Critical Management, Critical Systems Theory And System Dynamics

Stream 13: OR/Systems Thinking for Social Improvement

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Abstract

This paper explores the theoretical compatibility and practical benefits of combining methods developed within Systems Dynamics with Critical Systems Thinking to address concerns relevant to critical management. Three questions arise. The first is how System Dynamics methods might be useful in critical management studies. What 'problems' within critical management studies might qualitative System Dynamics methods resolve? The second question is the nature of the theoretical relationship between Critical Systems Thinking and System Dynamics, asking where the potential similarities and differences in underlying theoretical perspective occur? The third question examines the extent to which it is possible to combine apparently incommensurate methodologies in a theoretically coherent way. Are there theoretically permissible ways of combining the methods of System Dynamics and Critical Systems Thinking? Can methods that were originally developed within a functionalist paradigm, be legitimately and usefully adapted for use within critical management studies?

This investigation is important because Alvesson and Deetz (in (Clegg, Nord, & Hardy, 1996), p212) identified as problematic, both the lack of empirical studies within critical management studies and the lack of diversity of established empirical methods, developed in ways compatible with the theoretical assumptions of critical management theory. The former problem means that, typically, critical management studies use a limited range of methodologies and the (in)compatibility of other methods is assumed but is unelaborated and untested. The paper will conclude by identifying some general guidelines for combining these two different approaches to systems thinking.

Introduction

According to Jackson (1991, p183) critical management science (sic) had its origins in the 1970's when the first radical attacks were launched upon traditional management science. The early critique originated from Soft Systems thinkers and from Marxist scholars who questioned assumptions about the primacy of rationality and the 'naturalisation' of social relationships within mainstream management science. By the 1990's the 'critical edge' of critical management had moved, and both soft systems thinking and Marxist organisational theory were being interrogated from alternative perspectives, especially those derived from critical theory or postmodernism of resistance, see Reed's (1996) account of the historical development of organisational studies and Jackson's (2003) account of the emergence of critical systems thinking.

Two Theoretical Positions

The first section of the paper will identify the theoretical positions of both Critical Systems Thinking (CST) and System Dynamics (SD). In each case, the initial outline will frame the discussion in language that does not implicitly favour either theoretical position and will describe each approach in its own terms, relying on accounts given by practitioners from within their own paradigm. The purpose of the exercise is to identify theoretical and ideological assumptions and core practical concerns rather than to repeat standard critiques. The process will begin by outlining CST. Challenges for CST, as identified by its practitioners will then be discussed. The discussion of CST will conclude by identifying how the perspectives of SD may assist resolution of problems within CST. The same process will then be repeated for SD, concluding with an identification of how the perspectives of CST may assist resolution of problems within SD.

Critical Systems Thinking

The term "Critical Systems Thinking" may be used either generically or to refer to specific bodies of work. Flood and Jackson suggest that CST requires five fundamental commitments: to critical awareness; social awareness; emancipation; theoretical pluralism; and to methodological pluralism; (Jackson, 2003, p84). Midgley critiques this vision of CST (Midgley, 2003, p 109-112) and argues that all these 'commitments' are in different ways unsupportable. Midgley builds on Urlich's (1983) work, drawing attention to the need to enhance support for critical reflection on boundary decisions. A theme that unites critical systems thinking is emphasis on the need and utility of self-reflective practice.

Generically, CST is defined by Flood (1990, p204) as 'a broad notion of critical science employed with a systems perspective' and 'critique' is a process that

> 'puts up a common opposition to instrumental rationality, because such a rationality can be linked to control in the human condition in a similar way to the idea of power in control of the natural world.'(Flood, 1990, p204).

According to Flood (1990, Chapter 5), the radical 'epistemic' shift that differentiates Soft Systems Thinking from Social Systems Theory is its replacement of objectivist theoretical assumptions with subjectivist assumptions about the nature of social reality. The 'epistemic' shift that differentiates CST from Soft Systems Thinking is the recognition that subjective experience includes 'false consciousness'.

An acceptance of false consciousness affirms that the subjective explanations offered by individuals who report their understanding or perceptions of social situations, will include not only their knowledge, but also their self-deception and their self censorship, induced both by their perceptions of the power relationships between themselves and others and their perceptions about consequences of conforming or breaking with expected behaviour or opinion. Thus, one of the key tasks for critical

systems theory is to find methods of uncovering distortions and self- deceptions induced in human thought and communication.

Researchers themselves are not immune to the distorting effects of ideology, and this poses a problem for all critical inquiry incorporating the concept that 'false consciousness' distorts understanding. A widespread response to this (developed within diverse traditions including critical pedagogy, feminism and national liberation movements), has been the use of self-reflection with the purpose of identifying underlying 'normative' assumptions behind commonly accepted explanations for social processes, and then developing alternative explanations derived from different (contrary) sets of assumptions. This process is generally referred to as consciousisation or consciousness-raising, see, for example, (Freire, 1972). Self-reflection forms the core of the process of consciousisation and this explains why self-reflection has such a central position in the methods of CST, even when practitioners disagree on the relative importance of other methods and techniques. One of the key tasks for CST that Flood and Midgley agree upon is the need to identify suitable methods that can be used in systems inquiry to assist with the self-reflective process (Flood, 1990, p104) (Midgley, 2003, p117). One of the systems methodologies that has been most publicly successful in challenging established orthodoxy and assumptions in public policy has been System Dynamics, as evidenced, for example, in the work of Forrester whose model, in the 1960's, challenged accepted thinking on urban renewal (Forrester, 1995) and Meadows (Meadows, Meadows, Randers, & Behrens III, 1972), whose work in the 1970's successfully provided a plausible alternative to the dominant assumptions about economic growth and sustainability. On this basis, SD seems to offer a method that might resolve one of the agreed challenges identified from within CST, namely the need to develop a range of methods capable of facilitating scrutiny of the possible outcomes if social processes and public policy are viewed from perspectives other that the ones most commonly accepted. Jackson (Jackson, 2000, p155) also suggested that SD might be useful for assessing different policy options. The question that remains is whether SD can be used with CST in a theoretically permissible way.

System Dynamics

According to the first tutorial on modelling from the online Massachusetts Institute of Technology SD Education Project, (Martin, 2000, p6), SD

> '… can provide a common language for mathematics, biology, ecology, physics, history and literature.'

The discussion that follows emphasises the similarities between human and natural systems. Without any discussion of difference, the program proceeds to teach the fundamental concepts and technicalities concerned with terminology, diagramming and the use of computer software in SD modelling. From this description, SD appears to be a method closely identified with Social Systems Theory and therefore appears, *prima facie,* to be both theoretically and ideologically difficult to reconcile with CST.

Other literature from SD writers and practitioners indicates distance from Social System Theory and recognition of its limitations. Sterman (1991), summarises some accepted limitations including: concern about adequately modelling human processes; concern about the nature of the relationship between models and 'reality'; the difficulty of including non numerical data within computer models; the potential for distortion arising from biased choice of model boundaries; and the difficulties for consumers of models in understanding the assumptions and processes used by 'expert' modellers. His observations are now presented in more detail.

On the nature of the connection between the model and 'reality', Sterman recognises a tension between the competing demands of 'comprehensiveness' and 'comprehensibility'. Comprehensiveness demands the inclusion of all relevant factors while comprehensibility demands simplification, in order to make the model understandable. His solution to this tension indicates that he sees models as an aid to thinking and conceptualisation about the 'problems or situations', rather than as faithful representations of an 'objective reality'.

> 'A truly comprehensive model of a complete system would be just as complex as that system and just as inscrutable. The map is not the territory – and a map as detailed as the territory

would be of no use (as well as being hard to fold)… The art of model building is knowing what to cut out, and the purpose of the model acts as the logical knife.' (Sterman, 1991, p5)

This view is confirmed in later discussion when Sterman (1991, p10) asserts that 'simulation models are "what if" tools'. Meadows et al(2003), also consider that their models provided means of exploring possibilities rather than predicting outcomes.

Secondly, Sterman, accepting that human decision-making does not follow rational rules, expresses concern about the adequacy of computer modelling processes for human decision-making. He proposes an anthropological approach for collecting reliable data about actual human behaviour in a range of contexts. It is instructive to examine his reasons.

> 'The description of the decision-making rules is one potential trouble spot in a simulation model. The model must accurately represent how the actors in the system make their decisions, even if their decision-making rules are less than optimal…Unfortunately, discovering decision-making rules is often difficult. *They can not be determined by aggregate statistical data, but must be investigated first hand.*' (Sterman, 1991, pp11-12) (My emphasis)

Thirdly Sterman raises concerns about the difficulties posed by social issues for those who assume that the only useful variables are those capable of quantification. His explanation of the problem would be familiar to anyone in soft systems, although his solution of making 'reasonable estimates', presumably quantitative, may be more contentious.

> 'The majority of the data are soft variables. That is, most of what we know about the world is descriptive, qualitative, difficult to quantify, and has never been recorded…Leaving such variables out of models just because of a lack of hard numerical data is certainly less "scientific" than including them and making reasonable estimates of their values. Ignoring a relationship implies that it has a value of zero – probably the only value known to be wrong! (Forrester 1980)' (Sterman, 1991, p12).

The fourth difficulty concerns the choice of model boundaries, and hence relevant feedback systems, over the model outcomes. When modellers choose their boundaries, they are making judgements about what factors to include and what to exclude from the model. These judgements are informed by the assumptions of the person building the model and are a potential source of error. He explains his argument in the following way.

> 'The definition of a reasonable model boundary is another challenge for the builders of simulation models. Which factors will be exogenous? What feedbacks will be incorporated into the model? In theory, one of the great strengths of simulation models is the capacity to reflect the important feedback relationships that shape the behavior of the system and its response to policies. In practice, many simulation models have very narrow boundaries. *They ignore factors outside the expertise of the model builder or the interests of the sponsor,* and in doing so they exclude important feedbacks. The consequences of omitting feedback can be serious.' (Sterman, 1991, p13) (My emphasis)

Awareness of the distorting effects of choice of model boundaries is a concern shared by critical systems thinkers.

A fifth difficulty he identifies concerns the practices within computer modelling relating to documentation and awareness of assumptions. He contrasts the shortcomings of computer modelling *as practiced* with the *theoretical advantages* of computer modelling frequently cited to support its use. He makes the following observations

> 'In theory, computer models offer improvements over mental models in several respects:
>
>> They are explicit; their assumptions are stated in written documentation and open for all to review.
>>
>> They infallibly compute the logical consequences of the modeler's assumptions
>>
>> They are comprehensive and able to interrelate many factors simultaneously.

A computer model that actually has these characteristics has powerful advantages over a mental model. In practice however, computer models are often less than ideal:

> They are so poorly documented and complex that no one can examine their assumptions. They are black boxes.

> They are so complicated that the user has no confidence in the consistency or correctness of the assumptions

> They are unable to deal with relationships and factors that are difficult to quantify, for which numerical data do not exist, or that lie outside the expertise of the specialists who built the model' (Sterman, 1991, p4-5)

Wolstenholme, offered an alternative formulation of the purpose of SD, and observes that

> *The use of System Dynamics diagrams to structure and analyse ill-defined situations can be considered as a free standing methodology,* having much in common with the soft system problem solving methodologies recently developed as an alternative to science-based approaches (Checkland 1983,1987, Ackoff 1978, Eden et al. 1979, Bryant 1989, Rosenhead 1989, Keys 1988),' (Wolstenholme, 1990, p2-3), my emphasis.

Wolstenholme proposes the development of a purely qualitative branch of SD modelling. Jackson (2000, p154) argues that Wolstenholme is working within a functionalist perspective because he is describing systems without adequate reference to human consciousness and meaning, Sterman's and Meadow's comments imply that they see exploration of meaning in mental models as a primary role of SD. This indicates that the SD qualitative modelling processes may be used within alternative theoretical paradigms. Senge applied SD to the development of learning organisations, combining both functionalist and interpretivist perspectives, but, as Jackson (2000, p272) points out, he did not examine the theoretical compatibility of the two perspectives. To conclude the observations made by some SD practitioners recognise dissimilarities between the subjects (or objects) of social science research and natural science research and the difficulties of applying natural science methods, but offer no analysis of how the use of SD within other perspectives changes the nature of its claims.

Practitioners within both SD and CST have identified significant challenges within their own approaches to systems inquiry. CST potentially offers SD insights into the ways in which ideology and 'false consciousness' support erroneous assumptions; how power distorts both communication and choice of boundaries; and how all these processes adversely affect simulation modelling unless active measures are taken to reduce the distorting effects of these processes. SD offers CST tools that may aid with the processes of self-reflection and comparison of likely outcomes of alternative sets of assumptions about social processes.

Perspectives on theoretical difference

Discussion of theoretical difference first came to prominence in organisational theory through Burrell and Morgan's work on sociological paradigms (Burrell & Morgan, 1979). The history of the 'paradigm wars' in organisational studies has been recounted from different perspectives, for example, (Clegg & Hardy, 1996), (Burrell, 1996), (Alvesson & Deetz, 1996), (Reed, 1996) (Ackroyd, 1994; Martin, 1992; Mingers & Gill, 1997) (Donaldson, 1996). In response to the difficulties identified with using the term 'paradigm' Alvesson and Deetz have used the phrase 'metatheory of representational practices'. This seems to be congruent with Burrell and Morgan's original intention in writing about 'paradigms', as reported by Burrell(1996). It was not their intention to create a taxonomy but to draw attention to differences that had been previously ignored, to 'create space' in organisational theory for studies based in theoretical assumptions other than a 'naturalised' functionalism.

Review two Typologies: Burrell & Morgan and Alvesson & Deetz

In 1979, Burrell and Morgan first published their typology and legitimised debate about alternative theoretical ways of conceptualising and representing what happens within organisations (Burrell & Morgan, 1979). In this typography (summarised in figure 1), they (1979, p29) differentiate between 'paradigms' within social theory, and within organisational theory. The differentiation is according to

two dichotomies. First whether the underlying theoretical paradigm assumptions are objectivist or subjectivist; and second, whether social regulation or radical social change is assumed to be socially desirable. Figure1 illustrates some of the key differences in assumptions about methodology and social relationships that characterise each of the four positions in their simplest form.

Objectivist/ Social order	Objectivist/ Social conflict
Favours the use of the classical methods of natural science. Views social relationships naturalistically.	Views social relationships and power as intimately tied to ideology and ideology as the product of economic relationships. Precepts of Scientific Marxism are given the status of scientific laws.
Subjectivist/ Social order	**Subjectivist/ Social conflict**
Rejects the use of the methods of natural sciences. Uses interpretive methods of inquiry for understanding social relationships. Views social relationships as a product of shared interpersonal understandings.	Rejects unreflective use of both the classical methods of natural sciences and the methods of interpretive inquiry. Social relationships are considered as a product of shared interpersonal understandings but the ways in which these understandings develop is open to manipulation by social institutions that encourage and propagate 'false consciousness'.

Figure 1. Different theoretical and ideological positions, based upon Burrell and Morgan's typology.

Some commentators critique Burrell and Morgan's typology because it is not comprehensive or does not do justice to some perspectives; for example, Flood (1990, p83) argues that the framework does not provide a complete taxonomy of the different possible theoretical positions, (objectivist anti-positivist positions are excluded, see also (Jackson, 1991, p22)). Alvesson and Deetz(1996, p195) object that the objectivist/ subjectivist divide implicitly privileges the functionalist position, by concealing the subjective nature of the underlying assumptions in objectivist ontology. They (1996) also note that the typology creates artificial boundaries between theoretical perspectives by implying greater polarisation between positions than is justified and by supporting the idea that there can be no meaningful communication between research based in different paradigms. The survival of the typology for over two decades and its citation and use in recent work indicates that researchers still find it useful despite its incompleteness and contested conceptual divisions, see for example, (Flood, 1990; Jackson, 1991; Lewis & Grimes, 1999).

Although Alvesson and Deetz (1996, p196) explicitly state that in naming polarities they change a 'continuous world' into a 'discontinuous' one and place together theoretical positions that differ, they developed an alternative typology. They use this to highlight important theoretical differences that are collapsed within Burrell and Morgan's typology, between critical management studies based in critical theory and those based in oppositional post-modern perspectives, see Table 2.

Dissensus/ local-emergent	Dissensus/ elite-a priori
Dialogic studies; Postmodern; Deconstructionist Rejecting of all 'grand narrative'; rejecting of the naturalisation of power relations; Rejecting of claims to universalism. Problematises individual autonomy and often sceptical of concepts of moral responsibility. Focus on centrality of meaning over rationality; fragmentation of personal identity;	Critical studies; Late modern; Reformist Asserts partiality of science and its pretence of neutrality. Accepting of societal goals of emancipation and liberation; rejecting of the naturalisation of power relations; accepting of concept that humans share some universal qualities by virtue of being human. Problematises individual autonomy and moral responsibility with the concept of false consciousness, the role of the unconscious and ideology/ distorted communication but ultimately accepting of some degree of moral responsibility
Consensus/ local-emergent	**Consensus/ elite-a priori**
Interpretive studies; Premodern; Traditional; Rejecting of 'grand narrative', naturalises power relations; sceptical of claims to universalism; accepting of claims to individual autonomy and moral responsibility. Focus on centrality of meaning and lived experience rather than concerns of rationality.	Normative studies; Modern; Progressive; Accepts neutrality of science; views social relationships naturalistically. Founded upon the premises of the 'grand narrative' of the enlightenment; including primacy of rational thought and acceptance of individual autonomy and responsibility as unproblematic concepts

Table 2 A reproduction of Alvesson & Deetz 'Contrasting dimensions from the metatheory of representational practices' (Alvesson & Deetz, 1996, p196), incorporating and summarising some material from adjacent tables

In figure 3, the three major strands of systems thinking in social science as identified by Flood (1990), fall into different quadrants on Burrell and Morgan's typology, in terms of their theoretical and ideological assumptions.

OBJECTIVIST/ SOCIAL ORDER	OBJECTIVIST/ SOCIAL CONFLICT
Social System Theory* derived from General Systems Theory	
Development of causal modelling of social systems: Simons,	
Adaptation of 'hard' systems methods developed in engineering to social problems	
Classical System Dynamics	
SUBJECTIVIST/ SOCIAL ORDER	**SUBJECTIVIST/ SOCIAL CHANGE**
Soft systems thinking	**Critical Systems Thinking**
Development of 'soft' system inquiry: Checkland, Ackoff	Development of 'critical' system inquiry: Ulrich, Flood, Jackson, Keys
Soft Systems Methodology	Critical Systems Heuristics, Total systems intervention, Local systems intervention
Soft System Dynamics?	

Figure 3 Three theoretically/ ideologically different approaches to systems thinking in social science (based on Flood)

* (Parsons, 2003) {1963} was a leading exponent of Social Systems Theory. Flood refers to this as 'traditional systems' thinking. Burrell and Morgan used terminology from social science literature.

When Alvesson & Deetz' topology is substituted, it is not so clear where the different traditions within CST should be located. It might be argued that in its nature, CST must be based in the dissensus/ elite-a priori quadrant by virtue of its foundational *systemic* assumptions about interrelatedness, or for Jackson and Flood, by the fixed nature of their five commitments, (Jackson, 1991, p184). Alternatively, the focus upon pluralism and the potential legitimacy of multiple perspectives might place CST in the dissensus/ local emergent quadrant. More likely, many of the distinctions of position within CST can be more properly located at different places along the continuum between elite-a priori and local-emergent within the dissensus half of the diagram.

Dissensus/ local-emergent	Dissensus/ elite-a priori
Critical Systems Thinking	**Critical Systems Thinking**
Critical systems thinking as Discordant pluralism Gregory	'Critical' system Thinking as complementarism:
	Critical Systems Heuristics, Total systems intervention, ?Local systems intervention
Consensus/ local-emergent	**Consensus/ elite-a priori**
Soft systems thinking	**Social System Theory* derived from General Systems Theory**
Development of 'soft' system inquiry: Checkland, Ackoff	Development of causal modelling of social systems: Simons,
Soft Systems Methodology	Adaptation of 'hard' systems methods developed in engineering to social problems

Table 4: Critical Systems Thinking using Alvesson & Deetz schema

Comparing the typologies produced by Burrell and Morgan with that of Alvesson and Deetz illustrates both the strength of this type of approach in drawing attention to difference, and its weakness in accentuating artificial polarities.

Working With Theoretical And Methodological Difference

This section will examine some alternative ways in which apparently incommensurate approaches can be reconciled to create a theoretically coherent research methodology. This section will discuss the approaches suggested by Flood (1990), Gregory (1996) and those offered by Lewis and Grimes (1999), and identify the most appropriate way(s) forward in this instance.

Flood (1990, p135) developed a general framework that characterised six different responses to combining or co-joining disparate 'paradigmic concerns' (this term includes the ideological, ontological, epistemological, methodological and method base of each approach). Through argument, he quickly disposed of all approaches except 'complementarism' and 'methodological imperialism by subsumption'. Complementarism, he defined as 'methodological incommensurability and theoretical commensurability (at a meta-level of reasoning)'(Flood, 1990, p138), whilst 'methodological imperialism by subsumption', he claimed, operated in the following manner:

> 'a methodology is adopted that may call upon other methodologies at a specific point in order to act as sub-methodologies to deal with specific matters. For example, if the 'what' had been decided upon through the use of the mother methodology, a 'how' methodology may be drawn into the process.'(Flood, 1990, p140).

Flood's argument that 'methodological imperialism by subsumption' can be disposed of by appealing to epistemology based upon Habermas appears to be an unwitting example of theoretical, if not methodological imperialism by subsumption and should therefore not be accepted. Gregory (1996), reprinted (2003, p132), came to the same conclusion following a different line of argument, and also develops a more detailed critique of the System of Systems Methodologies, Gregory (2003, p137)

Lewis and Grimes (1999, pp 2-4) identify two different approaches to multi-paradigmic research. 'Paradigm bracketing' where the researcher identifies and makes explicit, the implicit assumptions of the paradigm informing research or literature and dialogically compares the insights gained from differing multiple perspectives after the biases have been acknowledged. In research, this requires sequential analysis of the same data from two or more paradigmic perspectives and separate recording of the observations arising from each set of assumptions. The second technique they identify is 'paradigm bridging' where the theorist aims to identify any theories that provide 'transition zones', between paradigms. These 'transitional zone theories' integrate between paradigms in ways that resolve the tension between theories for the issue of concern. The example given is of the use of Gidden's structuration theory to provide a 'transition zone theory' between social theory explaining human behaviour with reference to social structure and social theory explaining human behaviour in terms of shared meanings (Lewis & Grimes, 1999, p3). There is some similarity between paradigm bridging and complementarism. Gregory's position of discordant pluralism provides a third alternative, beginning from the presumption that paradigms cannot always be bridged. Gregory argues that attempts to bridge paradigms may exercise 'illegitimate force' tantamount to imperialism by subsumption because bridging often requires some of the discords between paradigms to be trivialised or marginalised in the interests of accommodation. Gregory argues that this disadvantage can be overcome if conciliation is not imposed and the similarities and differences between pairs of paradigms are used to enhance critical appreciation of the research issue. Gregory explains the difference between complementarism and discordant pluralism in the following way:

" The complementarist legitimates his or her position through immanent critique and through the recognition of limitations, whilst the discordant pluralist's position is legitimated by its critique of *both* similarities *and* differences, in which methodologies are viewed as challenging and supplementing one another." (Gregory, 2003, p138)

Discordant pluralism resembles paradigm bracketing, but the constellation metaphor allows the tensions within paradigms and the synergies between paradigms to be recognised without either being

forced into the apparent harmony of complementarism or the apparent opposition of paradigm bracketing. Although the examples of the method of 'discordant pluralism' provided by Gregory (Gregory, 2003, p134-135) show the method being used by Jay and Bernstein to analyse the philosophic influences on Adorno when the whole body of his work was scrutinised (and reference work analysing the philosophical systems of Derrida and Habermas) this same method should be applicable to the more limited circumstances of a single piece of work, to clarify the tensions and synergies between theories and methodologies used that appear to require incompatible assumptions.

Each of the five approaches requires different degrees of theoretical 'fit' between paradigms, as shown in Figure 5.

Paradigm bracketing	Discordant pluralism	Paradigm bridging	Complementarism	Methodological Imperialism by subsumption
Least 'fit' required				Most 'fit' required

Figure 5: Comparison of requirements for ideological, theoretical and methodological 'fit'

Combining the approach of Lewis and Grimes with those of Gregory and Flood, the differences between the various methods for co-joining theoretically and methodologically different approaches are shown in Figure 6.

	Requirements
Paradigm bracketing	Acknowledges difference and does not attempt to combine the different approaches,
Discordant pluralism	Acknowledges synergies and tensions but avoids a 'reconciliation under duress'
Paradigm bridging	May co-join theoretically and methodologically incommensurate paradigms if a suitable bridging theory can be found that resolves the relevant issue of difference,
Complementarism	Requires theoretical but not methodological commensurability
Methodological imperialism by subsumption	Subsumes methods from one paradigm and uses them within the theoretical and methodological assumptions of another

Figure 6: Summary of the differences between approaches that combine different methodologies and theories.

How does this apply to CST and SD? The discussion in the previous section indicated that SD could be considered in either of two ways: as a method that is logically independent of any single theoretical perspective, despite the shared adherence by most practitioners to 'traditional systems thinking' with its implicit base in Social Systems Theory; or as a method epistemologically tied to 'traditional systems theory' and Social Systems Theory (SST). Each possibility is considered in Figure 7.

	CST plus SD as theoretically dependant on SST	CST plus SD as theoretically independent of SST
Paradigm bracketing	Yes	No
Discordant pluralism	Possibly	Possibly
Paradigm bridging	Probably not	Possibly
Complementarism	No	Probably
Methodological imperialism by subsumption	No	Yes, qualitative aspects of method, quantitative aspects limited use

Figure 7: Method of combining theory: implications for theoretical permissibility of Critical Systems Thinking (CST) and System Dynamics (SD)

Assuming that System Dynamics can be accepted as a method independent of 'traditional systems thinking', and the quotes from both Wolstenholme and Sterman seem to permit this possibility, it is theoretically permissible to combine the two approaches within a critical epistemology using 'methodological imperialism by subsumption', where SD becomes a 'helper methodology' within an overall CST framework. There is no theoretical reason why this should not be done, unless pluralism becomes a foundational commitment. Alternatively, if SD is not divisible from 'traditional systems thinking' and Social Systems Theory, as implied by the first definition provided by Martin, paradigm bracketing provides a permissible way of combining the two approaches.

'Discordant pluralism' would probably provide a theoretically legitimate means of combining CST and SD irrespective of whether or not SD were assumed to be theoretically tied to SST. The 'constellations', however, would differ depending upon the assumed nature of the relationship between SD and SST. If SD were assumed to be theoretically independent of social system theory, the 'constellation' at a theoretical level would contain only the assumptions of critical systems thinking. One implication of this position is that any claims made on the basis of analysis using SD methods must be clearly consistent with the theoretical assumptions of CST and must be careful not to use SD as a 'Trojan horse' that introduces and legitimates the familiar assumptions of SST and functionalist sociology. The implication of adopting a discordant pluralism approach, according to Gregory (2003, p138) is that one 'seeks to gain critical appreciation' and its purpose is ' transformation through understanding of self and others'. For example, this approach could be used legitimately as an aid to challenging habitual ways of seeing the world or a means of developing alternative 'mental models' to assist exploration of ways of seeing situations and relationships with others. Within such a theoretical framework, caution must be exercised to avoid making claims that imply that diagrams produced using SD methods represent a singular correspondence with reality.

If SD were assumed to be theoretically dependent upon social system theory then the 'constellation' would contain the core ontological and epistemological assumptions of both CST and SST. If Burrell and Morgan's Typology is applied to this constellation then no synergies would be apparent between the two theoretical perspectives and oppositions would appear on both the 'objectivist- subjectivist' axis and on the 'social order- social conflict' axis. However, if Alvesson and Deetz framework is applied whilst the tension would remain on the 'consensus- dissensus' axis, a synergy may appear (depending on the version of CST) on the 'elite/ a priori versus local/ emergent' axis, acknowledging the similarity between the two theoretical positions especially in their assumptions about the potential of at least some forms of education and some uses of technology to achieve emancipation and bring improvements to the human condition. An implication of this is that analysis of data should be theoretical consistent with any shared underlying assumptions between the two theoretical positions,

and should acknowledge and constructively use the tensions between the theoretical positions to interrogate analysis that depends upon disputed assumptions.

Application To A Real World Situation

The final section of the paper will illustrate how a methodology combining CST and qualitative SD is being used to examine quality in higher education in a Western Australian university. This section reports how I have used SD within a critical theoretical perspective, in part of my PhD research project. The project critically reviews the quality processes in Australian Higher Education. An early finding was that assertions about quality assumed each 'quality measure' could be viewed in isolation from other strategies rather than systemically. This meant that institutional strategies were adopted without consideration of the cumulative effects of combined strategy (Cooper, 2002b). I found that the combined effects on 'educational quality' of multiple policies that aspire to achieve different ends have not been examined, and the structural effects of policy interventions on organisational mechanisms for reward and control have not been considered.

A qualitative model was developed through an examination of the literature detailing different aspects of higher education policy and university management strategy to provide a conceptual map of how the *combinations* of Federal Government policies were likely to affect the operating environment of university managers, staff, and professional institutions and the relationships between each of these groups. In this conceptual map I used my knowledge as a staff member in interpreting how the different strategies interacted within the model. I presented an early (and subsequently amended) form of the model at the 7th ANZSYS conference (Cooper, 2001), a revised version of the model to the HERDSA 2002 conference (Cooper, 2002b), and an earlier version of some of the ideas in this paper to the 8th ANZSYS conference, (Cooper, 2002a).

The purpose of the model was to:

- Develop a systemic conceptualisation of how policies interact to change the organisational pressures that actors experience within a university.

- To identify potential unintended outcomes that combined management strategies may exacerbate

- To include these findings in a multi-method critical analysis of quality management in Australian Universities

The diagram first mapped how the strategic responses of one institution to government policies combined to change the internal demands and the rewards systems within the university. Time was identified as a resource over which academic staff and students could exercise some power, through the power of deciding how to allocate their own time between the different tasks that comprised their role and through deciding how to prioritise those demands. For academic staff the nature of the pressures would encourage them to accommodate to changed demands and rewards by either

- Seeking ways to reduce their own workload, especially their teaching load, (and that of students). This has implications for the nature of the teaching and learning relationship between staff and students and for academic standards;

And/or

- Increasing the numbers of hours worked to maintain their previous academic practices whilst accommodating new demands. This has implications for long term well being and burn out;

And/or

- Attempting to achieve more in less available time, with potential implications for increased both staff stress and standards;

As it was assumed that both academic staff and students would make individual choices about how they responded to the pressures, the diagram was indeterminate about how the pressures identified conceptually would translate into outcomes. The issue of individual choice in responding to situations

is one of the more problematic aspects of quantitative SD modelling. The decision-making situations in this diagram typify this problem. To quantify this model would require the modeller to formulate 'decision-making rules' to take account of differences in individual values, differences in individuals' perception of their situation, and differences in the degree to which decisions of individuals are affected by the choices made by colleagues. No theoretically satisfactory way could be found of symbolically representing 'the decision-making rules' within the diagram that would adequately describe the individual decision-making of staff members and students and the *mutual* effects of decision-making. Outcomes depended upon the exact *combination* of decisions made by individual members of both staff and student groups. Decisions made by some individuals may compensate for, or aggravate the consequences for other individuals and influence their choices. However, the manner in which individual choice was influenced was not straightforward and appeared to depend on the differing values-judgement made by individuals as they weighed their beliefs about the integrity of their work against their beliefs about their self-interest (any of which beliefs might themselves, be erroneous).

The decision-making situation began to resemble a complicated form of the 'Prisoner's Dilemma'. This is a philosophical conundrum that formed the basis of a psychological experiment exploring the interplay of morality and self-interest. Two people had to make independent decisions about whether to make an altruistic or a selfish choice (without knowledge of the other person's decision). If both chose altruistically neither suffered, if one made a selfish choice and the other an altruistic choice, the altruistic chooser suffered, if both made selfish choices, both suffered, (Honderich, 1995, p719).

It was decided not to develop the model beyond this point. If it is assumed that SD is not theoretically dependent upon Social Systems Theory, then SD can be justifiably used as a technique within CST for clarifying mental models and providing a visual and symbolic language that facilitates discussion of *mental models.* If it is used in this way, however, it is not possible to make *predictive claims about system behaviour*.

In this part of the research project, the combined research methodology has achieved the following useful outcomes:

- It has provided a conceptual structure for ordering and cross comparing the results of existing studies examining different issues in Australian universities that may be relevant to the research problem.

- It has been helpful in suggesting possibly avenues for relevant investigation and research.

- It has provided a way of conceptualising the relationships between institutional strategies and their cumulative effects on organisational demands and reward systems.

The conceptual model within the diagram was of necessity indeterminate about precise outcomes, because from a critical perspective individual choices about how to respond were interactively mediated by the perceptions, values, actions and interpretations of actors within the organisation. The diagram showed however, that independent on individual choices, current policies would tend to hinder some aspect of the institutional concept of 'quality improvement' (through lower academic demands, less attention to teaching or increased staff stress). This implication was independent of the ability to predict outcomes of particular combinations of individual decision making of staff and student groups. Diagramming therefore identified counter-intuitive organisational pressures, likely to encourage one or more outcomes that are incompatible with the long-term achievement of the institutional goal of quality improvement. From the point of view of a critical systems perspective, the model has served its purpose.

If SD were theoretically indivisible from Social System Theory then either a paradigm bracketing method or an alternative method derived from discordant pluralism would be required in this part of the research project. For a paradigm bracketing methodology, the work done so far would form only the first stage of the process of documenting the organisational dynamics of policy within the university from a SST perspective using SD as the methodology.

- A quantitative model would have to be constructed and tested

- The problem of determining decision-making rules would become a significant focus within the model development process and a potential weak spot within the model.

- Methods would have to be found for symbolically and numerically representing the set of decision-making rules within the model, which, in this case, would require the development of a defensible method of translating non-logical behaviour into logical programming rules, without relying on approximations gathered from aggregate data, (see Sterman's discussion of decision-making rules presented in the first section of the paper).

If this could be satisfactorily achieved, the findings would be presented alongside the assumptions of SST. A separate qualitative organisational analysis from a critical systems perspective would have to be undertaken and reported, along with the assumptions of CST. The findings of the two studies and their assumptions would be dialogically compared to see what new insights could be achieved through the juxta-positioning and dialogue between different 'pictures' of the same system. If the premise of theoretical dependency on SST were assumed, discordant pluralism would require a similar process, possibly with slightly different analysis methods. There are no plans to develop the current study in these directions because it would not be possible to produce an internally coherent quantitative model; there are no obvious gains in pursuing this line of research.

Conclusions

This paper has demonstrated that it is possible to devise a theoretically acceptable methodology by combining CST with SD and that such a combination provides benefits in real situations. It has been argued that one of the major concerns of CST is to find suitable methods to help with the task of questioning assumed explanations of social phenomena and their relationships. Qualitative SD can be useful to this process because the method requires that hidden assumptions in tacit mental models are made explicit, in order to represent the relationships between processes in a schematic diagram. The diagramming stage of SD requires researchers to explicitly identify their assumptions about system boundaries, relevant factors and the nature of the relationships between factors. This process allows scrutiny by others and provides a visual representation that aids exploration of the situation, communication and critique. In the real situation under discussion, SD diagramming was used primarily as a reflective method that provided a format for communication for tacit assumptions within a mental model in the thoughts of the researcher. The critique by others resulted in a re-working of the relationships and changes to the conceptualisation of some relationships. It is doubtful whether the conceptual clarification would have occurred as easily without a visual medium for sharing and testing the concepts within the mental model.

The more general insights gained from this process have been that there are several alternative approaches to developing permissible methods for combining apparently incompatible theories and methods. Five alternative methods were contrasted in Figure 6, and this schema provides a reference point for future use. In some instances more than one method of combination may prove theoretically satisfactory. When this occurs, the choice of how theories and methods should be combined needs to be guided by the requirements of the problem being addressed.

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