APPLIED GENERAL SYSTEMS RESEARCH

Recent Developments and Trends

Edited by
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State University of New York
Binghamton, New York

Printed in the United States of America

UNDERSTANDING SUPRA-INSTITUTIONAL PROBLEMS: SYSTEMS LESSONS DRAWN FROM AN APPLICATION OF THE CHECKLAND METHODOLOGY

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INTRODUCTION

During the years following the Second World War, the effort to solve practical problems grew more formal and technical. Managers are faced with the need to make difficult judgments on such matters as, for example, stock control, project scheduling, or some future pattern of demand for a product or service. As the manager uses his experience and forms his judgments, he may, to an increasing extent, make use of formal problem-solving techniques. These usually apply to particular aspects of his problem; but it is frequently difficult to isolate that aspect of the problem situation which the technique requires to be treated in isolation. Systems ideas have been developed particularly to examine an overall situation, in order to identify problems which are the product of an interaction between its various aspects. One outcome of this "systems approach" has been the development of methodology.

A "systems-based methodology for real-world problem-solving" has been developed at the University of Lancaster [1,2,3,4]. It is founded on the experience of a number of practical studies, almost all of them carried out inside organizations. However, the methodology has now been tested in a different context: it has been applied to a large "fuzzy" problem not contained within an organization. This paper is an account of what it was necessary to do, methodologically, in attempting to understand a particular supra-institutional problem. Elsewhere an account will be published of the substantive content of the study. Here, the concentration is on the systems lessons drawn from the study, in the belief that they are relevant to any supra-institutional problem.

THE CHECKLAND METHODOLOGY

A methodological enquiry is systematic, yet flexible. An inflexible mode of enquiry is only powerful while the assumptions on which the prescription, frequently embodied in a checklist of questions, remain tenable. On the other hand, it is possible to go to the other extreme and to approach an enquiry in a frame of mind merely conditioned by a philosophical awareness of the nature of the enquiry. Again there is an obvious danger--in this case that our discipline will slacken, and that the enquiry will get bogged down. An appropriate mode of enquiry would therefore seem to be one which is an effective learning system: that is, our thinking is disciplined by past experience but we remain alert to the peculiarities of the enquiry in hand, and ready to adapt the methodology in the light of fresh experience.

An action research programme conducted by the Department of Systems at the University of Lancaster for several years has led to the development of an adaptive mode of enquiry of this kind. The methodology was developed by Checkland and his colleagues [1,2,3,4].

The origination of the Department's work lay in the use of a systems approach to largely technical problems in industry [5]. What became increasingly apparent to the workers concerned was that some of the most important and intractable difficulties were being encountered in the pattern of human activities associated with those technical problems in industry. As a result, attention was focussed on a methodological enquiry into these "soft" problems.

The Checkland methodology compares and contrasts an agreed (i.e. neutral) picture of a purposeful system of activity with conceptual models, based on possible interpretations of the nature and purposes of systems relevant to the problem. If the picture were of a university, one (debatable) model might be based on the assumption that it is "a system which prepares the intelligent young for future employment."

This is a system-based methodology, but the systems thinking is confined to the conceptual part of the enquiry. For the rest, the enquirer is first collecting evidence for his picture, and then systematically comparing his systems model with that picture so as to generate productive debate among concerned actors on such feasible and desirable changes as might be made by intervening in the situation. The nub of the exercise is the definition of the systems to be compared with the picture [2,3].

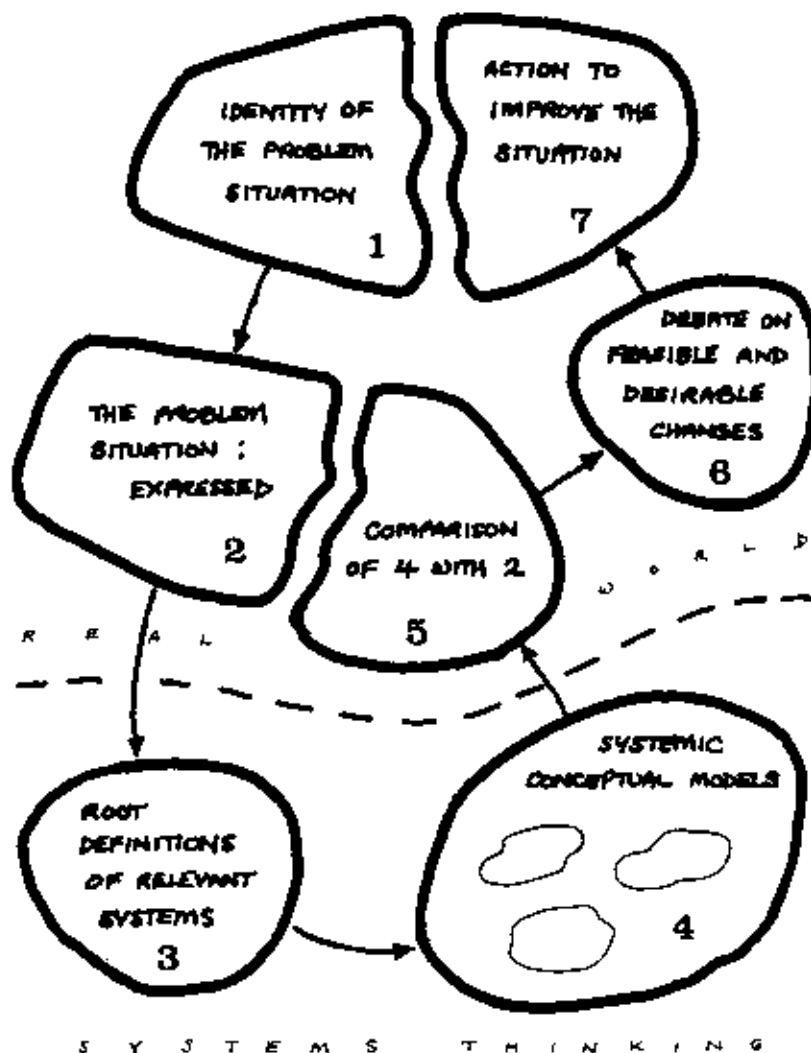The Checkland methodology is summarized in Figure 1.

Figure 1   The Checkland Methodology (After Smythe and
            Checkland) [3].

AN ADAPTATION OF THE METHODOLOGY

There commenced in 1974 a project concerned with both art and
systems [6].   It stemmed from the writer's long experience of the
art world, and concern for its problems [7].   The decision was
made to use the Checkland methodology as a means of carrying out
an investigation of the art world which would also test the meth-
odology itself in a new arena.   Consequently the first step was
roughly to specify the problem situation (see Figure 1), and here
our sense was that the problems of the art world were so inter-
connected and so little understood (so much what Ackoff would call
a "mess" [8]) that we would do well to consider the situation in
its entirety, i.e. the content of stage 1 would be "the art world."

At stage 2, it was recognized that a would-be descriptive
expression of the art world (produced with the intention of pro-

viding the neutral picture with which the models could be contrasted
at stage 5) was neither descriptive of the facts nor neutral!
Instead, as an experienced actor in the situation, the writer had
produced a description of his personal _conceptual model_ of the art
world at that time. In methodological terms the effort to produce
a "rich picture" (stage 2) had resulted in a model (stage 4) based
on a point of view (a "root definition"--stage 3) reflecting the
writer's engagement in the activities of the art world.

The lesson of this experience was that we can never expect
to arrive at a neutral account of a social problem situation, for
there is no definable set of "owners" to determine the boundaries,
purposes, and other defining characteristics of relevant systems.
The attempt to do so leads inevitably to the delineation, by
selective emphasis, of a _model_ which is the embodiment of a partic-
ular _weltanschauung_. One man's "solution" is another man's
"problem."

It was not practical to make progress without a methodological
adaptation in the light of the experience described. Specifically,
since it had not been possible successfully to complete stage 2,
it would be impossible logically to undertake a systematic com-
parison at stage 5 (See Figure 2).
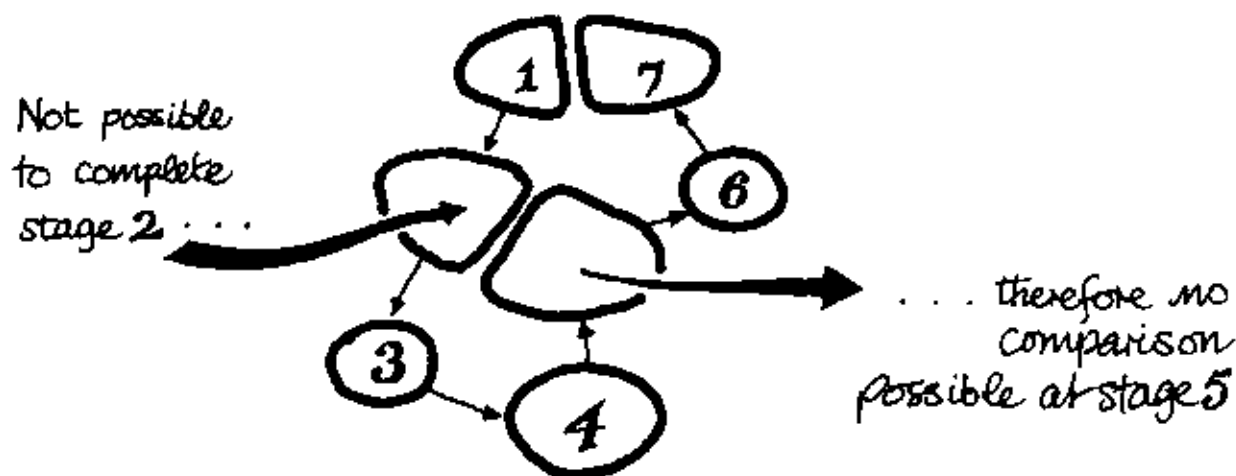
Figure 2   The logical obstacle to progress in the
experience described.

The experience led to the development of a new strategy.
Having accidentally started the study by producing a biased con-
ceptual model of the art world, it was recognized that, since the
methodology is iterative, there is no reason in principle why work
should not commence at the modelling stage (i.e. stage 4 in Figure
1). The revised strategy was thus to regard the art world (present

and historical) as reflective of the various models that those
who have influenced its development have in mind.

Following this adaptation, a dozen conceptual models of the
art world were developed, each on the basis of an explicit view
confirmed by reference to available sources. One example is a
model based on the view that art is (or should be) a high form of
decoration, from which it follows that those aspects of the art
world with which we shall be particularly concerned are those which
bring the artist into the sort of contact with a potential client
as will result in a contractual agreement of some sort. A second
example drawn from the set of models is one which is based on an
entirely different view; in this case we assume that it is the
aspiration of the artist to achieve recognition among his peers,
and that art is gradually concentrated into a closed "debate" among
specialists. Less obviously, we are able to conceptualize a model
of the art world in which we assume that art has an existence
which is independent of the wishes and the interests both of the
artist and of the patron: Such an art is the product of what we
have come to think of as "genius." In this third and final ex-
ample, the model is dominated by the critic, whose role it is to
discover the product of genius, and to reveal its hidden truth.
(It was found that certain people in the art world confirmed and
qualified some models more than others, and these were in con-
sequence taken to be more important, and were developed further.)

All of the models were then assembled so that correspondencies
and contradictions could be noted. The comparisons were dramatic,
and--being derived from a systematic amplification of views already
latent (or only part expressed) in the art world itself--the corre-
spondencies and contradictions both predicted and explained con-
tentious issues either current or likely to arise within the art
world. Further observations could now be made by the enquirer,
based on a systematic comparison between the real world evidence
and the models. Note that in a complex and ill-defined situation
of this kind the word "evidence" cannot denote the quantified
evidence of the laboratory, and it is unlikely that we should even
have access to evidence in the jurisprudential sense. We are lim-
ited by the very nature of this difficult form of enquiry to state-
ments issued by actors in the situation with which we are concerned.
Such statements define issues and attitudes, and as such are en-
tirely appropriate to the comparison at stage 5 of the revised
Checkland methodology.

After completion of the comparison stage described, the author
carried out a study at the request of a group of organizations in
the art world, in which the outcome of the general enquiry was
used. Further tests of the utility of the model ot the art world
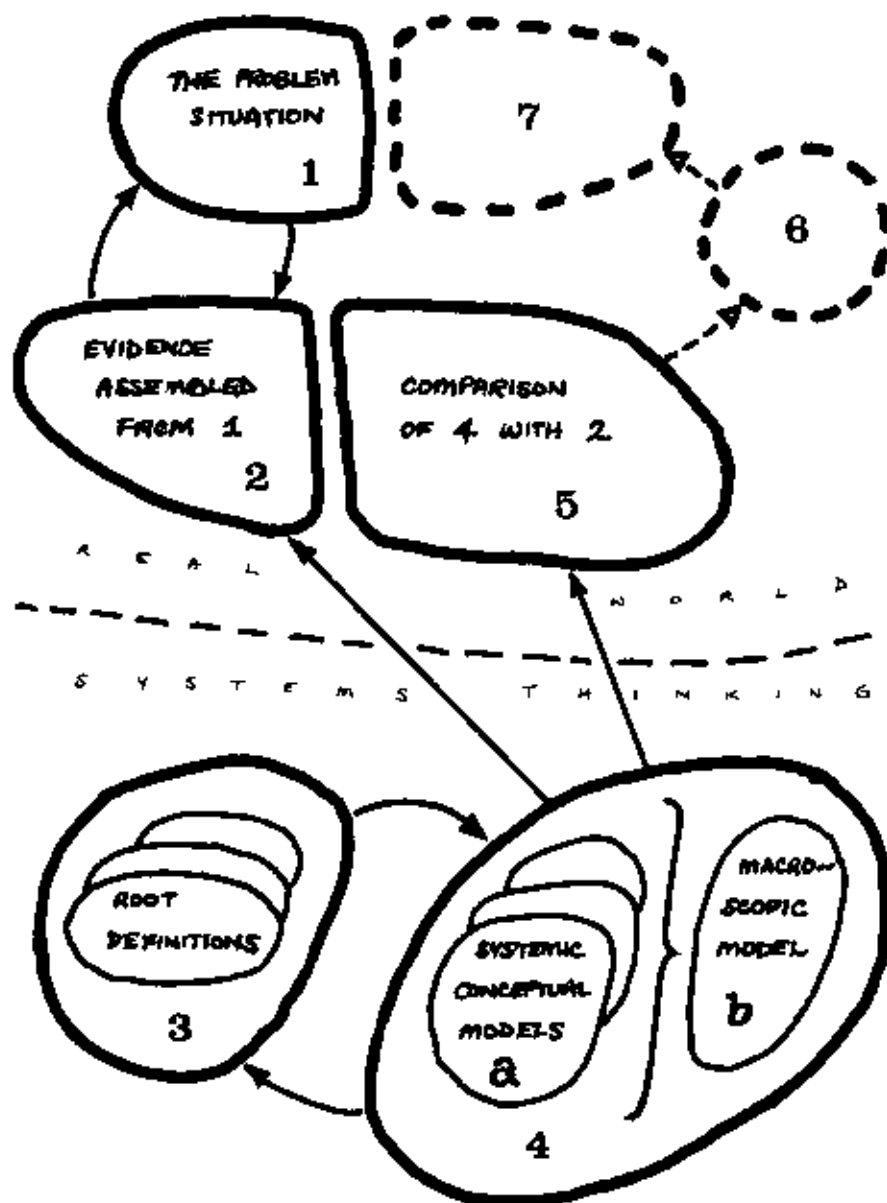are in hand.

Figure 3   The revised Checkland methodology in summary.
Work commences at Stage 4a.

The Revised Methodological Procedure

The Checkland methodology, as it has been adapted in the course
of this work, is summarized as a process diagram in Figure 3 (which
compares with Figure 1). It is not the purpose of this paper to
describe in detail the specific application of the revised meth-
odology, but the logical sequence of operations is set out below.
Note that the layout of the Checkland methodology has not been
changed in the diagram, and that the stage numbers also correspond
with the original, where the numbers 1 to 7 indicate logical con-
nections rather than a temporal sequence; this is done to emphasize
the major continuities between the original mode of enquiry and
this adaptation of it.

First. Stage 1 in Figure 3. Identify the problem area. Experience has shown it to be important to make this identification inclusive, diffuse, and inexact. This in no way weakens the subsequent enquiry.

Second. Work effectively commences at stage 4a. The effort is made to estimate key views of the problem area held within it, and to begin to make explicit conceptual models based on those views.

Third. Stage 2. Seek evidence for the reasonableness of imputing to certain actors in the real world a particular view as expressed in the model.

Fourth. At stage 3, the root definition implicit in each model is used to discipline its further development.

Fifth. Returning to stage 4a, the models, now more clearly defined, are developed as systems models.

Sixth. At stage 5, a comparison takes place between each of the models developed at 4a and the appropriate evidence collected at stage 2.

Seventh. The next task takes place at stage 4b. It is to assemble the models (4a) into a macroscopic model, noting which of them are cognate, and any serious contradictions. The macromodel is not a synthesis; it is an aggregate of models that either do, or do not fit happily together.

Eighth. Again at stage 5, the task is to compare and contrast the macroscopic model with information regarding extant issues (e.g. statements made by actors in the attempt to influence current developments).

DISCUSSION

The methodological approach described raises questions about the nature of the problems to which it might be applied, and about available modes of enquiry. One consequence of this study is that attention has been drawn to the importance of establishing the ownership of perceived problems. Broadly, it is useful to distinguish three kinds of problems, those with:

   (i)   single owners
  (ii)   multiple owners
 (iii)   public ownership.

The individual decision-taker in an organization can be said to "own" those problems which it is his routine responsibility to

solve. To these problems problem-solving techniques may well be
applicable. There are other problems to which technical solutions
are apparently applicable, in which the manager may find himself
drawn into conflict with those who are affected by his "solution."
An example of this would be the mechanization of a technology which
threatens part of a labour force with unemployment. In this case
a definition of the problem should include both sets of problems-
owners, and a solution may be sought using "soft" systems meth-
odology [9]. The aim of an approach of this kind would be to
spell out the implications of a range of views and possible actions
in a search for acceptable decisions (e.g. phased modernization,
perhaps with generous redundancy and retraining schemes). Problem-
solving of this kind, though more complex than cases in which the
problem can from the start be reduced to a decision on a choice
of means to achieve a defined objective, is itself relatively
straightforward compared with the task of tackling problems whose
ownership lies with the public as a whole.

Increased public consciousness of problems (which may be an
artifact of increased mass communication) begins to demand that
attention be paid to events which--though problematic--might not
hitherto have been considered as soluble. An example is the prob-
lem of an excess world population. Another example, slightly more
tractable, is the threat posed to the conurbations around the San
Andreas fault on the West coast of the United States of America.
In the latter example, various technical and even social actions
are being contemplated, and an authority has been established to
cope with the earthquake disaster anticipated [10]. But this kind
of action, like the official attempt to regulate fertility in
India, may imply the formation of institutions not normally ac-
ceptable in democratic societies. Certain extreme situations can,
of course, create a temporary increase in institutional scope, as
for example in war, when national mobilization may be possible;
and the "space race" is another example.

The publicly owned problem is one which is only capable of
"solution" to the extent to which the actors can reach a mutual
awareness of the kind described by Churchman:

> ...it seems at least plausible to argue that
> the "verification" of a research project of a
> dialectical inquirer is not the establishment
> of a solution, but the creation of a more
> knowledgeable political process in which the
> opposing parties are more fully aware of each
> other's Weltanschauungen and the role of data
> in the battle for power. [11]

Through an extension of this line of thought we may arrive at the remarkable idea that insoluble problems may actually be desirable:

> ...in Singerian* design neither satisfaction
> nor dissatisfaction are to be taken as end
> states. Rather they are signs of the need for
> additional planning and striving. In a sense,
> man struggles not to find solutions but to
> create new problems, or one might say, new and
> "better" problems. The attainment of any level
> of "success" of the human species introduces
> more problems than it solves, but the problems
> are in some sense better because they are
> founded on what has gone before. [12]

The study referred to in this paper concerns the stretching of a methodology to help us to design "better" problems in the public domain.

Finally, it will be noted that in the title of this paper the phrase "supra-institutional" has been used, rather than the word "public." This is because the study on which this paper is based was not a theoretical consideration of the problems presented by public problems. The outcome is the result of the particular experience of that study, which led to recognition of the consequence of extending the Checkland methodology beyond problems owned by particular organizations.

When we examine an institution-owned problem we expect that it will exhibit some structures and processes which reflect (however fuzzily) some degree of purposeful design. This is important because difficulties are encountered in non-institutional situations, in the absence of any such purposeful "design." We can nevertheless expect that supra-institutional problem situations will contain evidence of the tendency of the people engaged in them to structure those aspects of the situation which are within the scope of their power or influence, and in accordance with their unique perceptions. The strategy behind the methodological adaptation described in this paper is therefore:

(i) to abandon the attempt to proceed on the basis of a neutral expression of the situation, and

(ii) to concentrate instead on setting out the structure and processes that would be consequent upon the wholehearted adoption of the differing views of the main groups of people in the situation, each set of structures and processes being "drenched" in values.

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*The reference here is to the American philosopher E. A. Singer; Checkland [13] argues that his methodology is Singerian.

Instead of striving for scientific objectivity, the enquirer is thus enabled to strengthen his grasp of the "inter-subjectivity" of the situation [14]. What he does is to compare evidence deriving from attempts by concerned actors to shape the situation with the logical consequences of holding the views associated with various actor roles. These "logical consequences" are embodied in his conceptual models of human activity systems, both individual, and in the macroscopic, aggregated form.

By using the Checkland methodology in the way described, an approach has been opened to a systems-based attack on problems which exist outside the framework provided by institutions. This method has a potential value in the establishment of a better quality debate on social issues.

ACKNOWLEDGEMENTS

REFERENCES

1. P. B. Checkland, "The Development of Systems Thinking by Systems Practice--A Methodology from an Action Research Program," Progress in Cybernetics and Systems Research, 2, edited by R. Trappl and F. de P. Hanika, Hemisphere, Washington, pp. 278-284, 1975.

2. P. B. Checkland, "Towards a Systems-Based Methodology for Real-World Problem Solving," Journal of Systems Engineering, 3, 2, Winter 1972, pp. 87-116.

3. D. Smythe and P. B. Checkland, "Using a Systems Approach: the Structure of Root Definitions," Journal of Systems Engineering, 5, 1, November 1976, pp. 75-83.

4. P. B. Checkland, "Systems Methodology in Problem-Solving: Some Notes from Experience," Third European Meeting on Cybernetics and Systems Research, Vienna, April 1976. (Proceedings to be published shortly.)

5. G. M. Jenkins, "Systems and Their Optimization," Text of an inaugural lecture delivered at the University of Lancaster in 1967.

6. The title of the project is "The Concept of System as a Paradigm in the Domain of the Artist," and it is registered with the Department of Systems at the University of Lancaster.

7. S. Cornock, "The Role of the Artist in a Post-Industrial Culture: A Systems Approach," Advances in Cybernetics and Systems Research, 2, edited by F. de P. Hanika and N. Rozsenitch, Transcripta, London, 1973, pp. 413-420.

8. R. L. Ackoff, "Beyond Problem Solving," General Systems, 19, edited by A. Rapoport, S.G.S.R., Washington, pp. 237-239, 1974.

9. In the case of the Checkland methodology, one of the tests applied to the root definitions of relevant systems, namely asking "who are the victims, who are the beneficiaries of this system?" will draw attention to this aspect even if it has been missed in the initial formulation of the problem.

10. Open University, "Earthquake Data File," prepared by Roger Spear for the Third Level Course on Systems Performance: Human Factors and Systems Failures, Open University Press (TD 342 EDF, SUP 00341), 1976.

11. C. West Churchman, The Design of Inquiring Systems, Basic Books, New York, p. 185, 1971.

12. Ibid, p. 253 f.

13. P. B. Checkland, "Science and the Systems Paradigm," International Journal of General Systems, 3, 2, pp. 127-134, 1976.

14. R. L. Ackoff, "Optimization + Objectivity = Opt Out," European Journal of Operational Research, 1, 1, January 1977, p. 6.