Group Decision and Negotiation, 1:27–40 (1992)

Defining a Right Problem in Group Decision and Negotiation: Feeling and Evolutionary Generating Procedures

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Abstract

It is not unusual that decision makers define and solve a wrong problem. Here we develop an operational procedure for defining a "right" or correct problem. A problem may be represented as—a problem representation defining a problem consists of—two evolving hierarchies of relations, as discussed in the article. Rightness in a problem representation requires rightness in these relations which are beliefs held by a decision maker. Operational definition and validation of rightness in these relations, that is, retaining them as correct, is by feeling and by specified evolutionary generating procedures for examining, changing (evolving), and retaining these relations. Based on rightness in these relations, we discuss right group problem definition and solution in the general case where information is not fully shared (nonshared) among individuals in the group. Thus, our work contributes to procedural rationality—how decisions should be or are made—in individual and group decision-making and associated group decision and negotiation support systems (GDNSS).

Key words: right problem definition, procedural rationality, group decision, negotiation, support systems, evolutionary systems design

1. Introduction

Evolutionary systems design (ESD) is a methodology for policy-making—problem definition and solution (i.e., design) in complex self-organizing contexts involving multiplayer, multicriteria, ill-structured, evolving, dynamic problems (see Shakun 1988, 1990, 1991). Policy-making may be viewed as design of purposeful systems to deliver values to participants in the form of operational goals.

Problems may be represented as—or, a problem representation defining a problem involves—relations[1] between: (1) values or broadly stated desires; (2) operational goals or concrete expressions of these values; (3) decisions, actions, or controls taken to achieve these goals; (4) criteria based on goals for evaluating the effectiveness of decisions; (5) individual preferences defined on criteria; and (6) group or coalition preference defined on individual preferences. These relations or structures are beliefs held by a decision maker. Beliefs, that is, relations, can evolve so we can have an evolving problem representation.

More specifically, values are beliefs regarding desired or preferred modes of conduct (instrumental values) or end-states of existence (terminal values); see Rokeach (1973). For example, Maslow's (1954) values hierarchy involving safety, security, love, self-esteem, and self-actualization expresses terminal values. Values and goals represent wants. Operational goals are beliefs defined by specific, unambiguous operations and are characterized by performance measures. They are operational expressions of higher level values. Goals are delivered by controls chosen by players. Goals are used as criteria for evaluating the effectiveness of decisions. When goals are risky, criteria such as means, standard deviations, and so on, can be defined on probabilistic goal outputs. Individual preferences and group or coalition preference are aids in finding solutions.

ESD is an artificial intelligence (AI) framework for computer group decision and negotiation support systems (GDNSS), that is, for coordination technology. Coordination problems include group decision, negotiation, and planning. In ESD, the evolving group or joint problem representation is based on the union of individual-player problem representations. If the latter are not fully shared (made public) by individuals in the group, the public-group problem representation will be incomplete. In this case, each player privately can subjectively estimate missing information (Shakun 1990)—in other words, establish his or her private-group problem representation.

An individual-problem or group-problem representation consists of two evolving hierarchies of relations (Shakun 1991). The hierarchy 1 relation (see figure 1)

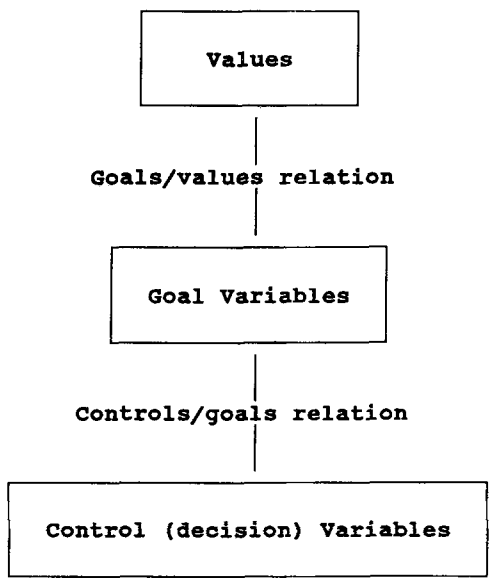

Figure 1. Hierarchy 1 relation between control variables, goal variables, and values.

is a framework for evolving, that is, for defining the general problem in the sense of defining values to be delivered to coalition members in the form of operational goal variables (dimensions) by exercising control variables. The hierarchy 2 relation (see figure 2) is a framework for finding a solution—finding the levels or particular values of the control and goal variables—to the evolved general problem at any stage. Together, hierarchies 1 and 2 define and solve an evolved problem. A solution has been found when in control, goal, criteria, and preference

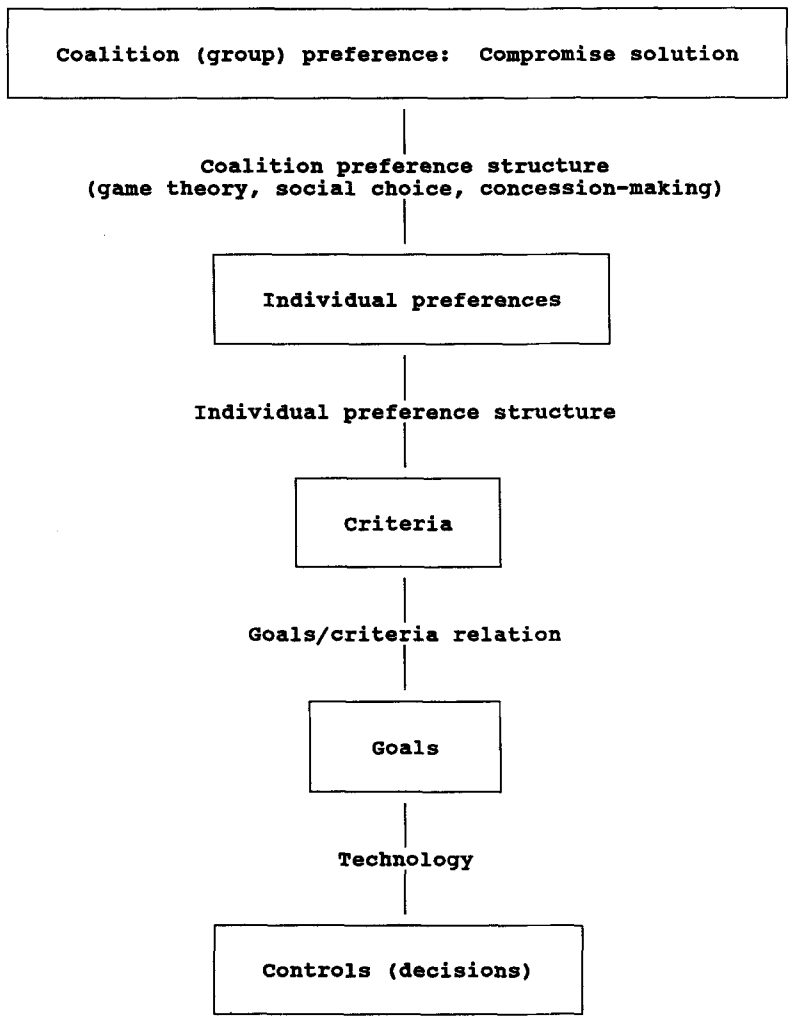

Figure 2. Hierarchy 2 relation between controls, goals, criteria, individual preferences, and coalition preference.

spaces the intersection of the coalition target—what it wants—and coalition feasible technology—what it can do or get—is a single set or point.

In this article, we explore what is meant by a "right" problem and how an individual or group can know operationally that it has defined it. In section 2, we discuss underlying concepts: Consciousness, the triune brain, beliefs, knowing, trusting, wants, cause, and effect. In section 3, we develop an operational procedure based on these underlying concepts for defining and validating a right relation. In section 4, we discuss right group-problem definition and solution, and draw conclusions. Thus our work contributes to procedural rationality, or how decisions should be or are made in intelligent systems.

2. Underlying concepts

In this section, we develop background and underlying concepts on which an operational procedure for defining a right problem rests. Thus, we provide here philosophic and scientific foundations for the procedure involving feeling and evolutionary generating procedures, discussed in sections 3 and 4.

We begin with consciousness. Consciousness may be regarded as self-organizing response capacity or awareness operating through cognition, affection, and conation; it is represented mathematically (cognitively) in the policy design problem by the problem representation. Consciousness is considered as an emergent property.[2] We may think of two modes of consciousness: an analytic, rational, logical, sequential mode associated with the left hemisphere of the brain, and an intuitive, holistic, simultaneous, gestalt mode associated with the right side of the brain.

To the extent that beliefs and decisions made are unconscious, consciousness as sensor "reads" them in the design process. In the cognitive global workspace model of Baars (1988), specialized unconscious processors in the mind try to send messages to a public blackboard, screen, or global workspace called "consciousness." These unconscious processors can compete or cooperate as systems or structures called "contexts" to gain access to the global workspace or consciousness. Once there, messages can be read by other unconscious contexts. Messages between consciousness and unconscious contexts form a "stream of consciousness." With the Baars model, unconscious processors may be viewed as experts or group members in a GDNSS underlying the design/decision problem. Thus, we may think of a negotiation model of consciousness in which unconscious processors negotiate to influence consciousness represented mathematically (cognitively) in the design/decision problem by the problem representation. These unconscious processors may be thought of as the source of self-organizing response capacity in consciousness.

Under the recent paradigm of emergent interaction and downward control (Sperry 1987), emergent properties exert downward control on lower level constituent (input) components, i.e., downward causation is operative or well as up-

ward causation. Unconscious processors exert upward control on the emergent property, consciousness while the latter exerts downward control on the former. We note that experiments by Weiss (1990) on unconscious mental functioning in psychotherapy provide support for upward/downward causation in that area.

The work of MacLean (1990) on the triune brain[3] indicates that the reality of a mathematical problem representation (a product of the neocortex)—its believability for a human—depends on a cofunctioning limbic system, the seat of affection. For something to exist for a human requires an affective feeling. Thus, the evolving problem representation characterizing the design/decision process is cognitive and affective, and is expressed conatively as the current or present decision is implemented. The act of control or decision is the design, solution, and implementation of the problem representation by a coalition of players at the present time. After system operation in the present time period, system redesign, re-solution, and re-implementation may be undertaken at the next present, one period later. Only the present control (decision) is implemented and there is a moving present—the now of consciousness. Through a sequence of acts of control, players in a group participate as codesigners in the evolution of the process of all there is, manifested by increasing consciousness. The act of control expressing consciousness is cognitive, affective, and conative—all three. We note the French saying: *"Trop de réflection, nuit à l'action"*—"too much reflection is harmful to action" and, by implication, to full expression of consciousness.

Beliefs as relations define the problem and solution. However, at the same time beliefs can unnecessarily limit the possibilities for solution and act as unnecessary constraints. Indeed, at least initially the problem may have no feasible solution. However, beliefs can evolve. Beliefs can also result in defining and solving the wrong problem. Thus, values defined may not be in tune with the process of all there is or, more simply, may not flow directly from our nature as human beings. The ultimate value is regarded as overcoming separateness from all there is (God, One, Tao, the absolute).

Whatever our nature—vibratory energy,[4] as the process of God, as body and soul—whatever the process of all there is, inherently we know something about it, and want to make choices (decisions) consonant with it. Wants represented by values and goals are desires coming from (in tune with) a person's nature, that is, a person knowing his or her nature and trusting that knowledge. Knowing is consciousness in tune with a person's nature, with the universe, the process of all there is. Knowing requires tuning in, resonating with the universe (see discussion on morphic fields below), and for its reality for us depends on the limbic system, as noted above for the triune brain model.

The absolute has infinite consciousness meaning infinite self-organizing response capacity. Under self-organization, the absolute manifests itself through the big bang in the relative—the process of all there is—as vibratory energy, as body and soul. The relative increases complexity (response capacity or consciousness) through dissapative self-organization—the process of cooperative control—evolving toward the absolute, God (Shakun 1988).

That God attracted or pulled the universe, the process of all there is, toward Himself was the final cause or purpose of the universe for Aristotle; it formed the basis for his theory of evolution. For Aristotle, everything in the universe had a final cause (purpose), formal cause (plan, design, form, or structure into which it is made), material cause (that of which it is made), and efficient cause (moving cause or responsible agent). Humans, animals, and plants had a soul that was both the formal and final cause giving both form and purpose.

In terms of Sheldrake's (1989) discussion of cause and effect, we note that in ESD the design/decision process can be attracted or pulled by future values and goals (purposes, final causes), rather than pushed (Aristotle's efficient cause) from the past. The past is the cause of the present, the now, to the extent we allow it, that is, to the degree we choose to allow past beliefs, events, and choices (past memories) to push us in the present through our present beliefs (relations) and present choices. The future is the cause of the present to the extent we are pulled by purposes such as future values and goals. The effect is the action we take now. Consciousness is experienced as the now (moving present) and is represented mathematically by the evolving problem representation in which future values and goals attract the system. To the extent these future values and goals (beliefs) are wants (in tune with knowing), an individual is defining values and goals in tune with his or her nature, the process of all there is. Thus, he or she is defining a personal right problem representing his or her wants.

In the ESD problem representation, wants (expressions of knowing) are represented as values and goals (beliefs) that can be distinguished from other values and goals not in tune with that knowing. Such "wrong" values and goals ("wrong" beliefs) not in tune with knowing can be distinguished from wants ("right" beliefs) in tune with knowing and dropped or changed in the problem representation using methods for examining beliefs.[5]

The Aristotelian soul as organizing principle giving both form and purpose has its counterpart in modern organismic or holistic philosophy. Underlying the systems approach, this philosophy views the universe as composed of hierarchies of wholes called holons or morphic units (Sheldrake 1988) which contain their own organizing principles. The soul as organizing principle is replaced by other organizing concepts: systems properties, information, emergent organizing principles, self-organization, or organizing fields.

The process of all there is, is in evolution. In ESD, the evolutionary design of evolutionary systems, players want to make choices in resonance or tune with evolution and are codesigners of that evolution. Thus, we may think of decision makers as morphic units organized by and influencing morphic fields. These are evolutionary organizing fields. They organize morphic units and are themselves influenced by morphic resonance from previous similar morphic units that were influenced by like fields. Morphic fields have cumulative memory given by self-resonance with a morphic unit's own past and by morphic resonance with all previous similar systems; these fields are increasingly habitual. Morphic fields attract systems under their influence to goals and values called attractors.

Sheldrake's development of the concept of morphic fields is still speculative, but in the area of evolutionary system design of social systems it provides a companion framework for the ESD methodology, in general, and for knowing in an evolutionary perspective, in particular. Thus, knowing in ESD may be conveyed by morphic fields via morphic resonance from the past. This is the source of wants. Our nature, according to Sheldrake, is conveyed by morphic fields which are themselves in evolution and with regard to which we are codesigners.

We have noted elsewhere that the group decision/negotiation problem representation in ESD can be interpreted to include social-emotional as well as task aspects (Faure, Le Dong, and Shakun 1990). Based on MacLean's (1990) work in the triune brain, we now suggest that the problem representation can be further interpreted to include reptilian behaviors associated with the R-complex (reptilian) portion of the triune brain. In this generalized problem representation, controls are actions having task, social-emotional, and reptilian behavior components taken to deliver preferred combinations of task, social-emotional, and reptilian behavior goals. Reptilian behaviors observed in humans are described by MacLean. They include special forms of behavior, as establishment of territory, challenge displays, submissive displays, courtship behavior, and so on, and general interoperative forms of behavior which come into play in several different contexts and may involve several special forms of behavior. MacLean's six general interoperative forms of behavior are: routinizing (as daily routines), isopraxic (behaving in the same way as others), tropistic (responding to partial representations), preservative (repetitious action), reenactment (repeated series of different actions, as a ceremonial reenactment), and deceptive. Sheldrake would say that reptilian behaviors and the R-complex portion of the brain with which they are associated are organized by morphic fields.

3. An operational procedure for defining and validating a right relation

As discussed above, all beliefs, including values and goals, that define the problem can change. One is interested in the process by which beliefs (relations, problems) form and evolve. In ESD the general process for evolution of the problem representation may be termed cybernetics/self-organization: (a) problem adaptation through learning associated with cybernetic negative feedback/feedforward, as through information-sharing and concession-making; and (b) problem restructuring or reframing associated with cybernetic positive feedback/feedforward and self-organization.

Regarding restructuring, the group problem representation can have bifurcation points at which there is a choice of branch (structure); see Shakun (1988, Ch. 1). With description (1), cybernetics, the coalition (subject to actions by other outside players not in the coalition) based on knowledge can control the system to a bifurcation point. Then, at the bifurcation, based on knowledge, a new structure may be selected by the coalition (subject to actions by outside players) that is

associated with positive feedback/feedforward. Under description (1), self-organizing phenomena are relatively weak. Under description (2), cybernetic self-organization, self-organizing forces are stronger. However, again the coalition (subject to actions by outside players), based on knowledge, is able to control the system to a bifurcation point, but there fluctuations determine the branch the system will follow. In other words, under description (2) the structure generated is not predictable but depends on chance fluctuation, that is, on self-organization. With description (3), self-organization, the coalition does not drive the system to a bifurcation point. Rather, self-organizing chance fluctuations do so and also generate the branch the system will follow. Here the designer is self-organization.

For example, in restructuring controls, goals and values can be redefined, such as dropping old ones and introducing new ones by use of a heuristic controls/goals/values referral process discussed below. Other domain-independent methodological knowledge for problem evolution (adaptation and restructuring) can be used such as constraint relaxation, contingency planning, coalition formation, flexible goal target (see Shakun 1991).

As introduced in section 1, a problem representation defining a problem consists of two evolving hierarchies, 1 and 2. Rightness in problem representation requires rightness in the relations (beliefs) defining these hierarchies. Operational definition and validation of rightness in these relations (retaining them as correct) is by knowing, that is, by feeling and by specified ESD cybernetic/self-organization procedures (evolutionary generating procedures) for examining, changing (evolving), and retaining these relations.[6]

3.1. Rightness in hierarchy 1

We focus first on rightness in hierarchy 1—defining a right general problem—and begin with the heuristic control/goal/values referral process, an evolutionary generating procedure for validating the controls/goals/values relations in that hierarchy.

The ESD heuristic controls/goals/values referral process constituting domain-independent methodological knowledge is based on the idea that a value, goal dimension (variable), or control dimension can serve as a reference or focal point for relating or referring other values, goal dimensions, and control dimensions in restructuring the controls/goals/values relation. Some heuristics for this referral process stated for values and goal variables (control variables can also be used) are as follows (Shakun 1988, Ch. 13). Values are given as rows and goal dimensions as columns.

1. Given a particular value (row) and looking at the goal dimensions (columns), ask whether there is any other new goal dimension that also delivers the value.
2. Given a particular goal dimension (column) and looking at the values (rows), ask whether there is any other new value that is also delivered by the goal.

3. Given a particular value (row), is there any other new value (more general or less general) that also expresses this value?

4. Is there any other additional value that is important in this problem?

5. Given a particular goal dimension (column) is there any other goal dimension that is suggested by this goal?

6. Is there any other additional goal dimension that is important in this problem?

7. Is there any other additional player who should now be included in the coalition (group) goals/values relation (matrix)?

In generating, or creating, new values and goals, the heuristic referral process can involve emergent interaction and downward control (section 2), what Sheldrake (1990, Ch. 18) calls bottom-up and top-down creative generation. For example, with heuristic 2, a new value emerges from a particular goal (bottom-up generation). With heuristic 1, a new goal arises from a particular value (top-down generation).

ESD is a consensus-seeking group process; it seeks to move to the same preferred (desired) solution—hopefully, delivering wants that come from knowing—for all players in the group. Consensus seeking follows from the oneness of human nature, from the process of all there is that all humans know. Of course, in practice if consensus is not achieved, compromise provides a solution.

A powerful heuristic process for examining values and goals as beliefs is provided by the option process (Kaufman 1977). The ultimate value is to be happy. The option heuristics are in the form of questions such as:

1. What are you unhappy about?

2. Why are you unhappy (uncomfortable, afraid, anxious, angry, etc.) about that?

3. Why do you believe that?

4. What are you afraid would happen if you didn't believe that?

5. What do you want?

The option attitude is "to love is to be happy with"—I love you (me) by being happy with you (me), accepting you (me) in a nonjudgmental way (no expectations). Still, I might want other values and goals for one or both of us.[7]

The above heuristics in the form of questions may be used in the context of the option attitude by an "explorer," one who is examining his or her beliefs either by posing the questions to himself or herself, or having another trained person, a "mentor," ask the questions, while exhibiting a loving, accepting, nonjudgmental attitude, but give no answers. The explorer is his or her own expert who knows the answers that are right for him or her. Questions follow from the last answer; there is no predetermined sequence.

From the point of view of ESD, the option process may be viewed as a heuristic process within the general ESD process of cybernetics/self-organization for examining and changing beliefs that are values and goals. Beliefs chosen by a person under pressure or influence of others are a prime source of wrong beliefs, in other

words, not in tune with a person knowing his or her nature. Some beliefs so acquired are, of course, right. Instead of stopping or constraining himself or herself by his or her acquired beliefs, the beliefs can be examined, dropped, and changed or retained by the option process, resulting in evolved values and goals (beliefs) in tune with a person's nature—values and goals that are wants, or are right. The option philosophy as expressed by Kaufman (1977) is in the spirit of ESD.

Since wants are, by definition, desires coming from a person's nature, he or she need do nothing more than simply allow them (be open to internal self-organization) and choose them, or he or she can design them. Wants represented by values and goals that are right beliefs can be designed by a player based on knowledge (description 1 above) or knowledge and self-organization (description 2 above), and examined for rightness by the option process or the ESD heuristic controls/goals/values referral process. In any case, as supported by the triune brain research cited above, the ultimate test for right beliefs is feeling. Wants as right beliefs can be incorporated as values and goals in the problem representation.

In ESD, a coalition of players—subject to actions by other outside players not in the coalition and external self-organization—designs the system through the problem representation to deliver values and goals to participants. Values and goals are designed and chosen by players. Players are codesigners (partial creators) of the process of all there is. They both partially design that process and choose values and goals hopefully in tune with it (wants). Following, perhaps, the global workspace model (section 2), consciousness accesses and designs wants expressed as values and goals. The test for wants is retention of generated values and goals by a validation process. This validation of values and goals as wants (right beliefs and not wrong) is by knowing (feeling) and by specified ESD cybernetic/self-organization processes (evolutionary generating procedures) for examining, retaining, and changing values and goals. This includes the ESD heuristic controls/goals/values referral process and other domain-independent methodological knowledge such as constraint relaxation, contingency planning, coalition formation, and flexible goal target (Shakun 1991), and the heuristic option process.

Although we have only partial knowledge of our nature, we know enough to make decisions in tune, or in resonance, with it. A decision maker is in tune with his or her nature when he or she feels (knows) he or she is, trusting the wants coming from that feeling. However, wants (right beliefs) are represented by values and goals in the problem representation along with other potentially wrong acquired or created beliefs not in tune with the decision maker's nature. How to examine values and goals for rightness or wrongness becomes the question. To this end, if the decision maker is unhappy about identified values and goals themselves or cannot realize them because of conflict with other parties (as in group decision and negotiation), he or she can examine them by such heuristic processes as the ESD heuristic controls/goals/values referral process or the option process. When the decision maker uses these processes, right values and goals will be retained and wrong ones, dropped. New values and goals as expressions of wants

may be generated in the process. Thus, the problem may be restructured (Shakun 1991), a powerful approach in both individual and group decision-making and negotiation. The ESD and option heuristic processes may be included in a group decision and negotiation support system.

Shakun (1988, 1991) discusses the use of the ESD heuristics for examining and generating values and goals with the GDNSS, MEDIATOR. The option process can be used by a facilitator acting as mentor to an individual (explorer) in a GDNSS setting. The facilitator can transmit appropriate option questions (see list above) to the explorer who can type a reply, or the facilitator can conduct the dialogue orally in a breakout room or by private two-way audio or audio-video link. Alternatively, the explorer can ask himself or herself the questions. For example, if the explorer chooses "use option process" from the computer screen menu, a list of questions could appear. The user could conduct his or her own dialogue by posing questions to himself or herself, perhaps typing the replies. Written or out-loud replies with the option process appear to be more effective than conducting an internal dialogue. In general, negotiators can ask option-type questions of each other as clarifiers while maintaining an accepting, nonjudgmental attitude. A list of such questions could be made available by the GDNSS.

3.2. Rightness in hierarchy 2

The above discusses the use of feeling and heuristic processes for examining values, goals, and controls—the variables or dimensions in hierarchy 1—for rightness, thus operationally defining a right general problem. Hierarchy 2, using the right control and goal variables defined in hierarchy 1, is then a framework for finding a solution, in other words, finding the levels or particular values of the control and goal variables. Operationally, rightness in hierarchy 2 depends on the decision maker again feeling that he or she is in tune with the process of all there is. In figure 2 this means that the technology relation, goals/criteria relation, individual and coalition preference structures feel right,[8] and they are retained when examined by specified cybernetic/self-organization processes, as would be the case for beliefs (relations) generated (hence, examined) by evolutionary generating procedures.

For example, PREFCALC (Jacquet-Lagreze and Shakun 1984) is an evolutionary generating procedure in the form of a computerized heuristic process for interactively establishing an individual preference function on multiple criteria. PREFCALC makes use of both holistic (gestalt) and analytical abilities of the user. To illustrate, one user may express his holistic preferences on the choice of a car by a rank-ordering of the car alternatives or a subset of these. Perhaps he ranks a BMW automobile first. When he then analyzes the problem by specifying his criteria (price, performance as maximum speed, gasoline consumption, space, and so on), their relative importance or weight, and the shape of his marginal utility function for each criterion, he obtains an overall utility[9] that is highest for

Volkswagen, much higher than for BMW. Perhaps in working with the problem analytically the user weighs price heavily whereas holistically he is heavily influenced by performance. There is an inconsistency between his holistic preferences and his analytically derived preferences expressed by the utilities. Upon reflection he may modify his analysis: for instance, by decreasing the weight he puts on price, increasing weight on performance, changing the shapes of marginal utility functions. The evolved analysis may now show BMW to be first choice analytically as well as holistically. Alternatively, the user may feel that the original analytical result is right and may evolve his holistic judgment. He may now feel heavy influenced by price so that holistically Volkswagen becomes his first choice. As another alternative, evolution of analytical and holistic preferences may generate a third alternative car as his consistent analytic and holistic first choice. If they feel right, preference relations generated by evolutionary generating procedures such as PREFCALC are right in that they are relations generated, examined, and retained as the present evolutionary stable result of the procedure.

Another example of an evolutionary generating process is provided by Munier (1991). He discusses individual belief formation in an uncertain market as a deliberation process between the individual and the market—a heuristic process of cognitive rationality that could be used in establishing the technology relation.[10] Concession-making procedures leading to a compromise solution in negotiation is a further example of evolutionary generating procedures (e.g., see Shakun 1988, Chs. 6 and 7).

The PREFCALC, Munier, and concession-making procedures are examples in which the decision maker makes use of complementary capabilities of the brain—where he or she considers more than one perspective and has an opportunity to work through inconsistencies. Such approaches are advocated by Fishoff, Slovic, and Lichtenstein (1980) as countermeasures against elicitor effects. In other words, an elicitor can affect a respondent's values (beliefs) by defining value issues, controlling the respondent's perspectives, changing confidence in expressed values, and changing the respondent. In hierarchy 1 the ESD referral process and the option process minimize such elicitor effects by posing value-free questions. In the option process the mentor undergoes extensive training so that he or she can ask the option questions, but give no answers, while exhibiting an accepting, nonjudgmental attitude. The mentor asks a question only when there is a gap in the explorer's own verbal exploration of beliefs.

4. Right group-problem definition and solution: conclusions

Procedural rationality (how decisions should be or are made) involves judgment of rightness of the relations constituting the group problem representation shown in figures 1 and 2. Rightness of a relation is based operationally on feeling of rightness and evolutionary generating procedures for examining, generating, and retaining the relation (belief). Thus, an important heuristic question in procedural

rationality regarding any relation is, "Is this relation right?" If all relations are right, the problem representation is right. But who judges the rightness?

Each individual is able to judge the rightness for him or her of his or her own individual problem representation and the rightness for him or her of his or her subjective estimates of the individual problem representations of other players. In other words, an individual can judge the rightness for him or her of his or her own private group problem representation, as well as the public one. However, individual A is not able to judge the rightness for individual B of the latter's individual or private group problem representation even if available to A. Individual A may express an opinion regarding the rightness for B of B's representation. A can certainly judge the rightness for himself, A, of B's representation, that is, whether he believes it is B's representation. However, only an individual can know his or her own uniqueness, so only A can judge the rightness for A of a representation and only B can judge the rightness for B of a representation. Further, a group is a holon (morphic unit) whose collective (group) consciousness can also be included in the group problem representation (hierarchies 1 and 2) as it is expressed through individuals on behalf of the group. Thus, each individual problem representation includes that individual's expression of group-level relations in hierarchies 1 and 2.

Thus, in the general case of not-fully-shared (nonshared) information among individuals in a group, each individual can judge the rightness for him or her of his or her own private-group problem representation, as well as the rightness for him or her of the incomplete public one. If for all individuals the respective private-group problem representations are right for each of them and a group compromise solution has been found by the group, then a right group problem has been defined and solved, although it is publicly incompletely represented.

Regarding the public representation, if each individual judges that the incomplete public group problem representation is right for him or her, it follows that the incomplete public individual problem representations as judged by the respective individuals are right for them, and that the incomplete public group representation is right as far as it goes but is incomplete.

In the special case of full information-sharing, the public-group problem representation is complete. All individuals have the same private-group problem representation, that is, the public one. In this case, if each individual judges the public problem representation is right for him or her, then the public group representation is right and complete. If a compromise solution has been found, the group publicly knows the complete group problem it has defined and solved, and it is a right one.

Notes

1. Mathematically, a relation is a subset of a Cartesian product of sets.
2. An emergent property or output is a new property transcending, or going beyond, the properties of the inputs (components) used in modeling it.

3. The triune model of the human brain refers to three evolutionary formations—R-complex (reptilian complex), limbic system, and neocortex—reflecting an ancestral relationship to, respectively, reptiles, early mammals, and late mammals.
4. Bentov (1977) considers our physical bodies and all matter as holograms or interfence patterns of information-carrying coherent electromagnetic radiation.
5. For a discussion of beliefs (values), knowing, trusting, and wants, see Kaufman (1977). Kaufman associates knowing and wants with the right hemisphere of the brain. Beliefs—both "wrong" and "right"—are associated with the left hemisphere.
6. Feeling is a fundamental requirement for believability in the triune brain model, as discussed in section 2.
7. Put the other way around, I am happy with you (me) by loving you (me). Love and happiness are one, and separateness from all there is, is overcome.
8. In principle, not only these relations, as such, but all n-ary relations in the problem representation, hierarchies 1 and 2, must feel right.
9. PREFCALC normally uses piecewise linear, additive marginal utility functions.
10. For a general discussion of cognitive rationality in individual decision-making and in games, see Walliser (1989).

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