich's CSH is the attempt to marry the ideas from Habermasian critical social theory with the concerns of systems practice so as to effect an alternative *practical* approach to enquiry (Ulrich, 1983:106-166). The approach builds upon Churchman's ideas of systems practice as a *dialectical* pursuit; though Ulrich more precisely associates the dialectics of systems practice with Habermas' *pragmatistic* model of rational discourse and communicative action (*ibid* pp. 240-243). The model challenges the means/end dichotomy prevalent in positivist approaches manifest in what Habermas refers to as *decisionistic* and *technocratic* models of social enquiry. Decisionistic models separate the privilege of choosing between 'ends', seen as located in the domain of politics, from the value free 'means', located in the domain of expertise. Technocratic models reverse the primacy of the politician over the expert implicit in the decisionistic model, and suggests instead that the political process in decision making is simply a "stopgap in a still imperfect rationalisation of power, in which the initiative has in any case passed to scientific analysis and technical planning" (Habermas, 1971, quoted in Ulrich, 1983 p. 75). Both models assume the separability of means and ends.

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[1] Ulrich distinguishes between social mapping and social design: "If the task is to determine... *actual* social reality, i.e., the *problem* situation, we speak of "mapping"; if the task is to determine ("make real") *future* social reality, we speak of "design"" (Ulrich, 1983 p. 242). Social design corresponds with the SSM principle of conceptual modelling.

The pragmatistic model in contrast identifies a dialectic between means or *expertise*, representing questions of fact, and decision making about ends or *politics*, representing questions of value:

> "The dialectical or "pragmatistic" model thus requires a *model of rational discourse* between experts and political agencies, a model that can guarantee an adequate translation of practical needs into technical questions, and of technical answers into practical decisions. The basic requirement for such a discourse is that it be *public;* a second necessary requirement is that it be "*free from oppression",* that is , not subject to external sources of systematic distortion" (Ulrich, 1983 p. 78; original italics).

The "oppression" and "distortion" referred to by Ulrich can be understood in terms of a second theoretical construct offered by Habermas known as the knowledge-constitutive interest theory (Habermas, 1971). The theory is based upon the anthropological premise of there being two fundamental forms of human activity, *work* (or 'labour') and *interaction* ('language' or 'communication'). Each activity is associated with a particular *interest.* Work is associated with a *technical interest* in the prediction and control of natural and social affairs. Interaction is associated with a *practical interest* in fostering mutual human understanding. In order to realise the full potential of these two human activities - that is, having labour free from 'materialistic' and economic constraints and demands, and communication free from distortion brought about by 'false consciousness' - Habermas postulates a third *emancipatory interest*. This interest ensures freedom from coercion. The three constitutive interests are invariant though complementary, and are underpinned by three equally invariant though complementary 'rationalities' which are referred to respectively as *instrumental, strategic* and *communicative* (Figure 4).

Basis of Human Interest	**Knowledge Constitutive Interests & Associated Rationalities**
"Work"	*technical interest* in prediction and control of natural and social affairs *instrumental rationality* (labour) success depends upon technical mastery over social and natural processes
"Interaction"	*practical interest* in fostering mutual understanding *strategic rationality* (human interaction) success depends upon practical mastery over ensuring mutual understanding
"Power/Authority"	*emancipatory interest* in being free from coercion *communicative rationality* (authority relations) success depends upon being free from coercion imposed by power relations

Figure 4. Habermas' Taxonomy of Knowledge-Constituent Interests.

Ulrich's application of Habermas' pragmatistic model reinforces Churchman's idea of *purposeful* systems through making explicit the importance of including a dimension of human *intentionality* (Ulrich, 1983 p. 237). Returning to Burrell and Morgan's framework of

social theory paradigms it is evident that CSH does not fit readily into any of the four 'paradigms'. CSH might be seen rather in terms of proposing radical change through operating a *dialectic* between the *structuralism* in the objective domain, as depicted by the deliberations of the 'involved', and *humanism* in the subjective domain, as depicted by the counter-deliberations offered by the 'affected'.

In defining an emancipatory interest, constitutive theory provides an element of *purpose* to the pragmatistic model of inquiry through dialogue between those "involved" and those "affected":

> "... the idea of the "emancipatory" interest is to combine the "technical" interest in instrumental control with the "practical " interest in mutual understanding, so as to emancipate the inquirer from the seemingly objective (because unreflected) constraints produced by the former, technical, interest" (Ulrich, 1983:63).

From a theoretical standpoint, systems practice has undergone what Flood (in Flood & Ulrich, 1990) has identified as the two significant epistemological breaks: the first, manifest in particular through Checkland's SSM, has brought in the interpretivist idea of systems thinking where systems are considered as *epistemological* conceptual tools rather than *ontological* real world entities; the second, manifest through Ulrich's CSH, has highlighted the critical interpretivist divide between the (systems) rationale of the involved in contrast to the (social) rationale of the affected. Both 'breaks' are associated with a constructivist epistemology. The challenge remains with reconciling these two "epistemological breaks" with constitutive interest theory. With the first break the challenge is to clearly demarcate the relevance of constitutive interests to the *epistemological* idea of systems, in the same way - as discussed elsewhere (Reynolds, 1998) - as the ontological relevance of constitutive interests has been made relevant in systems practice; that is, alignments of 'hard'/technical, 'soft'/practical, and 'critical'/emancipatory (cf. Ulrich, 1988b pp. 150-151, Table IV; Oliga, 1988 p. 92; Flood and Jackson, 1991b pp. 324-325) .

The second epistemological break bears on the Habermasian 'emancipatory' project more directly by challenging systems practice to define more clearly the task of emancipating the 'affected' from the "premises and promises of involved experts" (Ulrich, 1983 p. 308). From a *political* or institutional standpoint, systems inquiry has shifted from an ontological concern regarding the factors necessary to control and maintain an *object system*, to a more explicit epistemological concern with *systemic practice* to bring about social transformation.

Systems Change Matters

The interaction between the involved and the affected corresponds at an institutional level with Oliga's interpretation of the interaction between power and ideology (Oliga, 1990). To recap, Oliga contends that the failure of systems practice to engage in the dialectic between power and ideology has effectively reinforced measures of social control and stability rather than facilitating social transformation and change. In hard systems approaches this failure is brought about by a neglect of the 'ideological' constituent (dismissing 'subjective') whilst in soft systems approaches the failure is due to neglecting issues of 'power' (thereby implicitly and uncritically accepting 'false consciousness'). Oliga argues that forces of change can only take effect when issues of power and ideology are both "doubted" through critical engagement between those involved with and those affected by systems practice.

Through its focus on interaction between the involved and the affected, CSH has an implicit radical agenda of institutional transformation. Although the methodology cannot claim to *replace* efforts to achieve institutional democratisation, it has a core purpose of ensuring that systems are not expert driven but are open to social critique and thereby open to radical change (cf. Ulrich, 1988b p. 159).

The "polemical employment of boundary judgements" is the term given by Ulrich (1983 p. 313) to the heuristic tool for enabling lay citizens or their representatives ('witnesses') to question the 'premises and promises' of the planners. According to Kant's *critical ideal of reason* "... no standpoint, not even the most comprehensive systems approach, is ever sufficient in itself to validate its own implications" (Ulrich, 1988b p. 157). Those 'affected' by a system can theoretically question the premises of experts in a polemical manner without assuming any expertise of their own. As Ulrich points out, polemic...

> "entails no positive validity claims and hence requires neither theoretical knowledge nor any other kind of special expertise or "competence". A polemical argument is advanced merely in hypothetical fashion, to show the dogmatic character of the opponent's ("the expert's") pretension of knowledge" (Ulrich, 1983 p. 305).

The practical limitations are centred around achieving meaningful dialogue between the 'involved' and the 'affected' in circumstances where the *former might be an unwilling player* and the *latter has little effective means of expression*. Flood and Ulrich (1990 p. 201) maintain that "... it pays careful and explicit attention not to presuppose that those in control of "decision power" are willing to take account of the views and interests of those affected, but only that they are interested in making their own views and interests appear to be defensible on rational grounds"

The question raised by Jackson (1985) as to why CSH should suppose that the powerful should take account of the views and interests of those affected but not involved is addressed by Flood and Ulrich:

> "As a rule, the powerful ... seek to conceal their specific private interests behind some facade of common interest, of generally acceptable norms or "objective necessities". A critical approach, although it cannot "force" the powerful to take account of the less powerful, can at least unveil this facade of rationality and objectivity which is so characteristic of the strategic action of powerful vested interests in present-day "interest group liberalism" ...[Polemical employment of boundary judgements] pays careful and explicit attention not to presuppose that those in control of "decision power" are willing to take account of the views and interests of those affected, but only that they are interested in making their own views and interests appear to be defensible on rational grounds" (Flood and Ulrich, 1990 p. 201).

Those in power have an interest in justifying the status quo through recourse to objectifying their authority (with the implicit intention of rendering harmless their position). Ulrich (1988b p. 158) argues that through such strategies the powerful leave themselves open to possible exposure and challenge given the application of appropriate social critique enabled by "democratically secured institutional arrangements". Ulrich later suggested possible areas for innovation:

> "*...a critically heuristic training for citizens*... I believe that the systems idea...might become important as a "countervailing power" to face the steadily growing influence of expertise in our society, namely, by something like a generally available "*expertise of laypeople in dealing critically with expertise*". ... I think of *new arenas of participatory conflict resolution* such as "planning cells" and "citizen reports on technological projects", i.e. , institutional arrangements within which citizens, together with experts and designers, can train themselves in critically heuristic debate." (Ulrich, 1993:608, original italics).

The suggestions here were later developed into what Ulrich (2003) described as critical reflective practice, as against another parallel tradition of CST referred to as critical pluralism (cf. Mingers, 1997; Jackson, 1999).

3.4. Critical Reflective Practice and Critical Pluralism

In the same way that Checkland's SSM gained prominence within the tradition of *soft systems approaches*, Ulrich's CSH emerged and developed prominence during the same period within a *critical systems thinking* tradition. CST was named in the mid-1980s, and was later given expression with two significant publications: the journal *Systems Practice*, first published in 1988 and renamed in 1998 as *Systemic Practice and Action Research*; and secondly, a compilation text in 1991 entitled *Critical Systems Thinking: Directed Readings* (Flood and Jackson, 1991a). The Centre for Systems Studies at Hull University has played a leading role in promoting CST through encouraging research and publications.

A particular variant of CST promoted at Hull is one based on promoting methodological and theoretical pluralism. The dominant expression of this is total systems intervention (TSI) – a methodology for drawing different methods together through a three-fold process of (i) creatively exploring problematic situations, (ii) choosing an appropriate systems approach, and (iii) implementing it (Flood and Jackson, 1991b). The emphasis on pluralism has been championed in particular by Mike Jackson. TSI builds on an earlier categorisation of systems methodologies (Jackson and Keys, 1984) called system of systems methodologies (SOSM). SOSM provides a matrix for classifying systems methods on two dimensions: one, the level of complexity of the problem situation (simple or complex), and the other, the degree of shared purpose amongst participant stakeholders (unitary, pluralist, or coercive relationships). It is this latter dimension that draws on the hard, soft, critical typology using metaphors as guiding principles – mechanic for the 'hard', living organism for the 'soft' and the metaphor of prison for the 'critical' situations. The classification yields a six celled matrix as illustrated in Table 3. Each cell defines a problem situation which then invites particular suitable systems methods (some examples are given).

Table 3. System of systems methodologies

		Participants		
		Unitary 'hard' systems based on mechanistic metaphor	Pluralist 'soft' systems based on organic metaphor	Coercive 'critical' systems based on prison metaphor
'Systems' i.e., problem situations	Simple	Simple unitary: e.g. systems engineering	Simple pluralist: e.g. Strategic assumption surfacing and testing	Simple coercive: e.g., critical systems heuristics
	Complex	Complex unitary: e.g., system dynamics, viable systems model	Complex pluralist: e.g. soft systems methodology	Complex coercive: (non available!)

Adapted from Jackson, 2000 p.359.

The two dimensions of situations are helpful in delineating the two aspects of systems thinking described above. The simple/ complex dimension relates to levels of interrelatedness and interdependencies, and the unitary/ pluralist/ coercive dimension relates to levels of engagement with multiple perspectives. Again such a model has been helpful in prompting systems practitioners to think more clearly about the nature of the problem situation – the 'mess' – in a simplified manner. It has helped with the appreciation that different systems methods might complement each other and indeed complement other approaches used for similar problem situations.

There are two difficulties with TSI. First, that a problem situation can somehow be easily identified as constituting one of the six 'problem situation' types by an expert practitioner seems to deny possibilities of there being underlying contrasting perspectives on the situation amongst different stakeholders. What may appear to be simple or unitary from one 'expert' perspective can often actually be quite coercive from the perspective of other stakeholders associated with the situation. Second, there is an underpinning difficulty in the pigeon-holing of particular systems approaches as being only suitable for specific types of situation. Firstly, there may be different opinions on where different systems approaches 'fit' based upon actual experiences of using the approach. A study of 30 key systems thinkers as practitioners (rather than focusing on methods associated with them) reveals the rich and diverse experiential background of using different systems approaches (Ramage and Shipp, 2009). Secondly, such pigeon-holing takes away the potential for systems approaches to themselves adapt and develop through different contexts of use amongst different users. A revised account of five systems approaches – system dynamics, viable systems model, strategic options development and analysis, soft systems methodology, and critical systems heuristics – drawn from various philosophical traditions suggests that their respective robustness over 30 years of use derives from their adaptability by different users in different contexts of use (Reynolds and Howell, 2010). Whilst systems approaches may well have derived from particular paradigmatic traditions of either functionalism, interpretivism or critical social theory, this does not imply

that they remain fixed in this tradition (ibid p.296). So whilst sociological paradigms may be helpful in *understanding* the origins of particular systems approaches, they are less helpful in theorizing and steering *practice* for developing methodologies based on mixed methods (Zhu, 2011).

Ulrich contrasts TSI, which he views as constituting a 'shallow' form of complementarism, with what he calls a 'deeper complementarism' offered by boundary critique underpinning critical reflective practice (Ulrich, 2003). This deeper sense of methodological complementarism does not privilege multiple methods per se but neither does it alienate or devalue any particular method. Rather than suggesting that there are appropriate methods for different predefined contexts, there is an acknowledgement of value given to any professional practice but that any such practice can benefit from a reflection on how it deals with judgments of 'fact', value judgements and boundary judgements. Boundary critique can therefore complement any methodology as a reflective tool. This deeper sense of complementarism using boundary critique at the level of methodology resonates with the theory of communicative action (Habermas, 1984) and the deeper sense in using Habermas' three knowledge constitutive interests at the level of theory in a more integral fashion for critical systems thinking (Reynolds, 2002). Traditions of American pragmatism with the writings of Charles Peirce, William James, and John Dewey, also provide more helpful theorizing frameworks for systems practice (Ulrich, 2006; Zhu, 2011).

Ulrich and Reynolds (2010) have further delineated two forms of boundary critique – boundary reflection and boundary discourse. Boundary reflection corresponds to a framework for understanding. Boundary discourse corresponds to a framework for practice. Together they contribute towards the framework for systems thinking in practice introduced earlier (Figure 2). The next section examines the implications of this critical systems framework for contemporary critical thinking.

4. IMPLICATIONS OF A 'CRITICAL' SYSTEMS THINKING IN PRACTICE

The previous section provides a framework for understanding the emergence of contemporary systems thinking in practice. But how might this inform a framework for practice for engaging with different perspectives and a framework for responsibility in enacting systems thinking in practice from a critical perspective?

From a contemporary 'soft' and 'critical' systems perspective, systems are regarded as conceptual constructs enabling an interdisciplinary space for purposeful conversation across disciplines and for exploring possibilities for creative change. In the context of international development discourse I have called this a 'creative space' (Reynolds, 2008b). If systems thinking in practice provides such a potentially powerful agent of change, what is that may inhibit such change? In the practical domain of engaging with different perspectives, the fear for change is manifest in the traps of uncritical thinking that pervade our everyday practices. Aligned with these traps is an unclear use of language around systems thinking. What precisely is meant by the terms systemic, systematic and system and how might such terms be more meaningfully incorporated in to a critical systems literacy?

4.1 Three traps of thinking in practice

Three particular traps of thinking in practice can be highlighted (Reynolds and Holwell, 2010, pp. 5-6; pp. 301-303). Each trap is associated with an uncritical focus on each of the three pillars of a framework for systems thinking in practice introduced earlier (Figure 2) – (i) silo problem-solving (fixing situations) representing the trap of *reductionism*, (ii) people management in (fixing people) representing the trap of *dogmatism*, and (iii) systems obsession (with fixed ideas) representing the trap of *fetishism* (with *expressions* of uncritical *holism* and *pluralism*). Each of these traps can then be aligned with relevant systems ideas associated with managing change.

Trap 1: Silo Problem-Solving: Towards Anticipating *Systemic* Change

> "We are most comfortable working in *silos* – our own, independent function or department, our own industry or agency, our own sector (business, government, civil)… Our structures hardwire us into silos, reinforcing independent rather than interdependent habits – even matrix organizations are still fixed within topic-specific domains, and the fact that non-governmental or non-profit agencies are segregated by function (education, healthcare, housing, etc.) creates the same silo mindsets" (Huston 2007 p.46).

The conventional functionalist systems idea of organisation – a whole consisting of related parts contributing to a particular function - has contributed considerably to a reification of this type of silo thinking. Organisations are typically organised with departmental terms of reference carrying clearly defined remits for employees. The idea is neat, easy to work with in terms of providing some assurance of *certainty*, or at least lack of ambiguity, and most importantly, as suggested above, *comfortable*. Comfort is conventionally drawn from some basic (mis)understanding about organisations working as self-contained functional systems, the output of which is unquestionably some 'good' for the wider community. It pervades many impressions of organisations whether small and simple or large and complex. The UK National Health Service (NHS) for example was likened to a super-tanker by a British Government Minister in the 1980s. The analogy conjures up not just slowness and difficulty in being re-directed, but that there are discrete parts with particular functions all contributing towards an ultimate destination. The image is very much in contrast to many complexity theorists such as the Noble laureate, Ilya Prigogine (1997), who claims that no static system can exist. Organisations like the health service are inherently unpredictable because they continually change from within due to the changing dynamics of interrelated parts. This is what is meant by **systemic** change.

A systemic **issue** comprises *complexity*, *uncertainty*, *interdependencies* and *controversy* involving a wide range of variables requiring *resolution*. A technical **problem** on the other hand bounded by a fixed bounded silo occupies the more comfortable domain, amenable to a *solution*, usually provided by a traditional 'expert'. Characteristics of issues are troublesome! They can sometimes distract from getting things done. But can they be ignored?

The trap of silo thinking is based upon the idea that such issues can be ignored. It is associated with reductionism. A critical perspective on systems acknowledges that, to use a famous systems adage, a system is merely a *map* of a situation or territory, not to be confused with the actual *territory*. Real world complexities represent something that exists outside of

any one conceptualisation of context. The real world complexity provides the site for systemic change. In terms of a systems literacy, the tension between system and situation might be appreciated in terms of a conversation. The distinction between thinking about systems and systems thinking is helpful in clearing ground between systems thinking and related disciplines associated with systems sciences (e.g., complexity and chaos theory). It respects rather than struggles against two different perceptions of 'systems': one, as with systems thinking, an epistemological construct; the other, as with systems sciences, more an ontological entity.

A key underplayed intent of systems thinking associated with systemic change is to make simple the complex web of interrelationships and interdependencies in a transparent (and thereby questionable) manner. In short, systems thinking about systemic change involves a continual conversation between 'systems' and 'situations'; a tension expressed through the act of making simple the complex – a tension that invites more an artistic rather than scientific literacy. This is not to deny the importance of a scientific literacy promoting more detailed understanding in terms of, say, evolutionary science, chaos theory and complexity sciences, but the craft of systems thinking is primarily geared towards making manageable the complex. The task involves using a language that is accessible to all stakeholders.

Trap 2: Fixing People: Towards Purposeful *Systematic* Change

> Glendower:
> I can call spirits from the vasty deep.
>
> Hotspur:
> Why, so can I, or so can any man; but will they come when you do call for them?
>
> From William Shakespeare (Henry IV Pt.1 Act III Scene 1)
>
> "A systems approach begins when first you see the world through the eyes of another" (Churchman 1968 p.231).

The Shakespeare quotation was used as an introduction to the British House of Commons Environment, Food and Rural Affairs Committee (March, 2003) report: The Water Framework Directive (WFD): Fourth Report of Session 2002-03 Volume 1 p.5. HC130-1. Its purpose was to highlight the problem and inadequacy of conventional approaches towards environmental management through control-orientated fiscal and regulatory measures.

The trap of 'fixing people' into pre-designed purposes – 'purposive management' – is based upon the misguided behaviourist idea that different purposes from different perspectives can be moulded into a consensual purpose. The story of failure in organizational change projects, and the argument for WFD, in contrast, suggests alternative strategies based upon working *with* people/ stakeholders rather than working *on* them. The trap here is related to the trap of dogmatism. Systemic failure in many situations can often be associated with the dogmatic disregard of other perspectives that inform the situation.

The literacy called for requires not just simplifying realities for individual comprehension but making sense of realities for mutual understanding amongst stakeholders involved in a situation in order to foster shared practice. This second aspect of a systems literacy speaks to the human dimension of intervention. As such it speaks of *systematic* change; change directed

by human agents. The term 'systematic' relates to an inevitable requirement of orderliness. Our means of communication through language and discourse requires levels of systematisation to a greater or lesser extent so as to generate some sense of mutual understanding.

The systems literacy relates to two significant intervention theories. In 1960 Douglas McGregor published *The Human Side of Management*, in which he introduced the concept of Theory X and Theory Y styles of management. Theory X is the conventional mechanistic style of top-down management treating people as having no responsibility, preferring to be told what to do and to have decisions made for them. Theory Y conversely assumes a more constructive role:

> "It was quite an article of faith, this Theory Y. Everything about the structure of corporations went against it: the perks and power structure of the hierarchy, the labour relations tradition, the curricula at most business school…, and all those devices like performance appraisals, that measured one person against another. Adopting Theory Y would mean giving up both the stick (threatening to fire people) and the carrot (bribing them or being paternalistic). Without those two weapons, what leverage did a manager have? Only the ability to spark other people's involvement and commitment, by giving them the opportunities to do good work—hardly a strong incentive by conventional standards" (Kleiner 1996 p. 46).

The second idea of social learning is situated in planning theory. John Friedman (1987) describes social learning as the third of four traditions informing planning - the other three being 'social reform', 'policy analysis' and 'social mobilization'. He contrasts social learning with the more control-oriented tradition of policy analysis which, he claims:

> "is a form of anticipatory decision-making, a cognitive process that uses technical reason to explore and evaluate possible courses of action.... Social learning, on the other hand, begins and ends with action, that is, with purposeful activity… It is the essential wisdom of the social learning tradition that practice and learning are construed as correlative processes, so that one process necessarily implies the other." (Friedman 1987 p. 181).

Social learning, like Theory Y, invokes a proactive engagement amongst stakeholders in systematically managing change. The idea moves away from implementation modelled on hierarchical notions of working *on* people – restructuring, reconfiguring, re-engineering – and then dealing with inevitable subsequent resistance amongst stakeholders, towards a more collective notion of working *with* people – stakeholding development. The notion of social learning builds on the importance of nurturing the tension between changing *practice* and *understanding* between stakeholders (Blackmore et al. 2007; Reynolds 2008b). The learning here is collaborative (hence 'social') involving multiple stakeholders including professional experts, and the action is concerted, again involving multiple stakeholders. The notion of concerted action is captured in the metaphor of an orchestra, with multiple individual players doing different things, though all contributing towards some hopefully harmonious output.

Conventional systematic change is *purposive*. This involves a linear application of tools to serve a prescribed purpose. In contrast, *purposeful* systematic change involves use of language, amongst other tools, for iterating on better revised goals based on improved understanding and better practice.

Trap 3: Maintaining Systems or 'Systems' Obsession: Toward Meaningful *Systems* Change

"To a man with a hammer, everything looks like a nail" (Mark Twain).

This familiar mantra provides a reminder that our tools and models, including systems frameworks as systems tools, can often be sub-consciously overpowering in determining how we approach issues. But what about its counterpart? Continually adopting 'new' systems runs the risk of elevating the notion of 'system' to a fetish status; celebrating the very notion of system as being the panacea for crises. Systems are often referred to in association with new developments – miraculous ways of doing things.

The trap of systems maintenance, or being obsessive with the tools we construct, lies in reifying and privileging the 'system' - whether it's old or new – as though it has some existence and worth outside of the user and some status beyond its context of use in enabling change. McGregor's Theory X depicting a conventional model of management hierarchically imposed and indiscriminately applied across all parts of an organisation, regarding stakeholders as objects rather than subjects, is perhaps the most pervasive example of an implicit system - a conceptual model - resilient to change. It is a pervasive way of thinking that continues to hold a widespread grip on management practice. There are many other 'systems' that similarly entrap our understanding and practice. A generic term for these is 'business as usual' (BAU). Examples include the annual cycles of organisational planning, target setting, budgeting, the development of performance indicators and performance related pay incentives etc. BAU models maintain existing 'systems' principally because of a fear for change. But the fear is not evenly distributed amongst all stakeholders. Some fear change more than others simply because the system works in a partial manner. The system works for some and not for others.

All systems are partial. They are necessarily partial – or selective – in the dual sense of (i) representing only a section rather than the whole of the total universe of considerations, and (ii) serving some parties - or interests -- better than others (Ulrich 2002 p. 41). In other words, no proposal, no decision, no action, no methodology, no approach, no system can get a total grip on the situation (as a framework for understanding) nor get it right for everyone (as a framework for practice) (Reynolds, 2008a).

Drawing on the quotation from Chapman at the beginning of this chapter, the two dimensions of partiality respond to the two transitions implicit in systems thinking about systems change; one, towards holism, and another towards pluralism. Given the partiality of systems a third critical dimension is required where systems boundaries inevitably need to be made and questioned on the inevitable limitations of being holistic and pluralistic.

Frameworks are used widely as a means of providing some overriding shape and guidance towards recommended action. Different systems approaches can be considered as frameworks. Systems are more detailed expositions of a framework. The relationship between a framework and systems is analogous to that between policy and plans. Whereas policy provides an overall guidance structure, individual plans around projects and programmes might be considered as expressions of policy. Indeed the term policy framework is often used to describe the wider setting of planning initiatives on projects and programmes. As the name

implies, *framework* has two interrelated parts; one, a cognitive or conceptual device – a *frame* of reference which, two, enables *work* through systems (plans, projects, programmes etc.)

The trap of fetishism signals responsibility in systems thinking in two dimensions – one towards understanding and another towards practice. First, with respect to understanding, there is an imperative to continually ask questions of 'systems'; to appreciate them as *judgements* of fact rather than *matters* of fact. For example, when confronted with arguments of an iniquitous 'economic system' generating continual social and ecological impoverishment, or an 'education system' that systematically continues to marginalise particular sectors of our community, systems practitioners have a responsibility to create space for, and help support the framing of, better systems, rather than perpetuating the myth that these are some God-given realities that we need to simply live with.

Second, with respect to practice, the sense of responsibility here lies with our humility in systems design; in avoiding inclinations to fetishise systems. Geoffrey Vickers cautioned against over-enthusiasm in the models (that is, systems) that we generate (Vickers 1987). We can often live by the dictate of models rather than, as should be, the changing realities in which the models are applied and which ought to further shape or indeed make redundant such models.

4.2 Towards a critical systems literacy

The risk of systems obsession is akin to moralism. Humberto Maturana makes a relevant point distinguishing between being moralistic and ethical. Moralists, he suggests, "lack awareness of their own responsibility. People acting as moralists do not see their fellow human beings because they are completely occupied by the upholding of rules and imperatives; that is a particular systems design. They know with certainty what to be done and how everybody else has to behave" (Maturana & Poerksen 2004 p.207). Being ethical, in contrast requires giving legitimacy to people, and particularly those who may disagree with the rules. Using our own form of systems literacy, systems boundaries (the domain of systems change) are subject to systematic changes invoked by the designers and users of systems, and systemic changes invoked by those subject to the use of systems. There is here a triadic interplay between three perpetual factors – systems with their boundaries, people and their values, and real world entities and events in the factual domain. The relationship between them can be expressed in terms of either an entrapped vicious circle or a liberating virtuous cycle. For example, in terms of vicious circles, the Mark Twain quote might be seen in terms of a hammer (a system's tool), the hammerer (systematic people), and the hammered (systemic events). The analogy of the UK National Health Service to a super tanker ship might be interpreted in terms of a steer (the system or definitive plan of direction), a steerer (systematic pilots or experts), and the steered (passive passengers).

The three types of trap noted above represent responses to particular types of well-founded anxiety and fear with managing complex issues. There is the continual fear of systemic *uncertainty* in unforeseen events and unintended consequences, the fear of losing or even reinforcing excessive systematic *control*, and the fear of *change* in systems; an undue ultimate optimism in old or new systems. Table 4 summarises these traps in terms of contributing towards a critical literacy of systems thinking in practice.

Table 4. Features of a critical systems literacy

Type of change	Location of change	Primary intent	Risks or traps	Some key vocabulary
Systemic	Complex realities or situation	Make simple & manageable the complex web of realities for improving situations	Seeing a mess as simple problem-solving i.e., reductionist thinking rather than as improvement resolution.	Complexity Feedback Emergence Uncertainty Autonomy
Systematic	Stakeholders	Developing mutual understanding and shared practice	Fixing people as objects for purposive endeavours rather than as purposeful subjects.	Perspectives Praxis Learning Stakeholding
Systems	Conceptual worlds	Improvement of situations and emancipation through reflective practice	Complacency and obsession with 'systems' e.g., as holistic devices, rather than as temporary pragmatic constructs	Judgements Boundaries Reframing Critique

A key intent of systems thinking associated with systems change is to continually question boundaries of our conceptual constructs with a primary focus on improving the situation. That is, with a focus on steering good systemic change.

5. SUMMARY

In an online analysis contrasting the source of scholarly publications in which the terms 'critical thinking' and 'systems thinking' were mentioned, 88% of the papers in which the term critical thinking appeared were in social sciences, arts and humanities, whereas for systems thinking 48% were found in literature from those fields with the remainder being dispersed across a range of other disciplines including business, engineering, maths, and different biophysical sciences (Cabrera, 2006). As noted by Cabrera, this would suggest that systems thinking appears to have significant currency over and above critical thinking in fostering a greater engagement of interdisciplinarity.

The argument put forward in this chapter though is that systems thinking is indeed interdisciplinary, but coupled with more explicit attention to critical thinking, systems thinking provides for a transdisciplinary engagement; one that transcends conventional disciplinary silos. The critical literacy embodied in such transciplinarity is manifest in a framework of systems thinking in practice. The notion of systems thinking in practice derives from a critical systems perspective constituting three activities associated with three entities – (i) a framework for understanding complex interrelationships in the real world context of change and uncertainty, (ii) a framework for practice when engaging with different perspectives amongst people involved and affected in the contexts of interest, and (iii) a composite framework for responsibility acknowledging the limiting and integral features of framing understanding and framing practice in the conceptual world of ideas and tools. The

framework appreciates (multi)disciplinary efforts towards framing an understanding of interrelationships and interdependencies of complex realities in the real world. The framework practically engages with multiple perspectives in endeavours of interdisciplinarity towards framing some sense of mutual understanding across different disciplines and perspectives. And most importantly the framework transcends disciplines through both (i) *boundary reflection* – checking on the partiality of understanding judgements of 'fact' through any one disciplinary framework – and (ii) *boundary discourse* – checking against the partiality of value judgments that inevitably inform any inquiry from any disciplinary or indeed interdisciplinary perspective. The transdisciplinary framework acts as a framework for responsibility. Together the three frameworks working together constitute a framework of systems thinking in practice.

Whereas a systems literacy involving systemic and systematic change provides a language to mediate between the mess of real world situations, and the systems (including methods, methodologies, approaches) used to deal with them, a critical systems literacy involving in addition, systems change, provides a language to mediate between systems ideas developed amongst systems practitioners and established thinking and practice associated with different professional traditions. The critical literacy refers to all approaches, whether traditionally systems based or belonging to other traditions of professional practices. It is in the practice of using them whilst being aware of the inevitable traps – reductionism (silo problem-fixing), dogmatism (fixing people), and systems fetishism associated with holism and pluralism (fixed systems) – that enables a critical systems literacy.

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