

Soft Systems Methodology as a Social Science Research Tool

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Soft Systems Methodology (SSM) is well-established as a vehicle for action research, particularly in programmes initiated at Lancaster University. It is now sufficiently well-known, in academic circles at least, to be considered as a candidate research tool for a wide range of social science research projects. This paper summarises (and updates) the set of issues which should be explicit when designing a research project which includes both SSM and other research approaches. It attempts to 'place' SSM within a taxonomy of social science research approaches, examines the contingencies which may determine the success and acceptance of the research, and explores the relationship between SSM components of such programmes and other, more traditional, components. A further important focus is the status of SSM products as theory, and the use of SSM for theory generation and/or testing.

Key words: Soft Systems Methodology(SSM); research; social science; theory; ontology; epistemology, modeling

The discussion which follows largely concerns issues raised while conducting and supervising SSM research in a (new university) academic environment with a rapidly evolving research culture, but one where soft systems ideas have not penetrated widely. As a consequence I normally find myself working with colleagues who have quite different interests and students whose research combines soft systems approaches with other, more traditional research approaches. Three themes for discussion are adopted:

- the position of soft systems research within the broad church of social science research
- contingencies for the successful adoption of SSM as part of a social science research project
- the relationship between a soft systems research component and other research components.

The first theme is approached from two directions: an analysis of the underlying philosophical position of SSM in the context of the social sciences (in which its ontology, epistemology and reasoning strategy are compared to the (implicit) taxonomy elucidated by Blaikie (1993) in his *Approaches to Social Enquiry*), and an examination of SSM's relation to theory. The second theme relies on the philosophical analysis to help determine whether important stakeholders will be likely to accept soft systems research. The final part sets out some ways, based on experience and practice, in which the methodology may be used in conjunction with other approaches.

BACKGROUND: SOME TAKEN-AS-GIVENS

As in any discussion, much is taken for granted. The following ideas about the nature of research and the nature of SSM are not defended, but form the basis for the ensuing arguments.

Research is distinguished from private study by being required to make an impact on its intended audience. It is distinguished from consultancy by being required to make rigorous and defensible additions to understanding or knowledge. Checkland's methodology is here singled out because it is the most developed of the soft systems methodologies and therefore an obvious candidate for a research tool. Mayon-White's (1993) map helps to locate it in its historical and theoretical context

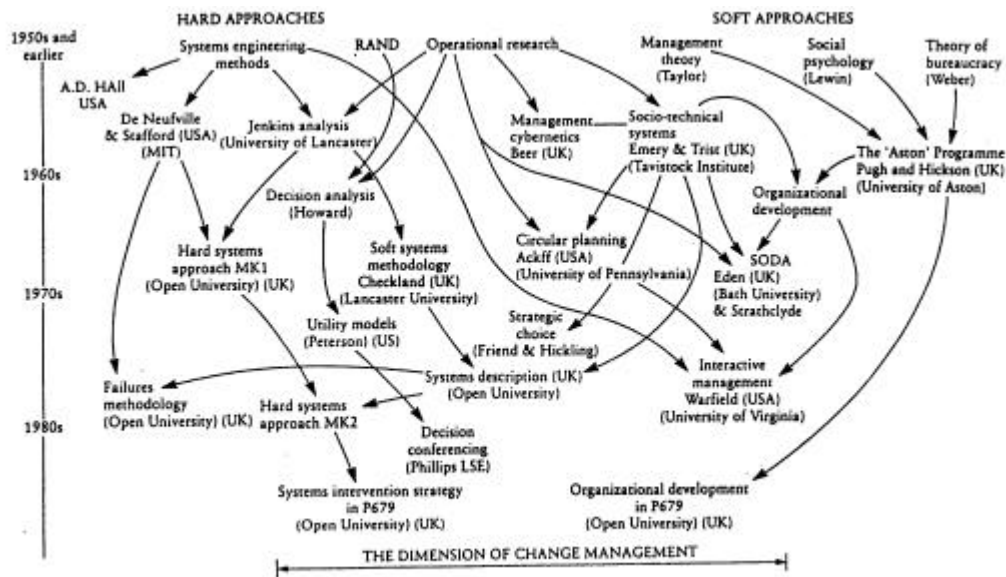


Figure 1 - SSM in context (from Mayon-White 1993)

It sets out to be a problem structuring and solving methodology, so this form of research is, by definition, 'applied', rather than 'pure'. It has become associated with a particular form of research - action research:

'the concept of *action research* is that of simultaneously bringing about change in the project situation (the action) while learning from the process of deriving the change (the research)' (Wilson 1984).

However, there is no fundamental underlying reason why it should not be part of any applied social science research activity. All research (including action research) must have a preoccupation with theory - verifiable, generalisable and transferable understandings. As a problem solving tool, SSM sets out to be neither a *theory generation* tool, nor a *theory testing* tool (Rose 1982); nevertheless, in as far as theory generation and testing are problems to be solved, there is no *a priori* reason why it should not be used for these tasks. Since SSM takes purposeful human activity as its domain of enquiry, it is assumed that soft systems researchers are *social* scientists, despite the fact that the systems movement is trans-disciplinary, and many systems practitioners ally themselves with *natural* scientists. Science and social science are the established churches, not the systems movement, and systems practitioners have to align themselves accordingly. Within the realm of social science, the home discipline for SSM researchers is management, though this field is also an uncomfortable mediation between disparate approaches - a 'fragmented adhocracy' (Whitley 1984). A further foothold is established within the emerging field of information systems (discussed in 'The Systemist' 1995 vol 17 no 1, see also Stowell 1995). In principle, again, since the domain of purposeful human activity systems maps reasonably well to the domain of social science, there is no reason why SSM should not be used in any social science discipline - in practice this may not be acceptable. The potential application area of SSM is extremely wide (any purposeful human activity, in theory): industry, public sector, charities, from local problems to board of directors and national executives, from

eight person departments to national evaluations. In practice, not every application area will be equally suitable.

Turning to assumptions made about the character of SSM: the methodology's philosophical stance (ontological and epistemological presuppositions) is normally placed within the 'interpretative' quadrant of Burrell and Morgan's (1979) famous matrix (Jackson 1991). Checkland (1981) claimed, in addition, a 'radical humanist' aspect. However, Burrell and Morgan's framework is increasingly hard pressed to cope with the developing complexity of philosophical positions and some more up-to-date evaluation is overdue. A reasonably participative and democratic stance is taken for granted with the methodology. In principal, there is nothing to stop a CEO undertaking a SSM enquiry in her back bedroom, and then implementing the conclusions in a thoroughly autocratic manner - in practice most successful SSM interventions are reasonably participative. There may be a number of inescapable reasons for this. The shared natural logic of ordinary language modelling assumed by Checkland doesn't really exist, though some aspects of it can be codified (Gregory 1995). One person's verbal logic is another's alphabet spaghetti; most successful modelling, in the author's experience, involves the negotiation of meanings between stakeholders. Moreover, at least in the action research context, solutions must be accepted and implemented - there is seldom much sense of ownership developed without participation of some form. In these assumptions may be sensed an underlying model of organisational change which is not very explicit, and is, at best, only one of several available candidates. The emancipatory ('critical') flavour explicit in the 'Action Science' of Argyris (1985), is less explicit in Checkland's work, and has led to some criticisms of the methodology as consensual and tending to support the status quo (Flood and Jackson 1991) and as pre-defining the nature of the intervention (Romm 1995) and to the development of critical systems thinking (Jackson 1991, Flood and Jackson 1991). A further taken-as-given is the importance of the analyst/researcher. There is very little that is prescriptive about SSM, in contrast, for instance, with Structured Systems Analysis and Design Method (SSADM), and a great deal of room for choice - a free hand with rich picturing and the selection of relevant systems, for starters. It must be acknowledged therefore, that SSM practice relies heavily on the skill, experience and intuition of the analyst.

BLAIKIE'S APPROACHES TO SOCIAL ENQUIRY

The philosophy of social science is a notorious minefield, encompassing not only traditional philosophies of (natural) science but a variety of other ontological and epistemological positions. Commentators vary in their interpretations of the field; the version chosen to underpin this discussion is that of Blaikie (1993). His account - in effect a taxonomy of approaches to social science, though it is not presented as such - offers a range of philosophical positions determined by their ontological and epistemological stances, together with the critiques of rival positions offered by advocates of these approaches. He also presents a conceptualisation of the 'research strategies' open to investigators, which I find more helpful to think of as *reasoning* strategies. The account does not oversimplify - by conceptualising the whole field as a positivism/phenomenology

dualism (Easterby-Smith et al 1991) for instance, or a Boston matrix (Guba and Lincoln 1994). Neither does it seek to promote the virtues of one position over another - perhaps as justification for a particular research approach such as action science (Argyris 1985). It is more up-to-date and wider in scope than Burrell and Morgan's (1979) 'four paradigms' matrix. Though any taxonomy of social science approaches will inevitably attract dissent (Blaikie pays scant attention to post-modernism or modern French sociological thinking), for the purposes of this paper the Blaikie account is simply taken as given. He outlines six classical philosophical positions: *Positivism*, *Negativism*, *Historicism*, *Critical Rationalism*, *Classical Hermeneutics* and *Interpretivism*, and five contemporary positions: *Critical Theory*, *Realism*, *Contemporary Hermeneutics*, *Structuration Theory*, and *Feminism*. In addition, he offers four associated reasoning strategies which he labels: *Induction*, *Deduction*, *Retroduction* and *Abduction*. These combine 'a logic of theory construction' and a 'research process.' These arguments are highly complex, and unfortunately beyond the scope of this paper.

SSM - ONTOLOGY, EPISTEMOLOGY, REASONING STRATEGY

In order to situate SSM within the Blaikie framework one must first establish some clarity about the methodology's ontological and epistemological position and associated reasoning strategy. This clarity will inevitably be clouded by (amongst other things) development of thinking over time, internal contradictions between its principal academic exponents, and differences between its pure theoretical explication and what actually happens on the ground - 'espoused' theories and 'theories-in-use' (Argyris 1985). Moreover, given that SSM explicitly rejects vice-like techniques in favour of heterogeneous applications which fit the problem, it seems reasonable to expect that the temperament of the analyst(s) will govern, to a large extent, the shape of the methodology's application.

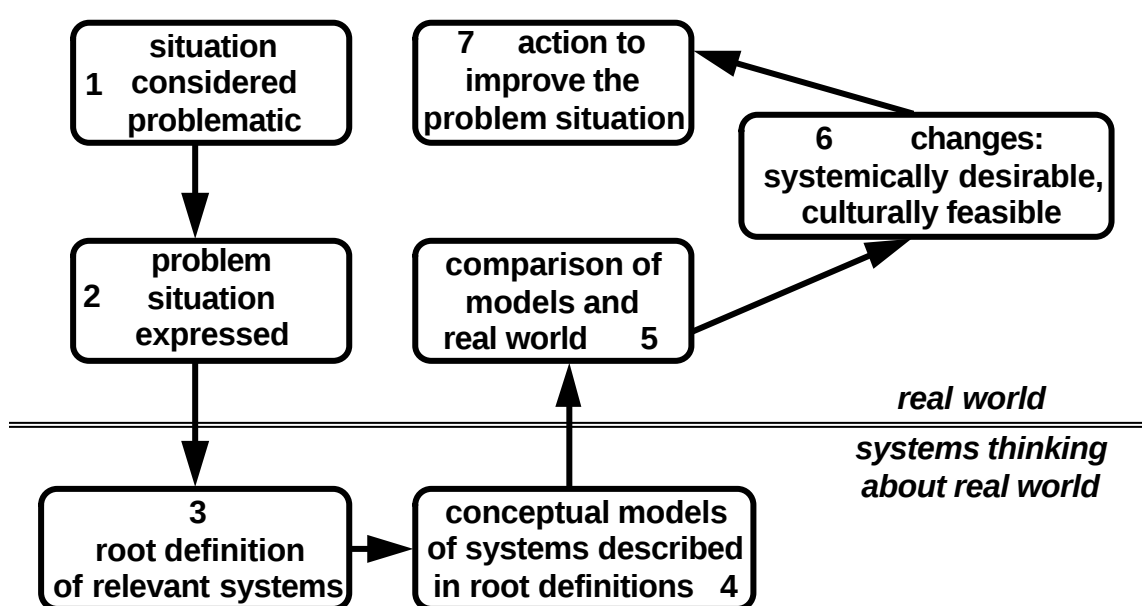


Figure 2 - seven stage model of SSM (Checkland 1981)

The early formulation of the seven stage model (figure 1), with its postulation of a below-the-line 'real world' - apparently unitary and the same for all observers - seems to assume an objectivist ontology. Though this remains something of an inconsistency throughout his writings, the assumption is illusory. Checkland always distinguishes his stance from that of the natural sciences: 'human beings can always attach different meanings to the same social world' (Checkland 1981); 'human beings are not simply ready to attribute meanings, they cannot abide meaningless'; 'an interpreted, not merely an experienced world' (Checkland 1990). Other exponents follow suit: 'human activity systems *do not exist*..... what do exist are *perceptions* of them in the heads of observers' (Wilson 1984). The central position of 'Weltanschauung' in the methodology, covering not only 'large-scale images of the world' ('religious', 'imperialist') - this is Dilthey's usage in his *Weltanschauungslehre* - but also small-scale images which can make sense of local social situations' (Checkland 1986) also predicates an interpreted or socially constructed view of reality. Even more fundamentally, the methodological device of developing 'relevant systems' - different *analyst* interpretations of the problem domain - is also consistent with an interpretative stance. In this case the underlying assumption is that the analyst is 'interpreting' or allotting meanings, and that a range of those interpretations helps the analyst to a better, broader, more useful understanding. Davies and Ledington (1991) point out that we cannot necessarily regard that understanding as 'truer.' More recently, Checkland has accepted that the meaning of the dividing line between the 'real world' and the 'systems thinking world' of the seven stage model was 'heuristic rather than theory-based' and that it implies a 'false dualism' which soft systems practitioners need to move beyond (Tsouvalis and Checkland 1996). We must take Checkland's 'real world' therefore, to be a socially constructed world in which 'participants continually negotiate and re-negotiate with others their perceptions and interpretations of the world outside themselves' (Checkland 1986). Since the analyst or problem solver is also a participant in that process of perception and interpretation of the world we should perhaps take the 'real world' of the seven stage model to mean a prior, or non-conceptualised perception of the problem domain, and the 'systems thinking' as the epistemological set of principles which allow us access to a richer understanding, and therefore altered (better, more insightful) perceptions of that domain.

SSM's grasp of the use of systems concepts as epistemological devices for achieving knowledge of the world also seems secure - at least in its exponents' writing about it. 'Weneed to remind ourselves that there is a distinction between complex reality and our notations of it' (Checkland 1981); 'hard systems thinking assumes that *the perceived world* contains holons: soft systems thinking takes the stance that the methodology, *the process of enquiry*, can itself be created as a holon' (Checkland 1990). Checkland adopts the word 'holon' (constructed abstract whole) for SSM models - 'models of pure concepts, not would-be descriptions of the real world' (Checkland 1986). Thus SSM models are clearly distinguished from more conventional systems models (descriptive and normative accounts of 'systems' which are assumed really to exist in the world). The investigative force of the methodology derives not from

an ontological view of a systemic world, but the epistemological power of a set of systems concepts which may structure thinking about the world. Those concepts, set out in the formal systems model (Checkland 1981), in turn derive their investigative power from being good and plausible expressions of one of the ways in which we tend to structure the unassailable complexity of the world in order to derive meaning from it.

The reasoning strategy of SSM centres around modelling. Unstructured modelling (rich pictures) which serves to abstract features of the problem domain is followed by formal textual modelling (root definitions) and activity modelling. Models are used as devices for reassessing and improving the problem solvers' interpretations of the problem. This is a well-expounded 'research process'; however, since the methodology is targeted at problem solving not academic research, there is no explicit 'logic of theory construction.' The outcome of the SSM research process is learning - in principle, that learning may be expressed as theory. The forms of theory generation and testing which *have* been found acceptable have tended to be testing and developments of the methodology itself. CATWOE - cross referencing with the empirically derived Customers, Actors, Transformation, Weltanschauung, Owners, and Environmental Constraints, to ensure root definition completeness and consistency (Checkland 1990), is a notable example. This is consistent with the self-reflective nature of action research. SSM holons, by definition since they are *not* normative or descriptive, are usually throw-away products on the route to learning. They are 'of *heuristic* value as they only serve as vehicles for exploration of the problem situation' (Tsouvalis and Checkland 1996, my italics) and their theoretical status as accounts of the areas that they conceptualise must normally be dubious.

To sum up: we may regard the ontological status of SSM as lying in an interpretative or socially constructed view of reality, its epistemology as the exploitation of systems constructs to structure learning, and its reasoning strategy as that of model building and testing. A few caveats, however, in line with reservations expressed earlier. Methodologies are not set in stone - they evolve - and so does the thinking behind them. Even in the limited selection of quotations given above it is possible to recognise an evolution away from a 'systems science' position towards a 'systems *social* science' position. A willingness to develop is to be applauded, rather than criticised. Given such an evolution, most well-documented pieces of thought will display some internal inconsistencies (such as those perceived in the seven stage model) - SSM is no different. This should provide no great obstacle to use, provided the general thrust is clear. Different analysts may use the methodology in different ways - this flexibility is a strength not a weakness. The final caveat is a more serious one: a discrepancy between espoused theory and theory-in-use. Though the theoretical status of SSM holons should be clear, many practitioners have the tendency, having spent much time and effort in developing models, to use them *as if* they were normative or descriptive. This practice is somewhat evident in work on 'neutral consensus primary task' models and derived information categories (Wilson 1984) and related information needs analysis (Patching 1990)

Returning to Blaikie's taxonomy of social science approaches, it is possible to recognise that SSM has something in common with both his characterisation of *Interpretivism*, and of *Realism*:

'*Interpretivism* entails an *ontology* in which social reality is regarded as the product of processes by which social actors together negotiate the meanings for actions and situations; it is a complex of socially constructed meanings. Human experience is characterised as a process of interpretation rather than sensory, material apprehension of the external physical world, and human behaviour depends on how individuals interpret the conditions in which they find themselves. Therefore, *social reality* is not some 'thing' that may be interpreted in different ways; it is those interpretations. Hence, in contrast to physical reality, social reality is preinterpreted.' (Blaikie 1993)

It may again be noted that this ontology sits rather uneasily with the seven stage model's predication of a 'real world' to which 'systems thinking' (only a specialised form of interpretation) is contrasted. *Realist* ontology, where the ultimate objects of scientific enquiry are considered to exist but social reality is still viewed as socially constructed, sits rather more easily. However SSM conveys no sense of a distinction between the domains of the empirical, the actual, and the real (different degrees of reality, as it were, for different phenomena) or offering 'true' explanations of phenomena - quite the reverse. Its formulations are strongly defined as conceptual, with a pragmatic focus on problem solving. Though these philosophical accounts appear mutually exclusive, for the layman at least they need not seem so far apart. If our perceptions of the world are accounted 'real', then social reality may be defined as the (real) sum of those (real) perceptions. This working proposition will square many apparent contradictions.

The epistemology of SSM also has something in common with that of *Realism*, which is based on the:

'building of models of.....mechanisms such that, if they were to exist and act in the postulated way, they would account for the phenomenon being examined. These models constitute hypothetical descriptions which, it is hoped, will reveal the underlying mechanisms of reality; these can only be known by constructing ideas about them' (Blaikie 1993)

Checkland uses systems concepts as the well-defined theoretical base for model building, and substitutes, for the *Realist* claim that social reality will be explained, the more modest claim that some part of human activity may be understood better than previously. Moreover, where the seven stage model's dividing line may be perceived as an ontological difficulty which may need some explanation, its epistemological function is clear and important. It separates conceptual products whose systems theory base is explicit (systems thinking world) from impressions and interpretations which may be equally 'conceptual', but have no defined theoretical foundation (real world). The analyst's ability to move freely between these two 'worlds', and to compare and contrast them (without losing sight of the status of either) is the most fundamental of SSM skills, and the foundation of the SSM 'learning system' (Checkland 1989), whether in the early seven stage model version, or the later 'mode two' development.

Checkland's reasoning strategy may best be aligned with *retroduction* in Blaikie's scheme, here defined by Bhaskar (1979):

'Typically, then, the construction of an explanation for.....some identified phenomena will involve the building of a model, utilising such cognitive materials and operating under the control of something like a logic of analogy and metaphor, of a mechanism, which *if* it were to exist and act in the postulated way would account for the phenomenon in question (a movement of thought which might be styled '*retroduction*'). The reality of the explanation must then, of course, be subjected to empirical scrutiny'

Again Checkland offers a more limited claim consistent with his ontological stance - the models are not 'explanations' of reality, merely systems-based constructs to be held up against the perceived world for the purposes of comparison. Blaikie also gives a typology of models: *representational, analogue, mathematical, theoretical, imaginary*. Checkland's 'holons' fit his description of *theoretical* models perfectly:

'*Theoretical* models consist of extending a familiar theory into a new domain of application; they draw from some more basic theory or theories a set of assumptions about an object or system, including its inner structure, composition or mechanism. Theoretical models differ from theories in that they use approximations, omit complicating factors, and introduce idealised relationships'

This distinction further underlines the distinction between theory and SSM models.

The underlying philosophical approach of SSM may not fit entirely neatly into Blaikie's taxonomy, or be perfectly consistently expressed in every detail, but it is neither reasonable nor sensible to expect perfect consistency and virginal scholastic purity of a methodology which has always got its hands dirty attempting to solve real problems. The researcher will be hard pressed to find *any* methodological approach displaying such purity and consistency. It may be argued that an approach that does not fit consistently into *one* philosophical tradition does not fit at all; the response will be that the purpose of a problem solving methodology is to solve problems - not to fit into philosophical traditions. One must also remember that Blaikie's taxonomic classes are themselves rationalisations of complex sets of ideas from the work of many different writers, which are very far from being consistent in themselves. It is my contention that the SSM researcher may proceed confidently in the knowledge that their research tools fit comfortably in the traditions of social science. Where and how they fit may offer some insight into the contingencies that will determine the success and acceptance of their work.

SSM AND THEORY

Given that theory is a proper concern of researchers and having expressed some reservations about the theoretical status of SSM products, some further consideration of these issues becomes necessary. The type of theory being considered here is Merton's (1957) *middle-range* theory, falling between the

'minor working hypotheses' of everyday life and 'all-inclusive' grand theories. It may be *substantive* - concerning an empirical subject area, or *formal* - relating to a conceptual area of interest in the field (Glaser + Strauss 1967). To Sawyer's (1984) categories of *normative* and *explicative* might be added *predictive* and *descriptive*. Where a constructed view of social reality is held, theories may appear 'inventions actively engaged in creating a reality, not passively waiting for their substantiation by the facts of the external world (Hughes 1990) - a viewpoint in accordance with Giddens' 'double hermeneutic' (Bryant and Jary 1991). In practice, theories have many of the same characteristics as models; they are abstracted simplifications of the world with normative, explicative, predictive or descriptive capability - induced from observation (positivism), or waiting to be refuted (in the Popperian scheme (Popper 1963)). However, theories must have some power to inform across time, across situation, between people; whereas models may be entirely local, transitory, and personal. Most SSM models are of this second type.

Since rich pictures are normally descriptions of local problem situations and have no explicit theoretical underpinning or modelling logic, it is difficult to imagine any circumstances in which they would have the force of theory. Holons (here taken to include activity models with or without associated root definitions and CATWOE) are not normally *normative*, *descriptive*, *predicative* or *explicative* (hence the well-documented difficulties in using such models as the basis for information system design (Sawyer 1991, Doyle and Wood, 1991). Checkland (1995) asserts that SSM models 'are not 'of part of the world; they are only *relevant to debate about* the real world. 'As *theoretical* models (in Blaikie's typology) they are highly abstracted, and constructed to embody systems principles; *one* transformation, *one* Weltanschauung and seven activities per model is unlikely to represent enough of the complexity of a situation to be adequately *descriptive*. A suite of complementary models, by contrast, might begin to do this - but most would consider this a slightly unruly way of representing theory. Some exceptions may be admitted - perhaps to do with the level of validation involved; in situations where the researchers have a great deal of experience, and are conducting large investigations (as in a project the author was involved in the NHS) a model may be so well-tested over time and situation that some confidence in it as a high-level theoretical description may be developed. Conceptual models are not *normative* - they are not statements about how things *ought* to be. Exceptions may also be admitted to this rule - for instance, in a green field site where no activity existed, a model might be used as a blueprint for organising that activity. In the NHS project already mentioned the SSM enquiry approach was reorganised into a model appropriate for an evaluation process for a major NHS change programme - this might be regarded as having some normative theoretical force. The models' *explicative* force resides in the comparison with the 'real world', not in the models themselves, and neither are they *predictive*. SSM models, then, under normal circumstances, are too local, transient, and personal to be regarded as middle range theory. However, the models built during an SSM investigation should not be confused with the learning acquired, which may be substantial, and suitable to be represented as theory.

The starting point for consideration of SSM and theory generation and testing is Checkland's model of enquiry (figure 2). The model holds equally well for most research activity.

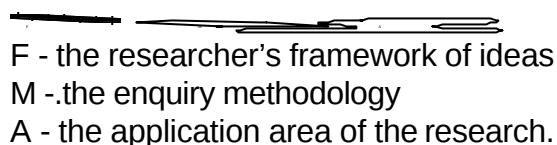


Figure 3 - Checkland's model of enquiry (derived from Hindle et al 1995)

F - a researcher's initial governing framework of ideas - may contain values, beliefs, opinions, knowledge, understanding. It *must* contain sets of implicit or explicit theories about reality and how new understanding may be achieved. It *should*, but all too frequently doesn't contain explicit theories about M (the methodology). It *may* contain implicit or explicit theories about A (the application area). For the SSM researcher, the main body of theory exploited - systems theory - governs M. 'Systemicity is shifted from the world to the process of enquiry about the world' (Checkland 1990). In many other research situations the principal focus is upon the theory base for A. However, an obvious implication is that there is room for explicit substantive or formal theory about A. in a SSM enquiry. In the NHS project already referred to, theoretical concepts from the evaluation studies literature were incorporated in the review process which was the end product of the study. In principal then, there is no objection to the researcher taking a theory, or theories about an area of purposeful human activity and using the methodology to test them. Theory about A may be incorporated into the modelling, for example, and then compared to the live situation. Similarly, there should be no objection to the researcher starting with a (theoretical) clean sheet with respect to A, and developing grounded (Glaser + Strauss, 1967) theory. Data collection can take any form (interviews, document searches, etc.); modelling is the iterative technique for codifying and reflecting upon the data. In the NHS study we might have developed the (hypothetical) theory:

In organisational situations where change is endemic, evaluation is more necessary, and less likely to happen

a conjecture made possible by long involvement with the application area, via the medium of the methodology.

SSM, then, is not confined to a problem-solving, action research mode. It falls within the domain of normal social science activity, with a defensible ontology, epistemology and reasoning strategy, and may also be used for the theory generation and testing activities of more conventional programmes. The development of more formal principles for these activities may be the subject of future research.

SSM AS A RESEARCH TOOL - CONTINGENCIES FOR OPERATIONAL SUCCESS AND ACCEPTANCE

The principal stakeholders in the (social science) research process may be regarded as:

- *researchers* - those who do the research
- *research sponsors* - those who indirectly or directly pay for it (such as research funding councils, student funding bodies, corporations, universities as the employers of academics.....)
- *research subjects* - those organisations or individuals who are being researched
- *the research audience* - those whose acceptance of the research make it meaningful (academic peers, host organisations, journals, publishers university examining bodies.....)

(In SSM terms: actors (*researchers*), owners (*research sponsors*) and customers (*research subjects, research audience*) depending upon the particular conceptualisation of the human activity system 'research'). Individuals or organisations may, and frequently do occupy more than one role. Moreover the balance of importance of the various stakeholders to the research process may vary considerably. For action research to be considered successful it must be accepted by the *research subjects* (host organisation) and some improvements effected; in the case of a PhD student's questionnaire the research might be entirely disowned by its hosting organisation - inconsequential as long as it satisfied the examiners.

Here then, is the major contingency for SSM research success and acceptance following upon the preceding analysis:

Where important stakeholders differ fundamentally in their ontological, epistemological and reasoning strategy stances from those of SSM, success and acceptance is unlikely.

Of course, it is only, amongst the academic community (and not universally even there) that these concepts are made explicit and discussed. However, the lack of *explicit* ontologies, epistemologies and reasoning strategies only implies that they are *implicit* - they cannot be absent. The manager who likes to make decisions on the basis of hard facts and figures, the software house with it's own development methodology and the marriage guidance counsellor trying to reconcile disparate perceptions of events must all, individually or corporately, make assumptions about the nature of reality and how it can be understood in order to proceed. Those assumptions may not be articulated, or even coherent and consistent. Paradoxically, the *less* articulated, clear and coherent the assumptions, *the more* difficulties are likely to be encountered. The effort of having to think out assumptions often forces a tolerance of other positions.

It follows then SSM research will be inappropriate in certain kinds of hard-nosed or autocratic business environments. It is not likely to be appreciated by a research colleague who specialises in mathematical computer modelling, or accepted in a quantum mechanics journal. The Medical Research Council probably will not fund it. Most other contingencies are really shavings from the main proposition. Certain management research environments which deal in the development of models which *are* believed to be descriptive or normative do not have much time for the scholastic niceties of Checkland's more modest approach

A sharp eye on the attitudes of the major research stakeholders, then, is the major precondition for success and acceptance in SSM research.

SSM AS PART OF A WIDER PROGRAMME OF RESEARCH

How then, given that the circumstances for adopting SSM are favourable, may it be integrated into a research programme containing other methods? SSM may be:

- a *problem-structuring* tool - SSM may 'front-end' other approaches by lending structure to 'soft' or (in Ackoff's term) 'messy' problems. The result of the study may be, for example, a set of 'research questions' to be answered by other means
- a *good-fit* research tool - a qualitative, activity-based, interpretative, participative, systems-based, methodologically explicit tool is appropriate to the research area and objective. Other tools may be used to promote other objectives
- a *triangulation* tool - findings obtained with another method may be confirmed, disconfirmed, or amplified
- a *theory testing or generation* tool - as previously discussed
- a *co-ordinative* or *directive* tool - the research process itself may be conceptualised as a purposeful human activity system. Models may then be built, which may, for example, delineate the various research activities and their logical dependencies which will constitute the research process. Alternatively, SSM may be used to provide a common basis for trans-disciplinary research (Hindle et al 1995).

Systems principles dictate in every case that clear thought must be given not only to the components of the research design, but to how they are linked, for the emergent property - a properly constituted research process - to be satisfactory. This is often *not* the case in conventional research programmes - methods (participant observation, questionnaire, textual analysis, statistical tests.....) are cobbled together without much governing theoretical epistemological understanding, but with the hope, prayer, and gut-feeling that a sensible research process will appear. The SSM research process is, in the opinion of the author, more explicit, coherent, and theoretically justifiable than many such mix-and-match programmes. However, links between SSM components and other components must always be thought out carefully with the questions: 'how will the outcomes of the SSM study feed into other components?' - 'how will the outcomes of other components feed into the SSM study?'

CONCLUSIONS

This article set out to explore the issues that should be explicit in the design of social science research which includes SSM as one of a number of approaches. SSM fits comfortably within the traditions of social science research, but this is a broad church with many different orthodoxies, and care is needed not to juxtapose incompatible ontologies, epistemologies, and reasoning strategies. For use in applied research (as opposed to its action research role) it needs to be re-focused away from desirable and feasible change and towards the researchers' learning. This is not difficult to do (change is always advocated on the basis of learning), amounting to greater emphasis on good use of the modelling tools and comparison, and less emphasis on actions for change. It

may be objected that a workaday problem-solving methodology does not have sufficient rigour to provide reliable learning - in fact the modelling techniques *are* highly rigorous, and founded on explicit theory. Though its products (the models) do not normally have any special theoretical status, they may (in some circumstances) earn that status, and there is no particular reason why good learning from a SSM study should not be represented as 'middle-range' social science theory. In addition to this use (theory generation), there is, in principle, no reason why the methodology should not be used for testing, (confirming, refining, refuting) theory, provided the epistemological approach is acceptable to the research stakeholders. It may be used in at least four other ways in a social science research programme, as a *problem-structuring, good-fit, triangulation* or *co-ordinative* tool. In every case attention will have to be paid to the relationship between the SSM component and other components of the research programme. As in any research programme, researchers will be wise to make sure that ontological, epistemological and reasoning strategy approaches are appropriate to the needs of the major stakeholders. to ensure success and acceptance.

Though this discussion may help to focus the contribution of SSM to social science research it does little to promote good research. Good research is effected, not by strong methodology alone, but by its conscientious, intelligent and self-reflective *application*. With SSM, as with any other tool, the skill and experience of the researcher in using the methodology is a crucial element. *All* research tools need to be used with a good understanding of their provenance, philosophical and theoretical underpinning, and inevitable limitations. Research tools also need to be used with an appreciation of the fallibility of reason and scientific method exposed by philosophers, historians and sociologists of science. 'Neither science nor rationality are universal measures of excellence. They are particular traditions, unaware of their own historical grounding' (Feyerabend, 1993). Not only is there room for intuition ('right brain' activity) in intellectual work, as Mintzberg (1994) asserts - it is an essential component. More power to those approaches which exploit it!

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