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THE ART AND SCIENCE OF MESS MANAGEMENT

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Some of us in academic life are fortunate enough to be under constant pressure from our students to formulate our philosophies and paradigms, and to elaborate on them once done. This is not always an easy nor pleasant task. Left alone, most of us are inclined to let our thoughts ripen in the unconscious recesses of our minds before raising them to consciousness where others can pry and pick at them. Those of us at the Social Systems Sciences (S^3) Program at the University of Pennsylvania are under such pressure constantly. It is applied to us in the most effective way: if we do not formulate our position, our students will. Many readers are undoubtedly under similar pressure; for this reason it seemed appropriate to present our current efforts to respond to it.

Our thinking in S^3 is rooted in some beliefs and attitudes with which many of you are familiar.

By a *problem* we mean a situation that satisfies three conditions: First, a decision-making individual or group has alternative courses of action available; second, the choice made can have a significant effect; and third, the decision maker has some doubt as to which alternative should be selected. There are three kinds of thing that can be done about problems — they can be *resolved*, *solved*, or *dissolved*.

Resolving

To *resolve* a problem is to select a course of action that yields an outcome that is good enough, that *satisfices* (satisfies and suffices). We call this approach *clinical* because it relies heavily on past experience and current trial and error for its inputs. It is qualitatively, not quantitatively, oriented; it is rooted deeply in common sense, and it makes extensive use of subjective judgments. Clinicians do, of course, use research, even quantitative research, but they seldom use it exclusively or allow it to play a decisive role. They incorporate its outputs into the pool of judgment that is dominated by qualitative experience. The research they carry out or use tends to be based on surveys of opinions, attitudes, or characteristics of people. Tests, questionnaires, and interviews are the principal instruments used.

Most managers are problem resolvers. They defend their approach to problems by citing the lack of information and time required to do anything else. Clinicians also argue that real problems are so messy as to render alternative approaches either inapplicable or inappropriate. Furthermore, they claim their approach minimizes risk and therefore maximizes the likelihood of survival.

PROFESSIONAL: OR/MS PHILOSOPHY

Solving

To *solve* a problem is to select a course of action that is believed to yield the *best possible* outcome, that *optimizes*. We call this the *research* approach because it is largely based on scientific methods, techniques, and tools. It makes extensive use of mathematical models and real or simulated experimentation; therefore, it relies heavily on observation and measurement and aspires to complete objectivity [Ackoff, 1979]. The research approach is used mostly by Management Scientists and technologically oriented managers whose organizational objective tends to be *thrival* rather than mere survival; they are growth seekers.

The researcher, and particularly the decision maker who uses the output of research, often resorts to clinical treatment of those aspects of a problem that cannot be treated quantitatively, hence cannot be included in mathematical models. Researchers, more than managers, tend to resist the dilution of optimal solutions with qualitative considerations and often prefer an optimal solution of an incompletely formulated problem to a less-than-optimal solution of a completely formulated problem.

Dissolving

To *dissolve* a problem is to change the nature, and/or the environment, of the entity in which it is imbedded so as to remove the problem. Problem dissolvers *idealize* rather than satisfice or optimize because their objective is to change the system involved or its environment in such a way as to bring it closer to an ultimately desired state, one in which the problem cannot or does not arise. We call this the *design* approach. The designer makes use of the methods, techniques, and tools of both the clinician and researcher, and much more; but he uses them synthetically rather than analytically. He tries to dissolve problems by changing the characteristics of the larger system containing the problem. He looks for dissolutions in the containing whole rather than solutions in the contained parts.

The design approach is used by that minority of managers and management scientists whose principal organizational objective is *development* rather than growth or survival, and who know the difference. To develop is to increase one's ability and desire to improve one's own quality of life and that of others. Development and growth are not the same thing and are not even necessarily related. Either can take place without the other; a trash heap can grow without developing, and a person can develop without growing.

An Example

An example may help to clarify the differences between the three approaches to problems. A large machine-tool manufacturing company was confronted with abrupt changes in the demand for its products. Reactions to these fluctuations were both disruptive and costly. Among other things, the company seemed to alternate continually between hiring and firing personnel, many of whom were highly skilled. This made for low morale, and low morale made for low productivity, not to mention hostility between labor and management.

The company's management periodically resolved its problem by drawing on past experience, using "good sound judgment" and common sense. This approach came to be regarded as inadequate because the problem kept reappearing and it tended to get worse over time. (It is not unusual for problems that are treated

clinically to reappear and get worse. This failing has plagued psychotherapy and sociotherapy since their inception. The treatments of alcoholism now in vogue are cases in point.)

Out of desperation management decided to give Operations Research and optimization a try. The researchers who were called in to do the job formulated the problem as one of production smoothing, the solution to which depended critically on the accuracy of demand in the forecast. Unfortunately, good forecasts could not be obtained. Therefore, the solutions obtained by optimizing the model of the problem were only marginally better than those previously obtained by problem resolving.

An attack using design was then made on the problem. First, the problem was reformulated to one requiring the reduction of fluctuations of demand rather than response to existing demand. The business of the company was redesigned to reduce these fluctuations. A product line was added the demand for which was countercyclical relative to that for machine tools, but with production requiring the same technology, and some of the same parts and sub-assemblies used in machine-tool manufacture. The new product line, road building equipment, could also employ virtually the same distribution and marketing system as machine tools. Subsequent fluctuations of combined demand for the two types of product were about 7% of the fluctuations for machine tools alone.

The dissolution of the problem by redesign of the business moved the company closer to at least one of its ideals, stable employment. It also significantly improved the company's earning stream and reduced its cash-flow and labor-management problems.

Improvements obtained by resolving problems tend to have shorter lives than dissolutions. Few if any problems, however, are ever permanently resolved, solved, or dissolved; every treatment of a problem generates new problems. Problems are still photographs clipped out of motion pictures — abstractions extracted from experience by analysis — they are related to experience as atoms are to tables. We experience neither atoms nor problems; they are conceptual constructs, not objects of experience.

What we do experience are large and complex sets of interacting problems, *dynamic systems of problems*. In S^3 we refer to these as *messes*. Our focus is on the management of messes rather than the solution of problems. Mess management requires *planning*, not problem solving.

There are three primary types of approach to mess management, hence to planning. Each is an extension of one of the types of treatment of problems.

The Clinical Approach

The clinical approach to planning deals with messes and the systems containing them holistically but, because it does not analyze them, it deals with no explicit model of their structures. Clinical planners bring together a sample of those preoccupied with each aspect of the mess or system facing it so they can formulate a consensual appreciation of the mess and a concerted attack on it. Clinical procedures are very participative; the clinician serves largely as a convener and process consultant. His role is nondirective — he avoids inserting content into the procedure.

This approach is used extensively by those who refer to themselves as change agents, behavior modifiers, action researchers, organizational developers, and so on. Having a strong attachment to the behavioral sciences, they employ a variety of

sociopsychological techniques to encourage and facilitate creative and cooperative interactions between participating stakeholders: for example, brain storming, synectics, and sensitivity training.

The advantages of the clinical approach to planning include the comprehensiveness of its concerns, the holism of its orientation, and its tendency to generate consensus and commitment to the conclusions reached. This approach also tends to produce an organization that continues to plan. Its emphasis on participation often results in an enrichment of work life, and it makes the participants feel better about themselves and their condition.

The disadvantages of the clinical approach derive from the lack of structure imposed on its output and explicit criteria with which to evaluate it. What people agree on and feel good about is not necessarily efficient, effective, or even moral. (Witness what the town meetings in prerevolutionary New England did to alleged witches.) Participative bodies are as subject to error as individuals and as subject to misleadership as leadership. Groups, like individuals, tend not to be aware of what they do not know and need to know. The participative process set up by clinicians usually focuses on the social aspects of sociotechnical systems and slights those that are technical. These can seldom be handled adequately by loose, qualitatively oriented discussions that derive their inputs from uncontrolled experience rather than controlled experiments. Such discussions are more likely to suppress symptoms than relieve ailments. Furthermore, to get rid of what one does *not* want does not assure attainment of what does want. (To switch television channels when an undesirable program appears is not to assure one's getting a desirable program.)

The Research Approach

The research approach to planning is familiar to most of you, but it does require enough description to assure that we mean the same thing by it. This approach begins by analyzing a mess so as to identify its parts and their interconnections. It tries to formulate the parts so that their interconnections are minimal, thereby allowing them to be treated relatively independently of each other. Most importantly, they are also formulated as problems to which problem-solving methods can be applied. Although stakeholders may be involved in formulating the mess, they are seldom involved in the problem-solving phase of the process because it requires technical competence that most stakeholders do not have. The solutions obtained generally require little integrating because of the way the problems were formulated (that is, independently of each other).

Because the research techniques employed are more applicable to machine-like behavior than to purposeful human behavior, this approach focuses on the technical aspects of sociotechnical systems and either ignores the social or leaves it to others to take into account as they will (they often do so clinically). The principal deficiency of the research approach to mess management derives from its virtually exclusive reliance on analysis. Let me explain.

A mess is a system of problems. A system is a whole that cannot be decomposed into independent parts. From this it can and has been shown that a system always has properties that none of its parts have and that these are its *essential* properties. For example, such essentially human properties of a person as his ability to learn and use languages, to create art, to invent and play games, to design and produce tools, and so on, are not to be found in any of his parts. Moreover, the parts of a system lose

their essential capabilities and properties when they are separated from the system of which they are part. (The dismembered hand cannot write, the detached eye cannot read, and the disconnected brain cannot think.)

Therefore, when a research-oriented planner decomposes a mess by analysis, he loses its essential properties. Furthermore, by treating the parts separately he also loses their essential properties. As a consequence, what he perceives as the hard facts of the mess are really soft fictions of his imagination, abstractions only loosely related to reality.

The Design Approach

The design approach to mess management and planning is a synthesis of the clinical and research approaches that tries to adopt their advantages and avoid their weaknesses, but it also adds some new ingredients. This approach involves a concept of planning as a structured process that has five phases.

Formulating the mess. This is done in such a way as to capture and highlight the essential systemic properties of the mess, not by listing independently formulated threats and opportunities, but by projecting the future that the system would have if it, and its environment, were to continue unchanged. It is the future that a system currently "is in."

Ends planning. This involves selecting the ideals, objectives, and goals to be pursued by preparing an idealized redesign of the system planned for, a design with which the relevant stakeholders would replace the existing system today if they were free to do so. (The differences between this most desired design and the description developed in the first phase define the gaps to be filled by the remainder of the planning process.)

Means planning. Here the ways of filling the gaps are selected. (These are more likely to require invention than discovery.) They can take the form of policies, programs, projects, procedures, practices, or individual courses of action.

Resource planning. A determination is made of how much of each type of resource — people, facilities and equipment, materials and energy, money, information, knowledge, and understanding — will be required by the means selected, and when these requirements will arise. Then it is necessary to determine whether, and how, these requirements can be met. If they are found to be infeasible, the previously formulated ends or means will have to be modified and the cycle repeated.

Design of implementation and control. Decisions are made as to who is to do what, where, and when, and how their behavior and its effects are to be monitored and modified when necessary.

These phases of design-oriented planning are carried out as participatively as possible, ideally providing all stakeholders — not just their representatives — with an opportunity to take part. They are organized into small planning teams and these teams are so organized and managed as to assure coordination of their efforts the outputs of which can then be integrated into a comprehensive plan [Ackoff, 1970]. The planning process is also designed to facilitate continuous improvement of plans and continuous organizational and individual learning, adaptation, and development.

Both the clinical and research approaches to planning are incorporated into the design approach. Clinical methods are used heavily in each phase of the process, but ideas — that is, information, knowledge, and understanding — derived from research are continually fed into the participative process by professional planners.

Moreover, whenever there is collective doubt, or the professional planners doubt collective judgment and it is possible to remove such doubt by research, it is used.

Research is also heavily used in inventing, elaborating, and evaluating new ideas generated by the design process, by providing the designers with the information, knowledge, and understanding they require for effective design. The professionals have responsibility not only for revealing the potential uses of the output of research, and for designing and conducting research to provide useful output, but also for revealing its limitations and showing where and how judgment is required to supplement it.

The participation of the stakeholders is structured to the extent necessary to carry through each of the five phases of planning. Moreover, the participants are coached by the professionals in the methodology of planning, how to design and conduct research, and how to organize and operate productive teams. Thus the design-oriented planner has responsibility for continuous education of the participants and for developing both the form and content of such education. In addition, he has responsibility for removing the principal obstruction between stakeholders and the future they most desire: self-imposed constraints. He must convince them that many of the constraints that they believe are imposed on them from without either lie within themselves or are imaginary.

Summary

The design-oriented planner, in effect, has a major responsibility for providing inputs to the planning process, in organizing and guiding it, in educating those involved in it, in specifying the nature of the output that is required, in providing criteria by which the output can be evaluated, and in facilitating such evaluation. The design-oriented planner must be competent in the use of the methods, techniques, and tools of both the clinician and the researcher. He need not be as skilled in the use of their instruments as they are, but he must know them well enough to be able to use those who have these skills effectively. He must do more than this: he must know how to design and invent, and he must be able to encourage and facilitate the efforts of others to do so. He must be a generalist who is familiar with the capabilities and limitations of relevant specialists; he must be a humanist as well as a scientist; and he must be as much at home with art as he is with technology. Finally, he must be as concerned with the qualities of life as he is with its quantities.

None of us in S^3 pretend to be all these things, but collaboratively we are trying to produce professionals who are. We believe that doing so requires new forms and content of education. We must redesign the educational process. [See Ackoff, 1979.] The focus on design of those of us in academia leaves us with more than the need to develop a new kind of education; it leaves us with the need to develop an adequate *methodology of design*, a *logic of creativity*. This must be very different from the conventional logic of classes because it must be a logic of uniqueness, of individuality. It cannot be an inductive or deductive logic such as is adequate for clinical judgment or scientific inference. It must be a logic of intuition from which creativity springs.

This sounds like a contradiction because we have traditionally taken intuition to be immune to logic, to be the antithesis of it. Therefore, we must generalize the concept of logic itself. What an exciting challenge this is! It is at least as exciting as Aristotle's effort to harness reason in logic, and the efforts of John Stuart Mill [1862] and R. A. Fisher [1949] to harness experience in experiment.

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