Decision Systems, Inquiring Systems and a New Framework for Action

by

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BACKGROUND

A range of different approaches to deciding and acting has been established empirically through collaborative inquiry with managers, professionals and politicians [4,33]. The seven distinct paths of action which emerged have been named: rationalist, empiricist, pragmatist, dialectic, systemic, structuralist and intuitionist. (See Box below for some synonyms for these approaches, and for keywords associated with each. See **Table 2** for an idealized process in each case.)

DECISION SYSTEMS: SYNONYMS & KEYWORDS

Rationalist (syn. *synoptic, planning, dynamic planning*): values, objectives, mission, policies, criteria, options, priorities, plans, utilities, assessment.

Empiricist (syn. *problem-solving, descriptive, investigative*): problem, real problem, diagnosis, solution, facts, evidence, information systems, pilot, test, records, evaluation.

Pragmatic (syn. *disjointed incrementalist, opportunist*): opportunity, practicality, improvisation, action, piecemeal change, results, satisficing.

Dialectic (syn. *bargaining, conflict· resolution, debating*): conflict, opposition, faction, negotiation, payoff, compromise, consensus, arbitration.

Systemic (syn. *holistic*): situation, system, model, map, structure, dynamic relations, focus, scenario, pattern, simulation, trigger, development, potential, holistic, variety, strategy, fit.

Structuralist (syn. *proceduralist, functionalist*): organization, structure, post, function, responsibilities, task, procedure, regulation, mechanism, accountability; authority, appraisal.

Intuitionist (syn. *Gestalt, visionary, imaginative*): disquiet, charisma, intuition, imagination, vision, brainstorm, imagery, attunement, commitment, enthusiasm, feelings, meaning, inspiration.

The seven paths have been developed by analysis and modelling. Each is all internally coherent and consistent approach to generating action deliberately, The paths may therefore be regarded as ‘approaches to action’, ‘structures for action’ or ‘theoretical systems enabling decision’, It is noteworthy that the term 'decision' is frequently used in the literature in places where the broader term ‘action’ seems more accurate. This seems to be because decision, being the moment of commitment, is generally recognized as the crucial element in action. In deference to the literature, the term 'decision system' will therefore be used. Each decision system is capable of being taught as a general approach to deliberating and proceeding in relation to any matter calling for action. Each decision system is associated with its own language and a particular style of working.

Extensive review of the literature has revealed many variants and composites of the seven decision systems; but no further distinct types which are internally coherent and consistent have been found. Although, empirically, the set of seven appears to be complete, any assertion of completeness requires a theoretical rationale. The challenge formulated in the previous paper [33] was to find such a rationale. The investigation commenced by examining comparisons with inquiry, before moving to an analysis of action. The layout of the paper reverses these steps. The first and main part of the paper describes a framework for action which suggests the need for seven decision systems. The second part of the paper explores the relation between the seven inquiring systems analysed elsewhere [29] and the seven decision systems.

APPROACHING THE PROBLEM

For over two decades, we have studied decisions in research workshops and in the course of organizational consultancy in public services, commercial firms, and political settings. Although direct observation has revealed the value of all decision systems, academic proponents tend to argue forcibly for the general applicability (and superiority) of their favoured system, denying its limitations and minimizing difficulties in practice. Most people identify strongly with one system, express a preference for one or two others, and puzzle over or disparage the remainder. **Table 3**, based on the earlier paper [33]

and subsequent research, summarizes in matrix form a variety of aspects potentially affecting the choice of one decision system rather than another.

It is possible, at a superficial level, for people to mix approaches intuitively or to act without awareness of the approach being adopted. However, when complex tasks are to be tackled, people regularly try to adopt just one approach. The discrepancy between this single-mindedness and the everyday messiness of people-in-action can be simply explained. *Decision systems are theoretical structures abstracted from goal-directed action as it spontaneously occurs. These systems are subsequently used deliberately to organize actions of varying significance and complexity so as to maximize confidence and effectiveness in reaching a goal.* This explanation led to two consequences. The first proposition clarified that there was a need for a model of the details of action itself-as distinct from the decision system which is a global approach oriented to reaching an overarching objective. The second proposition implied a hierarchical relationship with decision systems being the abstract or theoretical context for deliberate actions.

No adequate model which covered the whole of action, in the sense of deliberate achievement within a dynamic social context, was to be found in the existing research literature. Indeed, the reverse was the case in most social science disciplines, in management texts, and even in the systems literature [e.g. 1,10,24] In scientific studies, the action process tends to be viewed as an element of human functioning which does not require further analysis. Instead, the focus is on experiential concomitants (will, patience, perseverance &c) and social requirements (leadership, plans, consent &c).

Contributions relevant to the needed model were to be found within the skills research literature in psychology [6,54] Skill here refers to the use of capacities efficiently and effectively as a result of experience and practice. However, these studies have not taken a systemic viewpoint, and generally focus on simple (or ultra-simple) actions capable of measurement empirically. Furthermore, by the skills researchers' own accounts [49] the fragmentation of the literature has impeded useful conceptualization, limited practical generalizations, and resulted in terminological chaos.[1]

Systemic epistemology postulates that action must be capable of being analyzed and modelled as a system with an internal structure. Such a model should adequately represent action of all varieties and complexities of action, and would be expected to throw light on the number and nature of the decision systems. The construction of such a model was undertaken and the findings are presented below.

DECISION SYSTEMS AND THE FRAMEWORK FOR ACTION

The investigation was similar to that adopted in studying inquiry [27,29]. The aim was to start with the smallest possible entity that could be considered action and consider what higher levels were required. At some point near the top of this hierarchy, decision systems would have to be located. In such a hierarchy of forms of action, each level would be meaningfully described as action and would involve decision.

Analyses of the execution of actions by managers working in organizations were therefore performed. Simultaneously, the research literature in a variety of disciplines was reviewed (as noted earlier). This confirmed the complex nature of action, and supported the idea that hierarchical structuring was needed.

In what follows, each level will be systematically described in turn. The form of action at each level will be given a label and will be characterized, with examples, in a number of standard ways. These include: the mode of *initiation* and production of the action; the *function* within the whole action process; *properties* of action that emerge at that level;

[1] The focus of skills research broadened after the 1940's from manual operations and S-R associationist psychology to perceptual, intellectual and social interactions fundamental to effective action. In doing so, the literature split into three distinct divisions relating to perceptuo-motor skills [55], inter-personal interaction [5,49], and thinking [19,26,56]. Further spitting has worsened the situation, e.g. reasoning and problem-solving are distinct streams of psychological research with little cross-reference.

the *locus of control* of action — internal or external; *training* in effective execution; and the main forms of *error*. The framework as a whole is summarized in **Table 1** and represented in Figure 1.

« Insert Table 1 About Here»

L-1 - Elemental Action: Triggering an Acton

Action at Level 1 refers to the irreducible elements or entities of action which can still be said to be voluntarily and deliberately decided: e.g. a wink or nod, a mental association or single step in a thought process. For this existential unit of action, I will adopt Clynes' term 'acton', which integrates both physiological and conscious aspects [12, p.23].[2] In other words, any complete but complex action (physical or mental) may be decomposed until eventually there is a limit beyond which decomposition would result in a loss of the notion of action. Clynes suggested that in 'the present moment', which measures out at 0.2 seconds, only one decision can be made.

The function of the acton is to ensure rapid automatic progression of actions. This is possible because the inner structures of actons are pre-programmed within the brain. Actons are therefore associated with an internal state: the 'idiolog' or inner ideational schema/brain program. So, at this level, an individual can be said to pass from state to state. An acton may be aborted or blocked by external influences, but it cannot adapt. For example a tap on a computer keyboard, once initiated, may only be stopped by an externally applied force even if awareness during the tap develops that the wrong key is being pressed. The process of elemental action, therefore, is at the level of bio-mechanical function, even though initiation is deliberate (i.e., purely physiological reflexes are excluded from this schema by definition).

The acton has a start and finish and, once initiated by triggering, moves to its predetermined conclusion without stopping. Successful performance depends on the precision of the idiolog and on the precision of execution. Such environment-independent action has been referred to as a 'set procedure' in relation to computer and machine operation. Set procedures are composed of logically-interrelated elements, and hence are the bases for algorithms in which there is complete definition of the action process from start to finish. Clynes notes that the dynamic forms of actons may be internally shaped (unconsciously) by feeling states. (He demonstrated this by measuring the finger pressures required by different composers for the piano.) So playful, angry and sad waves of the hand are all decidedly different.

The initiating trigger for elemental action is located internally. Error typically flows primarily from inadvertent triggering: for example, nodding at an individual erroneously believed to be an acquaintance. Error may also result from internal faults in the programme or schema controlling the action. This was Freud's explanation, now generally accepted, for slips of the tongue [21].

This level of action is an experiential entity which can only be understood further in neurophysiological terms-in a similar way to fundamental sensory entities [25] or intelligence processes [23] Because there is no call for self-awareness once a decision to respond to a particular stimulus has been made, there can be no possibility of selecting and using data from the environment during the action process. The more complex form of simple action required for this is to be found at the next level.

[2] Terminology is a problem. In contrast to the inquiry framework where the terms chosen were hallowed by long usage and philosophical study, the fragmentation of the literature on action means that choices could not be fully satisfactory. For example, *procedure* will be used at L-2 following the motor skills literature, but the management literature uses it as an L-6 term; similarly *response* is used at L-4 in accord with management conventions, whereas psychologists would sec it at L-2. Only Clynes appears to have focused on elemental decisions (L-l), so his term has been adopted.

L-2 - Modulated Action: Adapting a Procedure

Action at Level 2 refers to a flow of consecutive actons appropriately adapted to precise details of the environment as it changes in response to, or independently of, each component acton. Such action can be termed modulated action, or, more simply, a procedure (sometimes qualified as 'open' or 'stepped'). This is what is generally regarded as the simplest form of action and is the main focus of study in psychology. It corresponds to a reaction or response to simple stimuli. However neither stimuli nor reactions are simple. Perception is a complex process involving the selection and integration of the incoming data, as well as thinking processes and motor outputs [41,50]. Reaction time, believed to measure speed of information processing, varies among individuals and has been found to relate to differences in intelligence [50].

Procedures can be recognized in the motor, mental and social domains. An everyday example of a motor procedure is riding a bicycle or walking to a door. Thinking at the procedural level becomes evident when solving (or failing to solve) brain-teasers with known unique solutions. A formal exchange of greetings is an example of a social procedure.

Research on action at this level is extensive. In the motor area, it is to be found within the perceptual-motor skills and ergonomics literatures where the concern is with the effects of stimuli (e.g., on signal detection, reaction time, perceptual accuracy) and development of adequate responses (e.g., in terms of dexterity, error-free action, complex manipulations) [36,54,55]. Also relevant is social skills research [5,49], and psychological studies of problem-solving and reasoning [19,26]. Communication studies which recognize gestures and bodily actions, as well as verbal aspects, also provide insight into L-2 action [9,22,52].

A procedure involves selecting from appropriately shaped actons in the light of environmental cues, and smoothly and appropriately linking these. Choice within a procedure is governed by the immediacy implicit in the need to maintain a flow of meaningful action closely tailored to, or intermeshed with, or even 'co-produced' [1] by, the environment. Coordination and timing are therefore of the essence. Many procedures are used repeatedly. Because slight changes are necessary in each case, functioning is better described as habitual rather than automatic.

The cybernetic character of modulated action is typically emphasized because, unlike elemental action, environmental feedback is part of the action process and allows for self-regulation. Once a procedure is initiated, input is controlled by the output and so stabilizes the dynamic output [41,58]. Because machines and computers have such a capability, this is the level upon which artificial intelligence and robotics focus. In these disciplines, an action like 'going to the door' is challenging, and one like 'building an oil refinery' is unthinkable [3,18]. Man-machine studies frequently focus on action at this level: Craik, for example, described the machine operator as an 'intermittent correction servo-mechanism' [13].

As well as internal states, there are now externally evident stages of action, as well as regulatory mechanisms, which allow for progressive adaptation to continue as long as necessary and ensure that the procedure can be voluntarily aborted.

A procedure may be complex, and the sequence of actons is not wholly predictable from the initiating decision (or first acton). Its control is felt to be external and data-dependent. The choice that emerges is focused on what information in the environment should be noted and used to trigger actons. Simple skill training, whether in physical, mental or social procedures, is based on guided practice. That is to say the trainer takes the learner through the procedure required in a variety of situations. Feedback indicating the results of action is essential if performance is to be brought into line with external requirements. Repetition is necessary to appreciate the relevant cues and to get used to their appearance in different contexts. For many procedures, the repetition required for effectiveness (i.e., precision of both idiologs and execution) is numbered in the tens or hundreds of thousands or more. Childhood training and experience in such things as the

use of symbols, motor coordination, social interaction, and manipulation of ideas are therefore essential to condition both brain and body mechanisms during maturation and to lay a foundation for later skill acquisition.

Errors in a procedure stem, first of all, from not noticing cues or from appreciating them inappropriately. Such errors occur frequently in attempting to act appropriately within an alien culture. In the case of dialogue, communication becomes confused and ineffective if cues are ignored. In thinking, memory loss or failure to keep key ideas in mind means that needed internal cues are lacking. Error also results, now habitually, if the accepted procedure itself is incorrect or imprecise, as psychologists have repeatedly found in relation to thinking [46,51], and as sports and music teachers regularly find in their pupils.

Performing a procedure allows for immediate and precise adaptation but does not include any comprehension of principle within action. The only internal imperative during action at this level is to keep going. Greater efficiency can be introduced by moving up a level from cues to explicit definitions of how states and stages should interact in any specified activity.

L-3 - Systematized Action: Employing a Technique

Action at Level 3 is action in which procedures are systematized and coordinated to form a whole underpinned by explicit principles. In other words, it refers to a practical method, or a technique or, in the skills literature, a strategy. This level emerges from the need to control the quality and efficiency of adaptation during the action process. So this is the form of action commonly seen as the basic building block for achievement in the social world.

The smooth use of procedures in a technique depends on action being driven and controlled by an understanding. So technique is internally-controlled. The classic study demonstrating that skills involve more than expertly executing procedures was carried out in invisible mending, a process traditionally regarded as immensely time-consuming to teach. By focussing on the principles rather than the procedures, time to learn could be drastically shortened [7]. Similarly, in thinking, psychologists have been concerned to assess and improve intuitive logical and statistical performance by considering the use and abuse of certain principles [19].

Techniques, some more effective some less, are therefore articulated, formalized and prescribed wherever possible to maximize efficiency and quality. In the physical realm, technical mastery is intrinsic to playing an instrument, dancing, and sport. Techniques also exist to aid social activities like self-disclosure [14] and self-concealment [22], and for mental activities like pragmatic thinking [2,15] and formal thinking [20,57]. In the management context, once dialogue is recognized to have a basic purpose, a technique can be developed e.g. to control a rowdy meeting, or to motivate or persuade someone. Technique, once mastered, tends to become implicit within action. (Virtuosity refers to high, possibly excessive, technical proficiency.)

Training here places lower level actions in a context. A thorough understanding of what is required is seen as a prerequisite for proficiency. Conscious effort is then put into getting the flow of action right in the light of the technical principles. Observation of people who are proficient, practice via role play, and feedback from others observing one's own performance in real situations, are all used.

Error results when techniques are applied mindlessly or for their own sake: for example dominating in a dialogue where agreement is available for the asking, or doing extensive data tabulations without any rationale. A common error in management is to substitute a technique for a full response. For example, performance indicators or targets reached is a useful and simple method in evaluation, but it can never, as is so often hoped, constitute a fully satisfactory rounded appraisal of performance. (The ‘complete action’ implied by coherent appraisal requires the use of higher levels of action [17, 47].)

A technique may be persevered with even when the situation changes. Coping with such changes demands an overview of contingencies, and the potential for switching tech-

niques without losing the natural flow of action. This increases the complexity of action and requires movement to the next higher level.

L-4 - Action Range: Activating a Response

Action at Level 4 refers to action which uses and blends a range of techniques in the face of situational contingencies. A contingency refers to a complex condition of the environment, and not to a unitary stimulus. Action must be flexibly activated to handle such aspects of any evolving situation using techniques. (This is not wholly unlike the way the procedure shapes the use of actons in respect of simple stimuli, but at a much higher level of complexity and far more oriented to the ultimate desired result.) The appropriate label here seems to be ‘response’ (as used in management), or possibly 'repertoire' but this latter term seems too static.

A response provides essential variety (hence the term repertoire), and the emergent property of action is global flexibility. For example, a number of techniques need to be flexibly deployed when considering a job applicant, including: assessing capacity for team work, exploring future potential, testing acceptability to existing staff, negotiating appropriate inducements and so on. Planning too involves many techniques including: prioritizing, programming, budgeting, consulting, and report preparation. Multiple techniques must also be used when thinking practically about some problem: subdivision, comparison, analogy, generalization, deduction.

Techniques may be deployed within a response either sequentially or, to a limited degree, simultaneously. While no one technique can substitute for another, not all are essential for a satisfactory handling of contingencies. A repertoire typically includes techniques with divergent, and to some degree conflicting, principles. Choice within the response is therefore partly a matter of value and preference.

A response requires to be activated when the progress of-a complete action (*v.i.*) is deflected by circumstances. Any particular technique in use then appears inappropriate or insufficient, and flexible modification becomes essential. The focus of this activation is external rather than internal. Heuristics or rules of thumb may be used in a general fashion to assist decision: for example, in chess, where the board position is not a simple stimulus, heuristics are useful [45].

Here training involves extending the repertoire, becoming acquainted with heuristics, choosing and employing these effectively, and learning to conjoin or switch between available techniques smoothly. The practitioner literature, often more relevant than the academic, recommends observation of experts, role-play and supervision.

The characteristic error involves responding inappropriately to the emerging contingency. For example, a manager may incorrectly reduce contacts with a subordinate who finds helpful and necessary confrontation painful. Failure to recognize incompatibility between techniques also leads to error. Thus attempts to program tasks while at the same time prioritizing them may lead to both activities being ineffectively performed. Similarly, responding to a subordinate's complaints with a coercive technique while encouraging autonomy is usually misconceived. Error also flows from excessive dependence on a heuristic, and from persevering excessively with just one or two techniques. For example, staff appraisal carried out with just one or two standard techniques will miss atypical staff who have unusual strengths.

A varied and flexible response to complex contingencies and clever heuristics are essential but not enough. What is ultimately required is the organized and integrated handling of responses and heuristics to achieve some given purpose. For this it is necessary to move up to the highest level of real world action.

L-5 - Complete Action: Generating an Intervention

Action at L-5 refers to action which includes and organizes, as needed, all lower level forms of action so as to produce a desired result in a dynamic social situation. Each complete action is an existential totality and it follows that there can be no higher form of

what is loosely termed ‘action’. Such action is commonly termed ‘an intervention’ in the management and systems literature, and corresponds to a set ‘task’ as defined by Jaques [24] or a ‘mission’ as defined by Kinston [28].

Actions like ‘computerizing a hospital’, ‘building an oil refinery’, ‘creating a theory of action’ or ‘introducing consumer-protection legislation’ are highly complex complete actions. They are capable of being studied — but not in the laboratory. On a personal level, buying a car, repairing a door, or helping a neighbour could be complete actions. Welford refers to skill at this level, even for overtly sensori-motor activities, as being primarily intellectual [55, p.13].

Decision may at times refer to triggering an acton (L-1), or adapting a procedure (L-2), or employing a technique (L-3), or activating a response (L-4); but the reference in organisations is usually to generating an intervention and producing a desired result.

Complete actions vary in complexity — usually the greater the impact desired, the greater the complexity required [35,48]. Handling an intervention as a whole requires a person to have a capacity for abstraction and overview commensurate with the complexity of the task [24]. If the task cannot be comprehended by the individual as a whole, it will be broken down (overtly or covertly) into sections that can be. Although some achievement may result from executing these less complex sections, the total task will not be successfully completed. The hierarchical nature of tasks has been repeatedly emphasized [24,48,55], and so an organized decomposition of complex actions is usually essential to successful completion of the whole.

For effectiveness, the whole process from initiation to achievement must be owned by the person responsible, particularly if performance of parts is delegated. Interventions are therefore internally generated and internally controlled. Even when the objective is set by another, generating an intervention demands an inner commitment to see the process through to a successful conclusion defined by that objective. Action at the lower levels is always seen as subsidiary, and is generated as required to progress the intervention. A complete action, as here defined, requires that all relevant components be practically and meaningfully linked, consciously or unconsciously, for success. As a result, the property that emerges at this level is coherence.

Error characteristically flows from not recognizing the full ramification of a dynamic situation and the action required to meet its evolving nature as the execution proceeds. As noted above, this commonly flows from insufficient capacity for abstraction to view the action as a whole. The result is incoherent or chaotic progression, and eventually a failure to achieve.

Practical training of managers and performers involves the study of complete case studies of successful and failed endeavours, and review of their own achievements or ongoing interventions. In organizations, people should be helped to appreciate their potential capacity for abstraction, and to recognize their limitations. The intellectual and social skills generally emphasized at this level are techniques aimed at avoiding stress e.g. programming component actions, creating rules, using others, prioritizing workload, and anticipating consequences.

Nothing in the hierarchy so far indicates how interventions should be handled in general, or how the different levels of action should be focused upon and used. Nor is there provision for that essential component of success: confidence in proceeding. Providing for these issues requires moving up to a higher domain which is theoretical or potential and which can orient action within the lower five levels.

L-6 - Structured Action: Adopting an Approach

Action at Level 6 is embodied in a theoretical structure which can be discerned in complete actions, and adopted deliberately to direct or organize these. This constitutes an ‘approach’ to action. A particular approach is explicitly adopted so that an intervention may be generated and executed with confidence. The original paper emerged from an exploration of approaches in use [33]. It was found that the enormous variety of ap-

proaches being explicitly or implicitly used and promulgated could be seen as derived from seven basic decision systems. These decision systems can therefore be seen as superordinate internally-consistent and critically-refined approaches.

The emergent property of action at this level is structure. Although their structure is left largely implicit, interventions would appear illogical and unjustifiable to those involved if it were not present. One source of confidence in proceeding using a structure will be explored in the second part: the way each decision system links to a particular inquiring system which offers a guarantee of certainty.

There is a second source. It appears that each of the decision systems depends on gaining confidence from the initiation of action at one of the levels of action. On this basis, the set forms a nested hierarchy — just as the inquiring systems did within the inquiry framework (see Figure 1 and [29]). The confidence-inducing links between levels of action and the decision systems will be briefly explored after the final level of action has been described.

Because a decision system is not a property of any particular situation or class of situations but is a property of a person dealing with a situation, one might think of a person as a decision system. To ease the process of deciding, and to increase the speed and sophistication of execution, people tend to adopt just one decision system as a preferred mode of approach to all complete actions. This shows up as a decision-style or work-style and affects choice of work. It also leads to the main form of error: persisting with one approach out of ignorance, or for personal reasons, when another is more suitable. (For further details on these matters, see [33].)

Even though each system gives rise to characteristic teachable techniques, training across the full range may be problematic. Our research suggests that managers enjoy being trained in decision systems with which they naturally identify, but may resist or even refuse training in the others. This is due to the ideological nature of the systems, and the link with personal identity noted above. Special exercises, incorporating key assumptions, have been developed for each decision system as a training aid [34]. At a minimum, awareness of the full set of systems, and respect for each is desirable. Mentoring may be necessary to overcome blocks and ensure a full understanding and identification with a new system.

An approach is a potential for action. It reflects a form of external control over action apparently independent of the actor and aims to generate confidence, both in the actor and in relevant others, that desired results will eventuate. However, there must be a personal identification with an approach if it is to be expressed in realistic interventions that can be effectively executed. Hence approaches are also experienced as internally controlled.

However, recognizable structure and personal preference is not enough for success. Any action that has lost its well-spring in human energy, creativity and harmony with surrounding actions will not be very effective. To take this into account, it is necessary to move up one further level and finally complete the hierarchy.

L-7 - Right Action: Releasing Spontaneity

Action at Level 7 is right action which is released in a process of realizing being.

Put another way, such action is a way of being real; or: to be is to act. Here is the ultimate source of all personal action. Right action implies both goodness and correctness. The notion of spontaneity conveys a sense of action that comes from oneself and yet from beyond oneself. To act spontaneously is to release oneself to be a vehicle for something beyond oneself in the certainty that this IS what is required for success. This quality of spontaneity needs to permeate all action at lower levels. This is possible, because, it will be recalled, actons at L-l are shaped by and so express a person's overall state of being.

De Bono is conceptualizing action at this level when he recommends a technique of random juxtaposition e.g. picking a sentence in a book at random and using it to aid deci-

sion [16]. He emphasizes that a person must understand this phenomenon and must believe in it in order to benefit. The key assumption is an underlying connectedness between an apparently random action and the purposeful action to be performed.

Spontaneity therefore reflects the dissolution of all boundaries: between different actions, between different spheres of action, between action and inaction, and between inner and outer control. So harmony is the emergent property. Logically, this must be the ultimate conception of action.

The awareness that there exists an ultimate source of all action is particularly well developed in the East, where great stress is placed on the relation between action and Being. Zen Buddhism, for example, sees spontaneous action as a way to enlightenment, and activity as based in tranquillity (and vice versa). The philosophy of Being inherent in the Vedic and Buddhist traditions not only helps the doer gain success in his undertaking, but, at the same time, sets him free from the bondage of action.

The *Bhagavad Gita* [8] emphasizes that human action is endless. It refers to *yagya*, right action, which is performed without strain or effort. Yagya is a way both to realize and to transcend the self. Yagya brings the individual into harmony with all action, and aids in the evolution of the Universe. The fruit of right action, therefore, is a response of nature to that action. This means that right action itself generates and partakes of the universal power that permits change of any sort.

The *I Ching* is a decision-aid based on the significance of spontaneous action. An oracle is selected by the fall of yarrow stalks or coins thrown while pondering a decision [59]. The oracles are associated with visual and symbolic images, and, because they are generally applicable, need to be meditated upon prior to taking action. The *I Ching* emphasizes recognition of personal and social responsibility for good decisions, and works on the assumption that any action is part of the total social situation including the network of past and future actions in and around a person's life.

Error at this level refers to the inappropriate intrusion of egotistical elements. The result is discomfort, unnaturalness, unnecessary conflict with oneself and others, and loss of power. Training at this level means fostering spiritual growth. This involves recognizing the spiritual dimension of action, developing an inner serenity, and recognizing one's potential for harmony and attunement with the All. Techniques used may be mental like transcendental meditation, or bodily like Tai Chi Chuan.

The Nested Hierarchy

It is necessary to return now to the decision systems within L-6 so as to explain the logic of the ordering of these in a hierarchy. This hierarchy only became fully evident through the present formal analysis and was not previously recognized. As noted already, the key issue in action is confidence in proceeding successfully. When the decision systems are examined in the light of the framework of action from this perspective, it seems that each emerges by focusing on a particular level of action as a basis for that confidence. This is what enables the decision systems to be represented as a hierarchy (as in Figure 1). The hierarchical relations are relatively weak in that each level contains a system which is self-contained and relatively self-sufficient.

In what follows, the link between decision systems and action levels will be noted. A decision method used by the decision-system and based on the corresponding level of action will illustrate the issue of confidence. Decision-makers committed to one decision system lack confidence in decision-methods based in other systems.

Thus, the *rationalist* decision system (L-1') assumes direct logical links between aims (whether personal or organizational), actions and outcomes, and sees these links leading automatically to the decision. Confidence is placed in decision-analytic methods where input of state variables (options, utilities &c) determines output. Such confidence seems to be drawn from the ideational quality, inner algorithms and automatic progression of action characteristic of the *acton* (L-1).

The *empiricist* decision system (L-2') assumes that decisions flow from the facts of the situation, and evidently draws confidence from the *procedure* (L-2) where progress of action is determined directly from data input. In the L-2' decision system confidence is firmly placed in methods like piloting, experimentation with different courses, and use of recorded outcomes to feedback and shape progress. Such confidence appears to be drawn from adaptation, feedback and stages of action characteristic of procedures.

The *pragmatic* decision system (L-3') assumes that the main need is to move forward with certainty and speed. Confidence is placed in arbitrary but supremely practical and swift decision-methods such as following custom and practice, tossing a coin, and wheeling and dealing. Such confidence seems to come from valuing *techniques* (L-3) which are certain and efficient. Techniques lack any sense of an overall goal and, correspondingly, pragmatism can lead to things being done simply because they can be done.

The *dialectic* decision system (L-4') assumes that the way forward must come from compromise amongst different possibilities for action. Each possibility is supported by a different and competing interest group with distinctive perspectives and values. Confidence here can be placed in decisions reached through debating and voting. Such confidence seems to be based on the *response* (L-4) in which action flows from choosing between competing aspects of the situation, and balancing various competing techniques, each with its own principles and values.

The *systemic* decision system (L-5') assumes that action should be based on an adequate model of the situation and its desired evolution. Confidence is naturally placed in decision methods which fully simulate the situation. The L-5' decision system is explicitly organized around, and gains confidence from, the need for an *intervention* (L-5) which is systemically complete, coherent and oriented to fully dealing with the situation as a whole.

The *structuralist* decision system (L-6') assumes that a structure is essential to handle action, and focuses on this rather than on any specific action. Confidence can be placed in the use of decision methods of any sort, providing they are explicitly recognized and sanctioned. In other words, confidence is based on valuing an *approach* (L-6) to action. The approaches are themselves structures, and not action itself.

The *intuitionist* decision system (L-7') assumes that decisions emerge from the unconscious. Confidence can therefore be placed in decision-tools such as the *I Ching* (described earlier) and dream analyses. Such confidence is based in valuing spontaneity (L-7) in which action flows successfully when the self is transcended. The L·7' decision system requires decisions to be growth-enhancing, and spontaneity has this quality. Both the L-7' decision system and *spontaneity* need to permeate all lower levels within their respective hierarchies.

The Total Framework for Action

The total framework has now been modelled. In this model, any intervention is a complete action. When generated in a particular situation, the *intervention* emerges from the interaction of *spontaneity* (which is transpersonal) and a theoretical *approach* (or personal decision-style). When executed, it draws upon *actons* (often automatically or unconsciously), and uses *responses* based more or less consciously on a repertoire of *techniques* and *procedures*. Put another way, for a complete action to have a chance of success, each of the seven levels in the primary framework must be activated. In any complete action, the actons (L-l) provide precision of execution, the procedures (L-2) enable close shaping of the execution to the environment, the techniques (L-3) provide for proficiency and efficiency of execution, the responses (L-4) enable contingencies during the execution to be dealt with, and the intervention (L-5) provides for coherence and identity of the overall execution. The two contextual or meta-system levels provide the essential confidence (L-6) and energy (L-7) without which successful action is impossible.

DECISION SYSTEMS AND THE FRAMEWORK FOR INQUIRY

Action involves choosing, consciously or unconsciously, between alternative possibilities. This implies explicit or implicit inquiry as to: when action is needed, what alternatives might exist, what purposes or values might inform choice, and whether action has been successful. Inquiry therefore permeates the action process, and any theoretical appreciation of why there are just seven decision systems would need to be linked to the nature of inquiry.

Confidence, so essential for successful action in the social world, depends, at least partly, upon feelings of certainty in the outcome of the inquiry associated with action. Although most decision-makers avoid philosophical and methodological niceties, there has been academic and official concern that both organizational and political decision-making are not sufficiently scientific [39,43,53]. The difficulty is that there are sharply different conceptions of what 'being scientific' means, with each conception appealing to a different way of guaranteeing certainty [11]. It is therefore to be expected that the different approaches to inquiry would imply and support sharply different approaches to decision and action.

Recent investigations have clarified that when inquiry is viewed as a practical activity taking place in a social context for defined purposes, then it may be usefully modelled as a seven level hierarchy [27,29]. Level VI of the hierarchy is testing, the reflective process which guarantees the truth of the knowledge resulting from inquiring activities at Levels I to V. The product at this level is a test. Tests are organized by systems which prescribe how to conduct any test in principle. Churchman called any approach to inquiry an 'inquiring system'.

Five inquiring systems were initially described by Churchman [11] and elaborated by Mitroff [42]. These authors were tentative about their hierarchical nature, despite intuitively articulating the systems in the correct ascending order. They also doubted, in this case correctly, that their classification was exhaustive. Subsequent researches indicated that there were two further approaches to inquiring, similar in principle to the others, but radically different in kind. These are used to reflect philosophically and imaginatively on the object of inquiry, and on the methods used for inquiry. In other words, they formed a context for Churchman's systems.

The complete and exhaustive analysis revealed seven hierarchically-ordered inquiring systems, in which the five originally described are those in operational use, and the upper two levels are purely theoretical inquiring systems. The inquiring systems form a secondary seven-level hierarchy nested within Level VI, much as in the case of decision systems within the hierarchy of action. Each inquiring system appears to be developed around the certainty of inquiry which is built around valuing and using the corresponding level in the primary hierarchy (*v.* Figure 1 and **Table 4**).

In order, the inquiring systems with ultra-brief definitions are:

- L-I' — **formal-analytic or deductive** (defining concepts using self-evident assumptions to form pertinent analyses);
- L-II' — **empirical or inductive** (amassing and organizing pertinent verifiable facts to discern regularities);
- L-III' — **explanatory, representational or synthetic** (comparing alternative hypotheses using indicators and controls to determine the better theory);
- L-IV' — **dialectical or conflictual** (developing and reconciling antinomies by devising syntheses and clarifying principles);
- L- V'— **holistic, 'soft-systems', or inter-disciplinary** (inter-relating a set of elements into a model by structuring into and within levels);
- L- V I' — **dialogic or philosophical** (ratiocinating key ideas using the rules of rational discourse to reach conclusions);
- L- VII' — **contemplative or imaginative** (contemplating an unbounded totality to create imaginative possibilities).

The principal properties of the inquiring systems as developed in [29] are reproduced in **Table 4**.

« Insert Figure 1 About Here »

Inquiring systems have features in common with decision systems. For example, just as real world action cannot be constrained to just one system, so real world inquiry demands the use of all inquiring systems. The lay-inquirer, like the man-of-action, freely uses all approaches, and usually without much concern for rigour. It is also evident that inquiring systems show the ideological character found in the decision systems [30; cf. 37]. So each system seems independent, self-sufficient and preferable to the other systems by those scientists who operate rigorously within it — even though each is particularly suitable for certain inquiries, and rather inappropriate to others.

Although certain inquiring systems have at times been virtually identified with decision-making approaches by Churchman and Mitroff, inquiry and decision are logically and practically distinct. Some correspondences between systems at the same level in the two domains are immediately evident and very close indeed: e.g. at the second level between the empirical inquiring system and empiricist decision system, and at the fourth level between the dialectical inquiring and decision systems [40,43]. But the similarity seems less obvious at the others levels. At the third level, for example, the pragmatic decision system dismays most academics because it appears self-serving, unsystematic and accepting of sub-optimality [38]; whereas the explanatory inquiring system, its counterpart, has become almost the epitome of good scientific practice. In what follows, the pair of decision and inquiring systems at each level will be considered briefly in turn. The aim is to show correspondences which suggest that confidence in the decision system is supported by the certainty promised by the inquiring system.

The **formal-analytic** inquiring system (L-I') has commonalities with the **rationalist** decision system (L-1'). Ideas, not facts, are the focus in inquiry, and objectives and priorities which dominate decisions are ideas. In the inquiring system, ideas are formed into propositions using self-evident formal reasoning, and results are assessed for internal coherence and consistency. Within the decision system, the inquiring system is used to understand and structure issues and problems, and to develop coherent and consistent priorities, policies and plans. Information is required in the decision system, but it is treated as secondary and dependent on purposes and ideas. The suitability of the rationalist decision system for issues which are well-understood and well-structured and the drive to structure decision-issues and assign utilities are two properties which appear to stem from its association with formal-analytic inquiry.

The **empirical** inquiring system (L- II'), which regards data as the source of certainty, can be directly associated with the **empiricist** decision system (L-2'). The decision system depends heavily on the inquiring system, because it sees decisions flowing naturally from the facts of the matter. Like rationalists, empiricist decision makers value inquiring highly and emphasise the likely existence of an optimum course of action. The decision system requires collection and use of reliable and valid data at all phases of the action process: for assessment of problems, for monitoring of pilots, for recording of progress, and for quantitative evaluation of outcome. In all these phases, the inquiring system offers both guidance and confidence.

The explanatory inquiring system (L-III') holds that data and ideas are inseparable with each depending on and affecting the other. Inquiry requires the selection of a preferred hypothesis from multiple possible hypotheses which are tested by comparison against each other. The corresponding decision system is the pragmatic in which action is generated by selecting a preferred alternative from a multiplicity of present opportunities. The decision system advocates use of facts but not the accumulation of information; and it requires the use of objectives but not the detailing of policies and plans. The inquiring system is particularly suitable for ill-structured and complex issues which contain a small section which can be practically and conceptually isolated, defined and studied. The pragmatic approach views decision issues in organizations in a similar way, and requires homing in on key foci to generate a sharply defined project where results are rapidly

achievable and gain certain. In this way, both the inquiring system and decision system value piecemeal development.

The **dialectical** inquiring system (L-IV') is based on the assumption that any representation or reality contains two directly opposing and hence conflicting theses. The immediate parallel with the **dialectical** decision system (L-4') is obvious: the conflict between theses is replaced by a dispute between protagonists or opposing factions who hold different values. Each has a distinct view as to what constitutes the proper course of action. In the inquiring system, information is irrelevant or meaningless by itself and may support either thesis; while in the decision system, information is selected and used by each faction to support its own interests. In both domains, there is a concern to clarify the underlying assumptions and to understand the nature of the conflict. In the inquiring system, it is assumed that it is possible to generate a higher level synthesis which will resolve the conflict. Until this occurs, conflict is tolerated rather than dissipated. In the decision system, by contrast, resolution is essential because the dispute blocks necessary progress. If a synthesis is unavailable, which is usual, compromise is sought instead.

The **holistic** inquiring system (L- V') aims to produce a model of a situation adequate to the purpose of the inquiry. The **systemic** inquiring system (L-5') rests heavily on this inquiring system: the potential future is a scenario based on a system of interacting and interlocking values; change is a complex evolution; and the strategy to manage it is an optimal-feasible systemic intervention aiming to produce balanced development. The inquiring system helps people feel committed to the strategy because all relevant factors, including the values and knowledge of relevant individuals, have been taken into account. Because both the inquiring and decision systems bring into play otherwise split-off and ignored variables or spheres of activity. So there are common difficulties with excessive, and possibly unnecessary, complexity and uncertainty, and painful awareness of ethical violations.

The **dialogic** inquiring system (L- VI'), which stems from philosophical analysis, is associated with the **structuralist** decision system (L-6'). In both cases there is an emphasis on the use of a reasonable procedure and on the specification of formal structures and relationships. In both the inquiring and decision systems, detailed facts are kept at a distance. The indications for both also show similarities: dialogic inquiry is necessary when a framework for addressing complex topics is required, or when issues of identity or self-description are present; while the structuralist decision-making is needed in complex organizations for precisely the same reasons-to provide organizational and procedural frameworks which structure decision-making, clarify work to be done, and provide for identity in terms of roles, responsibilities and formal relationships. The inquiring system and decision system both carry the potential danger of sterility and stagnation through loss of contact with specifics.

The **contemplative** inquiring system (L- VII') assumes that truth is immanent in the mind, while the **intuitionist** inquiring system (L-7') assumes the needed decision is. In both cases, attention turns inwards rather than outwards to allow for attunement to the situation and to what is really needed. Contemplative inquiring is a creative process relying mainly on image, emotion, symbolism, and unconscious mental activity. The decision system deliberately activates this process so as to generate an inspired vision which feels not only certain but right and good. Effective inquiry requires that contemplative inquiry should somehow infuse the other inquiring systems. Similarly, intuitionist decision-making unconsciously permeates the other decision systems, affecting when and how they are confidently applied.

SIMILARITY OR HOMOLOGY?

Modelling the decision systems in the context of all that may be meant by action has revealed the existence of a hierarchical framework for action whose structure closely resembles the framework for inquiry. Churchman's and Mitroff’s writings imply that the decision systems are virtually identical to inquiring systems. Although this does not seem

to be the case, there is more than just a superficial resemblance. The detailed similarities between the pairs of decision and inquiring systems may simply be a reflection of the fact that inquiring is a form of action, and conversely action is permeated by inquiring. However, the idea that there might be a formal correspondence between two primary hierarchies in two distinct domains (action and inquiry) deserves further study, especially since a similar pattern has been found in an analysis of purpose and value [28,30,31].

Inspection of the two primary hierarchies suggests that the sixth and seventh levels are very similar, while the lower five levels are very different. The sixth and seventh levels contain the orienting principles which determine, often implicitly or unconsciously, the what and how of actualization. So it is perhaps not surprising that these should be similar. Thus, the highest level in both cases (L-7 and L-VII) reflects the boundlessness of human imagination, creativity, and a transpersonal interconnection with the cosmos; while the mediating level in both cases (L-6 and L-VI) reflects self-conscious and critical theorizing, and the need for a personalized structure to aid actualization.

On closer examination, formal similarities at lower levels of the two primary hierarchies can be identified. The first level in both cases is elemental; the second level flexibly applies this to external reality; the third level introduces systematization; the fourth level allows for general applicability and coverage; and the fifth level provides for completion and integration. In both frameworks, there is an oscillation between an internal or subjective and an external or objective locus of control as the levels are ascended. These formal correspondences provide some corroboration for the structural validity of the analysis.

CONCLUSION

The argument for the validity of the framework for action rests, first, in the logical nature and inner coherence and consistency of the analysis; second, in its broad concordance with empirical approaches and researches within a variety of academic domains; and third, in its practical usefulness as manifest, for example, in the differentiation of errors and training requirements.

The difference between the present study of action and the detailed but fragmentary accounts to be found in the disciplinary literature is that the present inquiry takes ‘the conceptual analysis of holistic experience as the starting point’ [1, p.4]. The claim for validity is restricted to the overall model, and not to every detail within it. Further fine-tuning and elaboration are continuing, and more detailed work from different perspectives are expected to produce modifications and developments [31,32].

The issue left open at the conclusion of the original paper [33] was whether the seven identified decision-systems were an exhaustive set. Subject to scrutiny revealing flaws in the analysis, this can now be answered in the affirmative. If the primary hierarchy is logically complete in seven levels and the decision systems are formed using each of these levels as a distinctive focus for confidence, then no further systems are to be expected. Further evidence for completeness emerges from the tight and logical link to the inquiring systems which also appear to comprise just seven.

REFERENCES

1. Ackoff, R.L. and Emery, F.E., On Purposeful Systems, Aldine Atherton. 1972.
2. Adams, J.L., *Conceptual Blockbusting: A Guide to Belter Ideas*, W.H. Freeman, 1974.
3. Aleksander. L. and Burnett, P., *Reinventing Man: The Robot becomes Reality*, Kogan Page, 1983.
4. Algie, J., *Six Ways of Deciding*, BASW, 1976.
5. Argyle, M., *The Psychology of Interpersonal Perception*, Penguin, 1967.
6. Argyle, M., *Social Interaction*, Methuen, 1969.

7. Belbin, E., Belbin, R.M. and Hill, F., 'A comparison between the results of three different methods of operator training', *Ergonomics*, 1, 39-50, 1957.
8. *Bhagavad Gita* (transl. Mascaro, J.), Penguin, 1962.
9. Broadbent. D. E., *Perception and Communication*, Pergamon Press, 1958.
10. Checkland, P., *Systems Thinking, Systems Practice*, Wiley, 1981.
11. Churchman, C. W., *The Design of Inquiring Systems*, Basic Books, 1971.
12. Clynes, M . *Sentics: The Touch of Emotions*, Anchor Press, 1977.
13. Craik, K. J. W., 'Theory of the human operator in control systems: (i) the operator as an engineering system; ii) man as an element in a control system', *British Journal of Psychology*, 38, (i) 58-61, (ii) 142-148, 1947-48.
14. Danish, S. J., and Hauer, A. L., *Helping Skills: A Basic Training Workbook*, Behavioral Publications, 1973.
15. De Bono, E., *Teaching Thinking*, Penguin, 1976.
16. De Bono, E., *PO: Beyond Yes and No*, Simon & Schuster, 1972.
17. Deming, W. E., *Out of the Crisis: Quality, Productivity and Competitive Position*, Cambridge University Press, 1986.
18. Engelberger, J., *Robotics in Practice*. Kogan Page, 1981.
19. Evans, J. St. B. T. (ed.), *Thinking and Reasoning: Psychological Approaches*, Routledge Kegan Paul,1983.
20. Feuerstein, R., Hoffman, M. B. and Mille, R., *Instrumental Enrichment*, University Park Press. 1980.
21. Freud,S., *The Psychopathology of Everyday Life*, (1901), Standard Edition, Vol. 6., Hogarth Press and the Institute of Psychoanalysis, 1960.
22. Goffman. E., *Strategic Interaction*, Ballantine, 1972.
23. Hendrickson, A. E. and Hendrickson, D. E., 'The biological basis of intelligence. Part 1: Theory.' and 'Part 2: Measurement.' In: Eyscnck, H. J. (ed.), *A Model for Intelligence* (pp. 137-196; 197- 228), Springer Verlag, 1982.
24. Jaques, E., *A General Theory of Bureaucracy*, Heinemann, 1976.
25. John, E. R., Herrington, R. N. and Sutton, S., 'Effects of visual form on the evoked response', *Science*, 155, 1439·1442, 1967.
26. Johnson-Laird, P. N. and Wason, P. C. (eds.), *Thinking: Readings in Cognitive Science*, Cambridge University Press, 1977.
27. Kinston, W., 'Measurement and the structure of scientific analysis', *Systems Research*, 2,95-104, 1985.
28. Kinston, W., 'Purpose and the translation of values into action', *Systems Research*, 3, 147-160, 1986
29. Kinston, W., 'A total framework for inquiry', *Systems Research*, 5, 9-25, 1988.
30. Kinston, W., 'Completing the hierarchy of purpose', In: Ledington, P. W, J. (ed.), *Proceedings of the 33rd Conference of the International Society/or the Systems Sciences*, 3, 245.264,1989.
31. Kinston, W., *A Guide to Organizing the Practice of Ethics in Society* (in preparation), The SIGMA Centre.
32. Kinston, W., *An Expanded Framework for Action, Discussion Document*, The SIGMA Centre, 1989.

33. Kinston, W. and J. Algie, ‘Seven distinctive paths of decision and action’, *Systems Research*, 6, 117-132, 1989.

34. Kinston, W. and Algie, J., *Training Aids for the Seven Decision Systems*, The SIGMA Centre, 1991.

35. Kinston, W. and Rowbottom, R., ‘Levels of work: New applications to the management of complex organizations’, *Journal of Applied. Systems Analysis*, 16, 19-34, 1989.

36. Legge, D. (ed.), *Skills*, Penguin, 1970.

37. Lilienfcld, R., *The Rise of Systems Theory: An Ideological Analysis*, Wiley. 1978.

38. Lindblom, C., *The Intelligence of Democracy: Decision-making through Mutual Adjustment*, Free Press. 1968.

39. Lindblom. C. and Cohen, D. K , *Usable Knowledge: Social Science and Social Problem Solving*, Yale University Press. 1979.

40. Mason, R.O., ‘A dialectical approach to strategic planning’, *Management Science*, 15, B.403- B.414, 1969.

41. Miller, G. A., Galanter, E. and Pribram, K. H., *Plans and the Structure of Behaviour*, Holt, Rinehart & Winston, 1960.

42. Mitroff, I. I., *The Subjective Side of Science*, Elsevier, 1974.

43. Mitroff, I. I. and Betz, F., 'Dialectical decision theory: A meta-theory of decision-making', *Management Science*, 19, 11-24, 1972.

44. National Science Foundation, *Knowledge into Action: Improving the Nation's Use of the Social Sciences. Report of the Special Commission on the Social Sciences*, Washington D.C ., 1968.

45. Newell, A., Shaw, J. C. and Simon, H. A., 'Chess-playing problems and the problem of complexity', *IBM Journal of Research and Development*, 2, 320-335. 1958.

46. Nisbett, R. E. and Ross, L., *Human Inference: Strategies and Shortcomings of Social Judgement*, Prentice-Hall, 1980.

47. Ohmae, K., *The Mind of the Strategist*, McGraw-Hill, 1982. .

48. Rowbottom, R. and Billis, D., *Organizational Design: The Work-Levels Approach*, Gower, 1987.

49. Singleton, W. T., Spurgeon, P. and Stammers, R. B. (eds.), *The Analysis of Social Skill*, Plenum, 1980.

50. Vernon, P. A. (ed.), *Speed of Information Processing and Intelligence*, Ablex Publ., 1989.

51. Wason, P. C., Self-contradictions. In: [26], 1977.

52. Watzlawick, P., Beavin, J. H. and Jackson, D. D., *The Pragmatics of Human Communication*, Faber & Faber, 1968.

53. Weiss, C. H. (ed.), *Using Social Research for Public Policy Making*, D.C. Heath, 1977.

54. Welford, A. T., *Fundamentals of Skill*, Methuen, 1968.

55. Welford, A. T., *Skilled Performance: Perceptual and Motor Skills*, Scott Foresman, 1976.

56. Wertheimer, M., *Productive Thinking*, Tavistock, 1961.

57. Whimsey, A. and Lochhead, J., *Problem solving and Comprehension: A Short Course in Analytical Reasoning*, 2nd Ed, The Franklin Institute Press, 1980.

58. Wiener, N., *Cybernetics*, Wiley, 1948.

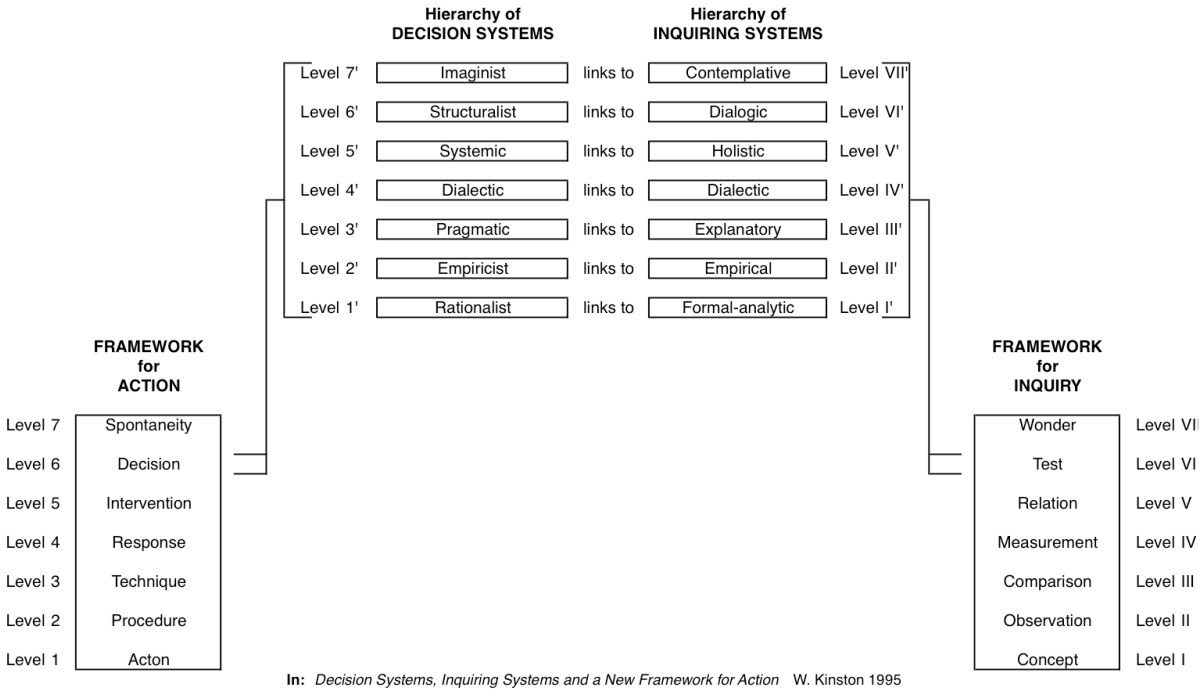
59. Wilhelm, R., *I Ching or Book of Changes*, 3rd Ed. (transl. Baynes, C.F.), Routledge Kegan Paul, 1968.

FIG. 1: The frameworks for action and inquiry.

The diagram shows the hierarchical levels and the relation between levels of inquiry and action and the approaches to action/inquiry
i.e. the decision systems and inquiring systems.

The two frameworks (primary hierarchies) are in single boxes indicating their holistic nature: whereas the systems are in discrete boxes reflecting their inner coherence and distinctiveness. Note that the hierarchy of systems in both cases lies wholly within the sixth level of the respective framework and is an image of the primary hierarchy. For more details see text and refer to [29,33].

Figure 1 - The frameworks for action and inquiry



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Tables

Table 1: Levels of human action and decisions, and their characteristics

L	Form of Action Label	Function	Mode of Initiation	Locus of Control	Emergent Properties	Contribution to Execution	Characteristic Error*
1	**Acton** Elemental action	Need for rapid automatic progression of action.	Triggering	Internal	State	Precision	Triggering activity inadvertently
2	**Procedure** Modulated action	Need to maintain a flow of action appropriate to the circumstances.	Adapting	External	Stage	Shaping	Missing or misunderstanding cues
3	**Technique** Systematized action	Need to enhance the efficiency and quality of adaptations.	Employing	Internal	Principle	Efficiency	Applying technique mindlessly
4	**Response** Action range	Need to deploy a mix of techniques to cover developing contingencies.	Activating	External	Variety	Flexibility	Responding inappropriately
5	**Intervention** Complete action	Need to produce a particular result in the situation.	Generating	Internal	Purpose	Coherence	Progressing action incoherently
6	**Decision** Structured action	Need for a committed and reasonable approach to intervention.	Adopting	Both internal and external	Structure	Confidence	Persisting with an unsuitable approach
7	**Spontaneity** Right action	Need for a deep inner and transpesonal release of action	Releasing	Identity of internal and external	Harmony	Energy	Allowing intrusion of egotistical elements

* There are more errors than those listed: see text.

Table 2: The seven decision systems in schematic outline

Phase of Action	Rationalist	Empiricist	Pragmatist	Dialectic
Phase1: Start	Start with the over-arching common aim(s) and value(s).	Note a problem and reduce it to a manageable size.	Screen opportunities for action eliminating anything impractical or uncongenial.	Acknowledge the conflicts and get a basis for discussion.
Phase 2: Explore	From this, specify objectives and criteria in terms of what is feasible and desirable.	Using available information define the real problem in terms of what is meaningful and resolvable.	(Two cells) Emphasize maximizing advantage and using and building on existing strengths.	Sort out the various protagonists, and their main opposing arguments.
Phase 3: Develop Possibilities	From this, develop options, and analyze these in terms of pros and cons using the objectives and criteria.	Obtain facts relevant to the problem or surmised solutions and pull out implications.	--	Debate so as to clarify values, assumptions, and implications of the bids for action. Work out payoffs and negotiate.
Phase 4: Resolve	Assign priorities.	Recognize the unique best solution and adopt it.	Seize the most attractive opportunities.	Settle on a consensus by synthesis or compromise.
Phase 5: Reiterate	Work out a more detailed action plan, sequencing tasks in a coherent process.	Test the solution in a pilot version with full collection of data.	Develop convenient tactics including back-up possibilities.	Agree the delimited resolution in detail and document agreement.
Phase 6: Implement	Mobilize people and resources for action.	Promulgate the solution and expect action.	Persuade others to cooperate, improvise and learn by doing.	Delimit and phase action.
Phase 7: Review	Check progress against plan (priorities, tactical objectives); and compare results with values and higher level objectives.	Control process and record progressive results. Obtain evidence whether the problem is solved.	Watch for danger signs and new opportunities. Recognize gains and losses during action.	Check that agreement to the resolution is holding. Assess whether the conflicts have been sufficiently resolved.
Phase 8: Overcome Failure	Adjust plans; or re-define a new mission or new key objectives.	Revise protocol; or redefine the original problem.	Switch tactics; or fall back on other possibilities; or turn attention elsewhere.	Re-activate debate, and work towards a different compromise; use external arbitration.

Phase of Action	Systemic	Structuralist	Intuitionist
Phase1: Start	Develop potential failure scenario for the situation, based on interacting values.	Identify a structural failure and establish authoritatively that it should be dealt with.	Express a felt disquiet; or realize that drive is missing.
Phase 2: Explore	Identify critical features and constraints, and model their interrelations and dynamics.	Review organization and procedures: i.e., roles, personnel, task, structures, conventions.	Attune and focus to explore perceptions, feelings and worries of all those involved. Open up the imagination.
Phase 3: Develop Possibilities	Systemically elicit expertise to find and use triggers for development. Simulate effects of activating triggers in various ways.	[Explore for possible blockages and ways around these.]	Incubate and play with images and any ideas that come.
Phase 4: Resolve	Evolve an optimal-feasible strategy. Model progressive thresholds in interventions and outcomes.	Assign responsibilities.	Crystallize inspiration.
Phase 5: Reiterate	--	Specify and assign specific tasks and sub-tasks.	Articulate vision; and envisage growth-enhancement.
Phase 6: Implement	Intervene by deploying flexible varied response and ensuring meaningful control of the total situation.	Issue instructions and lead by coordinating task execution.	Enthuse and lead with charisma. Interact fully with mutual support.
Phase 7: Review	Use intervention model to check developments; fine-tune model of situation against unfolding reality. Analyze fit between outcomes and scenario.	Monitor task execution. Appraise personnel performance and potential. Check that all functions smoothly.	Monitor self, and engage in mutual counseling. Look for fulfillment of the vision and deep satisfaction with action and its results.
Phase 8: Overcome Failure	Modify the intervention model; or rethink the ideal scenario; or remodel the situation.	Reassess tasks, roles and personnel needs; reassign responsibilities; restructure tasks or procedures.	Mediate afresh on the vision to refine it; or re-explore the worry area.

Reprinted from [33].

Note: Putting the action process into such clear-cut phases is inappropriate for some of the approaches.

Table 3: Aspects affecting the choice of a decision system

Mode	Immediate Applications if:	Preferred Structure of the Issue:	Involvement of Protagonists	Value Drive to Act	Unique Strengths	Inherent Dangers	Use may be inappropriate if:
Rationalist	The issues relates directly to an overarching aim and value. i.e. setting priorities	Well-structured and simple or complex but well-understood.	A wide range of relevant and associated objectives are clear and shared. e.g. in a planning group	Desire for abetter planned output for the organization.	Reduction in risk and chance while taking an overall view.	Planning gets over-elaborate and unrealistic. Plans become divorced from action and commitment.	Protagonists have endemic conflicting objectives in relation to the issue. The situation is not understood.
Empiricist	The issue naturally reduces to one or a series of simple problems where the facts determine action. e.g. paying staff regularly.	Well-structured; well-understood; and as simple as possible.	A narrow range of specific objectives are clear and shared. e.g. in a research group	Desire for knowledge about the issue which may be useful.	A unique best solution may be found.	Information is collected for its own sake. Protagonist's values and objectives are ignored. Excessively oriented to past rather than to future.	Change is rapid in the system or environment. Problems are multiple and interconnected, or unclear. Endemic conflicting objectives are inherent in the issue.
Pragmatist	The issue must be tackled by immediate action using available opportunities. E.g. handling a crisis.	Complex or poorly structured, but with areas which can be easily defined, understood and focused on.	Simple directly relevant objectives are available or discovered which suit key protagonists as individuals.	Desire for some tangible achievement and personal gain.	Action always results, rapidly if necessary.	Loss of a sense of direction. Inadequate use of information. Machiavellianism. Bold long-term projects and fundamental changes avoided.	The issue must be handled as a whole and over a long-term. There are key groups of protagonists which opposing objectives.
Dialectical	The issue inherently leads to one or other partly obtaining advantage over an other. e.g. altering distribution of benefits.	Complex and poorly structured. Poorly understood, i.e. experts disagree.	Protagonist form factions each with opposing interests in relation to the issue.	Desire for factional gain without excessive loss to individuals or factions or the whole organization.	Productive conflict and consensus emerges. Payoffs balance out.	Generation of unnecessary conflict which diverts energies. Vacillation between two sides. Payoffs become excessive. Delayed decision making. Superficial perceptions reign	Issue is simple and well-structured and a strong underlying consensus actually exists.
Systemic	The issue demands socio-technical development of the whole system. E.g. organizational evaluation.	Unstructured and complex. Structure is imposed on the issue in light of the desired future scenario.	All participants need to be involved. Experts also required.	Desire for a better future for the organization and its clientele.	Maximum impact combined with maximum participation. Balanced development.	Generation of unecessary complexity, uncertainty and awareness of ethical violations. Models are not understood by decision makers, or are too computer-dependent.	Issue is simple, factural or polarized.

Strucuralist	The issue indicates that the existing organization or procedures are not fully or properly developed. E.g. reorganization	Any issue in which the individuals involved are to be held personally to account.	Protagonists are persons in posts, i.e. individuals within depersonalized positions. One protagonist exists in overall authority.	Desire for a combination of stability and maximum efficiency.	All possible decisions are covered. Autonomy in choice of decision style.	Loss of direct contact with specific goals, facts and people. Excessive concern with status. Proliferation of structures and empire building. Too mechanistic, rigid, remote	Assignment or deferment is inappropriate. The why and the how of the issue are in question.
Intuitionist	The issue immediately touches on deepest feelings and personal concerns. E.g. staff development.	Any issue in hich the individuals feel epersonally involved; or needs to be looked at in a completely new way.	All relevant individuals must become deeply personally involved and commit themselves to a course of action.	Desire for personal and group growth. Desire for realization of personal creativity.	Personal development is inherent. Action feels in tune and both right and good.	Dogmatism. Messianism. Inability to tolerate and use different decision methods. Desgree of awareness required is beyond many people's ability. Poor use of information.	Issue is factual or polarized. Suitable modelling techniques are available. Deliberate explicit phasing of the decision process over a long period is required.

Although adherents to a system regard it as appropriate to all issues, research suggests that differences in suitability exist. For more details see [28].

Table 4: Principle characteristics of the hierarchy of practical inquiring systems as used within a situation to aid a decision-maker

Level	Nature (labels)	Result of an inquiry (example from health services research)	Growth of knowledge in the situation	Relation between realities and representations	Certainty of output	Indications for use	Dangers (usual criticisms)	Contraindications for use
I'	**Formal** (analytic, deductive, rationalist)	A value-free analysis pertinent to the situation; e.g. analysis of the different types of health care programmes.	Generating ever more elaborate and grounded analyses.	Representations, deriving from elementary formal reasoning, reveal and embody enduring self-evident properties of the situation. Realities are complex and difficult to know, cf. mathematico-logical reasoning.	Very uncertain, as analysis may be inapplicable or artificial in the actual situation	Well-understood and well-defined topic with clear objectives. Inquirer understands the topic and how it relates to the situation.	Proliferation of propositions with little concern for data or implementations. Analysis becomes a self-fulfilling prophecy (i.e., 'true by definition')	Situation is poorly understood. Inquirer does not understand the issue in context. Analysis is over-extended or over-elaborate.
II'	**Empirical** (inductive)	Empirical content on its own pertinent to the situation, e.g. an epidemiological survey of morbidity	Amassing and organizing ever more facts.	Representations are justified by the facts (i.e., realities) deriving from sensory experience. Ideas and reasoning are subjective and hence untrustworthy. Cf. empirical investigation.	Uncertain because experience is fallible, and facts get very complicated on close inspection.	Well-structured recognized problem. Agreement about the relevant objectives. Simple experiment or data collections will suffice. Inquirer has a 'fee' for data.	Proliferation of data with little concern for explanations or subjectivity (e.g. goals, attitudes). Excessive reliance on agreement. Loss of extreme possibilities.	Ill-structured problem is made to look well-structured. Hard data is limited, too costly to obtain, or inaccessible. Consensus on data is lacking.
III'	**Synthetic** (representational, explanatory)	Selection of a better alternative in the situation, e.g. randomized controlled trials of alternative regimens of care.	Trying out and progressively improving ever more detailed alternatives.	Representations and realities are inseparable, each deriving from and interacting with the other. So multiple representations of the same reality need to be developed and compared. Cf. hypothesis testing.	Maximum certainty because many perspectives and possibilities can be examined.	Ill-structured problem but an overall picture is available and a part can be defined and focused on. Objectives are clearly given. Inquirer takes a balanced and unbiased view.	Proliferation of alternatives. Important alternatives are omitted, or trivial ones are included. Realities and representatives are charged to carry out the test. Too ready acceptable of the validity of controls and indicators.	Overall picture is unavailable. Objectives are confused. Inquirer is biased.

IV'	**Dialectical** (conflictual, critical)	Exposure of conflicts in the situation due to opposing assumptions, with or without a resolution. E.g., critical analysis of a health policy decision.	Devising ever more powerful syntheses and recognizing ever more antinomies.	Complete representation must contain at least two directly opposed representations and agreed realities can support either. Representations are imbued with value and affect agreement on reality. Cf. dialectic analysis.	Uncertainty which may lead to vacillation between alternatives or to polarization.	Ill-structured topic whose true nature is in doubt and subject to intense debate by experts. Opposing objectives in the situation. Inquirer capable of intuitive and synthetic reasoning. Proliferation of unnecessary conflict. Loss of contact with specific realities. Excessive influence of prejudice. Development of weak compromises.	Proliferation of unnecessary conflict. Loss of contact with	An optimal solution is available. Issue is well-structured and uncontentious.
V''	**Holistic** (interdisciplinary, 'soft system', developmental)	Formulation of a model to indicate actions to change the whole situation. E.g., developing a model for practical organizational change.	Developing ever more extensive and finely-tuned models.	Representations are used to alter realities in line with intentions. Representations require key factors in reality to be interrelated to form a structured system. Cf. system modeling.	High uncertainty as the situation is every-developing and psychosocial aspects of participants and inquirer must be included.	Situation demanding explicit structuring so as to aid intervention. Concern for future development. Objectives unclear. Use of personal power likely. Inquirer can reason reflectively.	Generation of unnecessary complexity, uncertainty and individual awareness to violation of values. Lack of concern for reliability, validity, consistency, objective certainty,or conflict and power issues.	Simple alternatives must be decided. Sense of certainty of results or acceptability to participants are of overriding importance.
VI'	**Dialogic** (philosophical, ratiocinatory)	A conceptual analysis of aspects of the situation divorced from immediate action, e.g. understanding the meaning of dying.	Producing ever more sophisticated arguments and conclusions.	Representations depend on a properly used framework of relevant fundamental terms provided by ratiocination and discourse. Realities are taken for granted, are not relevant or are challenged directly. Cf. philosophical analysis.	Absolute uncertainty; source of doubt and dogmatic belief.	A framework for thinking is required. Difficulty with problem formulation. Issues of self-description or identity are present. Inquirer capable of sustained theorizing and arguing.	Degenerates into sterile word-play. Degenerates into fanaticism. Lack of a basic understanding of the topic in practical terms.	Practical inquiry at lower levels is need urgently.
VII'	**Contemplative** (imaginative, speculative, intuitive)	A whole formulation which completely grasps the situation and its resolution. (No specific example — can apply to many topics at each level.)	Creating ever more imaginative possibilities at all levels.	No distinction exists between realities and representations. Representation stems from truth immanent in the mind which employs image, symbols and the logic of the unconscious. Cf. imaginative insight.	Absolute certainty; source of faith and inspired belief.	Existing paradigm or idea has too many obvious anomalies; or too many philosophical objections. Inquirer capable of concentrated contemplation and abandonment of previously held convictions.	Development of an idea fixe, or messianism, which may lead to the insight being applied outside its area of development. Nothing but speculation. Motivated by a desire for glory.	Much immediately useful can be done within the existing paradigms. Social recognition of the need for imaginative reformation is missing.

Extracted from [29]: Table 2.