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A METALANGUAGE FOR COMMUNICATION, CONFIDENCE, AND COMMITMENT: A NEW PERSPECTIVE ON INFLUENCE DIAGRAMS

That is not it at all,
That is not what I meant at all.
"The Lovesong of J. Alfred Prufrock", T.S. Eliot

Therefore am I still
A lover of ...all that we behold
From this green earth; of all the mighty world
Of eye and ear--both what they half create,
And what perceive.
William Wordsworth

Recent international conferences of the System Dynamics Society have emphasized the value of diagrams and models to teach strategic thinking. In addition, these diagrams have proved useful in communication, which, as I. A. Richards states, is the process of eliciting meanings. According to Richards, "the goal of communication is to create a similar mental experience in the other, a goal that can be achieved only when the communicators share a certain degree of past experience"(Richards, 1923). The work of the researchers discussed below illustrates how diagrams are used to effect the sharing of experience to facilitate communication and cooperation in groups.

The purpose of this paper is to show some of the schemes used by systems researchers and consultants to collect data about their clients' perceptions of problem situations. These various schemes--which use both words and graphics, consisting more or less of curved lines and arrows--are useful for

1. helping clients express their perception of a problem situation
2. organizing clients' thinking
3. helping to overcome traditional rivalry between individuals and between groups
4. helping "to create a consensus and commitment to action in a team" (Eden, 1988,2).

My paper will discuss three such schemes, proceeding from the 'soft' systems methodology (Checkland,1981); then 'cognitive mapping' (Eden,1988); and finally, two system dynamics studies dealing with health care systems.

PERCEPTIONS AND CONCEPTUAL FRAMEWORKS

A major contribution of the work of Checkland, Eden, and the Stearns and Vennix teams is their recognition that they must address people's perceptions of a problem situation in order to construct a conceptual framework that will serve to clarify thinking about that situation. These frameworks also serve as a basis for creating consensus and cooperation.

The importance of perceptions has been supported by insights now being advanced by cognitive science into how people process language . For example, Terry Winograd, working in the field of Artificial Intelligence, argues that "reality is not objective, but neither is it individual" (Winograd and Flores, 1986,50). Despite Winograd's formal training in mathematics and computer science, he found his notions about language and thought "were far removed from the mathematico-logico paradigm" and closer to those working in biology, hermeneutics, and phenomenology.

Terry Winograd was not alone in recognizing limitations of the "mathematico-logico paradigm"--which historically been associated with positivism, the view that the world is independent of our perception of it. Interestingly, Checkland also acknowledges the importance of the work of phenomenologists like Husserl "whose central concern is the nature and content of our thinking about the world rather than the world itself as something independent of it" (Checkland,273).

Checkland observes that "In the humanistic-culturalistic tradition of phenomenology and hermeneutics human beings in the social process are constantly creating the social world in interaction with others. They are negotiating their interpretations of reality, those multiple interpretations at the same time constituting the reality itself" (Checkland,277).

SOFT SYSTEMS METHODOLOGY

Checkland developed a "methodology"--less precise that a technique, but "a firmer guide to action than a philosophy" (162) that would be useful for real-world social problems. He tells us that the "basic language used for model construction [consists of] all the verbs in the analyst's speaking language....These will need to be connected together in order to represent the system as an entity, and the most basic form this

connectivity may take is a number of arrows which indicate logical dependencies"(286).
Figure 1 below concerns the management of intellectual properties in a science-based company.

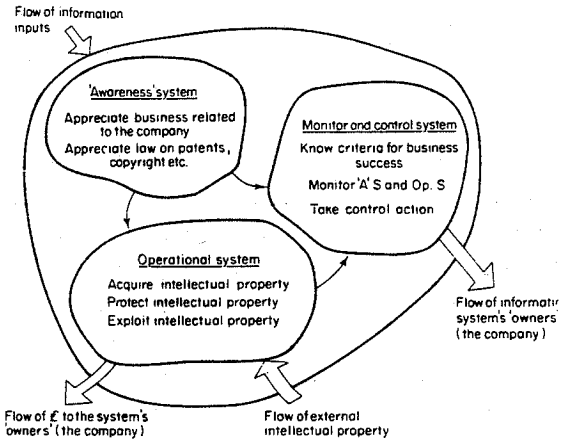

Figure 1: The general structure of the system described in the root definition (Checkland,289)

Soft systems methodology is imaginative, eclectic, and pragmatic. The methodology, says Checkland, was developed during nine studies between 1969-1972, "and has been subsequently tested and modified in more than one hundred studies since then" (16).
Checkland's achievement is his development of a useful methodology to analyze the ever changing nature of social reality.

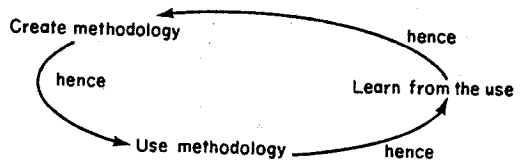

Figure 2: (Checkland,254)

He concludes the "The theoretical and practical work described here leads to the conclusion that the unquestioned prime value embodied in 'a systems approach' is that continuous, never-ending learning is a good thing"(285).

COGNITIVE MAPPING

Another approach to modelling real-world social problems which depends on "linguistic rather than numeric vocabularies" (Keys,1988,223) is Eden's cognitive mapping. Eden observed that while working in

Operations Research, most of the projects "taken to be successful and useful by [his] clients...were, without exception, those where modelling technique was simple and consequently transparent to the client, and seemed to organize his/her thinking rather than suggest a course of action....The basis of this development was...[the] discovery that managers think and work for the most part of their lives with language and ideas not with numbers and mathematical symbols" (Eden,1988,1-2).

Like Checkland, Eden accepts the premise that social reality is constructed or created by people in a community or a group, that individuals "see/perceive different things in what might be regarded as the same situation"(Eden,2). And like I.A. Richards, Eden understands that "effective interaction between members of a problem solving team depends upon the extent to which they can each understand how the other interprets the situation" (Eden,2). As in the studies by the Stearns team and the Vennix team, Eden says the consultant constructs "a model of the situation by listening carefully to the language used by the client" and then refines and modifies it in response to the client's corrections. An essential part of Eden's approach is what some psychotherapists call reflective listening. Eden refers to his earlier work as "encouraging problem solving through sensitive reflective modelling"(Eden,6).

While the cognitive map in figure 3, below, seems relatively simple, Eden acknowledges that a team map, which reflects the thinking of several people, can be rather complex.

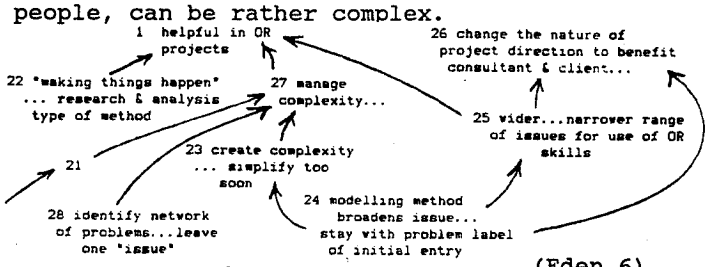

Figure 3: Elaboration of a cognitive map (Eden,6)

Eden maintains that by retaining large numbers of concepts of each member of the team--"most team maps reach in excess of 500 concepts and 700 links after aggregation for the first team meeting"(9)--the users feel ownership of the model." To record, represent, and analyze" such complex models there is a computer software called COPE, which enables the consultant " to manage complexity in many different ways"(10).

SYSTEMS INTERVENTION AND SYSTEM DYNAMICS

Systems intervention, like Eden's team map, uses visual models reflecting the concepts of various individuals and groups engaged in problem solving activities. "Systems intervention is a process that uses systems dynamics and behavioral science techniques to overcome barriers to change"(Stearns et al.,1976,10).

Like the schemes used by Checkland and Eden, the systems intervention approach to problem solving using visual models--system flow diagrams--to elicit concepts and cooperation from the problem owners. The problem facing the Stearns team required the consultants to win the confidence and cooperation of rival departments in a teaching hospital in order to avoid a "spiral of decline" when the chief of medical services announced his resignation.

The flow diagrams, a key element in systems intervention, "promote a dynamic view of a problem situation by showing past changes over time; they also provide a framework for future change...."(Stearns,11). As is the work of Checkland and Eden, the graphic models provide a framework for the discussion of differing perceptions "without rancor"(17). See figure 4 below.

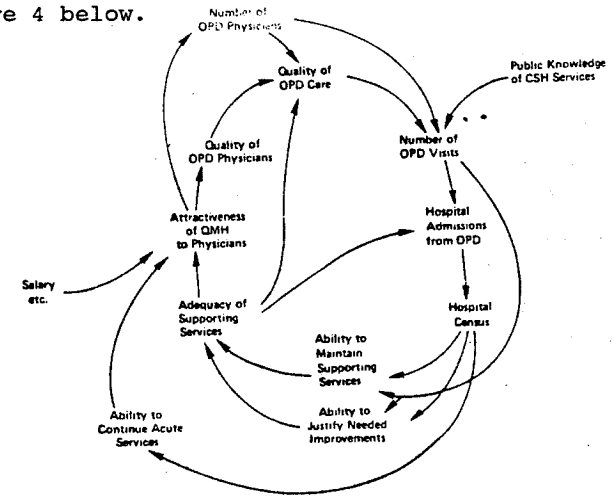

Figure 4: Interdependencies between OPD and hospital services, Stearns,13.

Another key element in systems intervention is a broad-based task force with the authority to implement changes, so that "a consensus would be tantamount to an authorization for action"(11). Thus "the people most likely to resist change take responsibility for seeing that it happens"(11).

A more recent system dynamics study describes the use of preliminary conceptual models--influence diagrams--to win the confidence and support of potential users of a health care model.
First the team developed a preliminary conceptual model "based on the relevant literature and on general insights within the group" (Vennix et al., 1988,421). This preliminary model was used to stimulate discussion and to elicit from individuals their concepts, inviting them to agree or disagree with the parts of the model, while the consultants continued to modify it to reflect more accurately the experts' perceptions of the real-problem situation.
Second, they used a variation of the Delphi-method to consult a large number of experts, using two Delphi-cycles to improve the preliminary model. The first cycle used a questionnaire, and the second a workbook, which would allow respondents to address complex interrelationships with variables. Participants were asked to circle those parts of the submodel with which they disagreed.
Third, they held a four hour structured workshop for the discussion of submodels. The workshop was run twice, with nine participants in each. The groups then divided into subgroups of three, and modified the influence diagrams in the workbook. Later they presented their results to the plenary group, integrating the changes on a large diagram, assessing them, and modifying them again as necessary.
The final conceptual model was developed from the results of the questionnaires, the workbooks, and the workshop discussions. It will be used to develop simulation models to teach health care policy development.

The Vennix team was notably successful in winning the support of potential users of their model. By acquainting health care professionals with their initial model (see figure 5 below)

which they published in a medical journal, and enclosing an article on the preliminary model with the questionnaire, they received an extraordinary 95% rate of response.

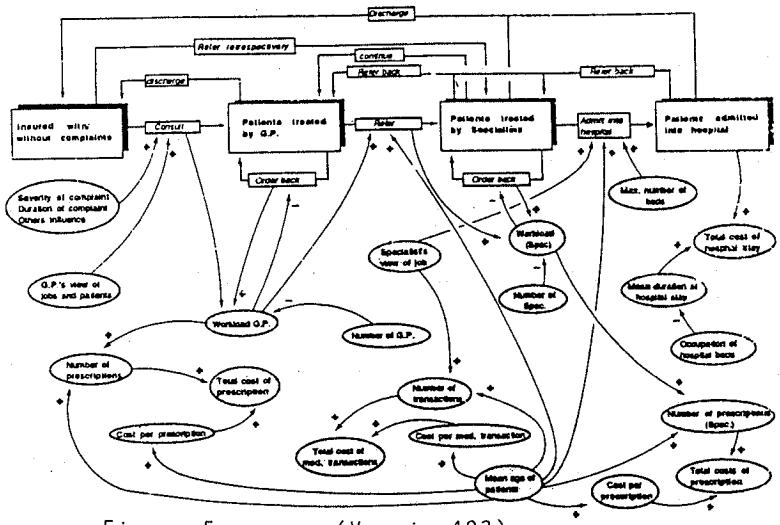

Figure 5: (Vennix,423)

CONCLUSION

Late twentieth century researchers are beginning to accept what the poets have long known about perception and meaning, namely that meaning resides not in the symbol or the referrent, but in the mind of the beholder. The studies discussed in this paper demonstrate that systems thinking and system dynamics use influence diagrams to help clients clarify what they mean, first to themselves, and then to others. The schemes used by Checkland, Eden, and the Stearns and Vennix teams are empirically proven processes that show us how to achieve what I.A. Richards identifed as the goal of communication.

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