THE MULTIPLE PERSPECTIVE CONCEPT

by

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I. HISTORY OF THE METHOD

The roots for the multiple perspective approach are two-pronged: the author's twenty years' experience in the aerospace industry, specifically in corporate planning, and the book of Harvard's Graham Allison, *Essence of Decision: Explaining the Cuban Missile Crisis*.[1] Linstone had seen that his analysis and modeling for corporate decision making only took into account some of the factors vital in the corporate decision process and Allison's work examined the missile crisis from three different points of view, rational actor, organizational process, and bureaucratic politics. Each provided insights not obtainable with the others. Beginning in 1977, his development of this approach and application to technology management eventually led to the book *Multiple Perspectives for Decision Making* in 1984.[2] An updated version, *Decision Making for Technology Executives: Using Multiple Perspectives to Improve Performance*, was published in 1999.[3]

II. DESCRIPTION OF THE METHOD

We shall now consider the three types of perspective used in this approach.

The Technical Perspectives (T)

Science and technology represent the most successful "religion" of modern times. From Galileo to the Apollo manned lunar landing, from Darwin to recombinant DNA, its methods have yielded dazzling triumphs. They form the paradigm for the technical perspective. The T world view is typified by the following characteristics:

- Problems are simplified by abstraction, idealization, and isolation from the real world around us. There is the implicit assumption that the processes of reduction and simplification permit "solution" of problems.

- Data and models comprise the basic building blocks of inquiry. Logic and rationality as well as objectivity are likewise presupposed. Order, structure, and quantification are sought wherever possible. Observation and model building, experimentation and analysis are usually aimed at improving predictive capability. Validation of hypotheses and replicability of observations and experiments are expected. The attainment of elegant models and best or optimal solutions is particularly prized.

The power and success of the "technical" world view and its value in yielding remarkable insights and excellent predictions in science and engineering remains unchallenged. Its extension beyond their borders is therefore understandable. Economics and the social sciences have striven to adopt the same paradigms. The impressive tools developed, particularly since World War II, under such labels as operations research, systems analysis,

decision analysis, management science, and econometrics illustrate the technical perspective in action.

The approach works well for those problems beyond science and engineering that are tame, docile, or well-structured. Examples are factory or blood bank inventory management, optimal urban fire station site location, airline scheduling and seat pricing, and economic input-output analysis. However, it runs into grave problems when applied to sociotechnical systems where human beings, individually and collectively, play important roles. A classic example is the well known application by MIT's Jay Forrester of his system dynamics to the corporation (*Industrial Dynamics*), the city (*Urban Dynamics*), and the world (*World Dynamics*). Forrester's own words reflect the engineers' self-delusion:

> All systems that change through time can be represented by using only levels and rates. The two kinds of variables are necessary, but at the same time sufficient, for representing any system.[4]

The world dynamics model used five variables—population, industrial production, natural resources, agricultural production, and pollution—to build a computer model and run it to the year 2100!

Being human, modelers succumb to the Pygmalion phenomenon. The sculptor king of Greek mythology fashioned a beautiful statue of a girl and then fell in love with it. Responding to his plea, the goddess Aphrodite brought the statue to life and Pygmalion married his model. Today's modelers, mesmerized by the ability of modern computers to bring their models to life, also become enamored of their creations. The models have become reality to them. Perhaps the most striking manifestation in recent years is the widespread seduction of Wall Street by "quants", mathematicians who construct sophisticated computer models for managing money for maximum profit.

One obvious way to avoid taking any single model too seriously is to use several models instead of one. This also helps to overcome the ever-present limitations in any one model, such as artificial boundaries, unwarranted assumptions, and oversimplifications. Multiple models are commonly used within the realm of the T perspective. In classical physics, there is great value in using both wave and particle models of light, both Newtonian and Einsteinian universes for mechanics. In aircraft development, the project engineer, the aeronautical engineer, the electronic engineer, the engine builder, the interior designer, and the market analyst all look at the same aircraft using distinct T perspectives. Representing different disciplines, they use different models and data. Nevertheless, they all operate with the same T paradigms.

We must clearly distinguish two functions of models:

(a) prediction; the ability to draw predictions from a mathematical model, and

(b) explanation or understanding; an abstract thinking aid, revealing or illuminating some aspect of system behavior in a simple way or unlocking an insight.

The abilities of science in modeling systems can be illustrated as follows:

- excellent explanation and excellent prediction: celestial mechanics
- excellent explanation and poor prediction: evolutionary biology
- poor explanation and excellent prediction: quantum mechanics
- poor explanation and poor prediction: economics. [5]

In the practical world, we are frequently more interested in a good forecast than in a good explanation. But, as Herbert Simon explains,

> The rapid rise in the last decade of chaos theory...has shown the fundamental reasons why such prediction may be impossible, now and forever. These are linked to the complexity of many systems of interest. Nature is capable of building, on a scale of microcosms or macrocosms or any scale in between, systems whose complexity lies far beyond the reach of our computers and supercomputers—present or prospective. [6]

Or, as John Casti observes, prediction requires computability and mathematically only a small subset of all possible functions is computable. It is therefore plausible that mathematical descriptions of many natural or human phenomena are inherently uncomputable. The more a system is susceptible to human influence, the lower is its predictability. [5]

The Organizational Perspectives (O)

Human beings are supreme social animals. Since the dawn of their existence, they have organized themselves into social groups and societies. The individual surrenders some of his rights and accepts responsibilities in exchange for the benefits offered by membership in a group or organization. In its more generalized form, we have the institution.

In Allison's rational actor perspective, the analyst considers "the United States" and "the Soviet Union" as unitary decision makers, each having national goals and alternatives for action, and desirous of a rational, value-maximizing choice.

His organizational process perspective recognizes that a government is not monolithic, but composed of organizations, each with its own parochial priorities and perceptions. For example, in the case of the Cuban missile crisis, it was at first puzzling why the movement of missiles into Cuba was cloaked in secrecy—lumber ships were used and the Cuban harbor where they were unloaded was cleared of all Cubans—while the uncamouflaged preparation and construction of the missile sites was easily identifiable in aerial photographs obtained by U.S. U-2 surveillance flights over Cuba. The Soviet Union certainly knew we could carry on

such flights near our shore; after all, they had shot down a U-2 over the Soviet Union years earlier. The mystery was solved when it became clear that responsibility for the two tasks was assigned to different Soviet organizations. The responsibility for delivery security arrangements was given to two agencies that practice secrecy as a standard operating procedure (SOP): shipment to the GRU, the Soviet military intelligence, and port security clearance to the KGB. However, site preparation was the responsibility of the Soviet Air Defense Command's surface-to-air missile construction teams and they followed their own SOPs. Missile sites had never been camouflaged in the Soviet Union, so there was no thought of changing the procedure in this case. [1]

In engineering, we find that technological risk cannot be understood purely in technical terms such as equipment mean time to failure and probability analysis. The Kemeny Commission on the Three Mile Island nuclear accident recognized the central role of human problems in operation, management, and governmental oversight in the anatomy of the accident. The Alaska oil spill case, discussed below, offers overwhelming evidence of the need to go beyond the T perspective in the management of technological risk.

The organizational perspective focuses on process rather than product, on action rather than problem-solving. The critical questions are "does something need to be done, and if so, what?" and "who needs to do it and how?" rather than "what is the optimal solution?" There must be a recognition that top-down imposition of solutions may well fail if there is no "bottom-up" support. In their United Nations-sponsored study of environmental degradation in the Himalayas, Thompson and Warburton conclude that the classic development approach has been to sound the alarm and then tell the country what the solution is, in other words, the T approach.

> It has not worked...because it has ignored (as if it were merely a detail of implementation) the deep political, economic and cultural structure...What is needed is a more sensitive approach, an approach that places "mere details"—the institutions that constitute the deep structure—at the very center of the stage... There is, we concede, a fair-sized break between the traditional single problem/single solution approach and the one we have developed here. There are many ways to characterize this break but perhaps the best is in terms of the shift it makes from product thinking to process thinking. The systems frame is no longer a model of the problem but simply an evaluative mechanism...We need more than one perspective. The approach by way of plural institutions and divergent perceptions meets this need. [7]

In the O perspective we deal with power. There is no intensive search for analytic tools; in fact, there often is a mistrust of "academic techniques". They are viewed either as unrealistic or as unpredictable and uncontrollable. It may come as a surprise to the T-oriented analyst that the typical organization chart is a poor guide regarding the locus of power in organizations.

> Real power does not lie in documents and memos outlining your terms of reference and area of jurisdiction: it lies in what you can achieve in practice. The boss's

> secretary can wield great power, like the king's mistress, without any authority at all -- or at least not the sort you can show anybody. [8]

In organizations that operate with potentially hazardous technologies, a crisis may instantaneously change the structure from a hierarchical to a flat organization in which the power of previously "low" levels is enhanced and equalized with that of previously "high" levels.

The dialectic approach characteristic of the organizational perspective is reflected in the history of energy resource forecasts in the United States.[9] The deep division between industrial interests and conservationists on oil and gas resources was already apparent in the early 1900s. In 1908 the U.S. Geological Survey (USGS) forecast total U.S. oil resources between 10 and 24.5 billion barrels and indicated we would run out of oil between 1935 and 1943. In 1974 USGS estimated oil reserves between 200 and 400 billion barrels. Each side seized on these estimates to confirm its policy stand. Many forecasts have been made since then and, except for the World War I and II periods, each faction habitually accuses the other of manipulating the forecasts for its own purposes. Table 1 suggests the different organizational views on resource forecasts. It becomes clear that the forecasts are the servants of policies already determined or preferred rather than being prerequisites for policy formulation.

Table 1. O Perspectives on Oil Reserve Forecasts [9]

	When prices are high	When prices are low
Industrialists favor	high forecasts "major new supplies can be found if prices are high"	low forecasts "higher prices are needed to bring on more supplies"
Consumers favor	low forecasts "oil is no longer the solution"	high forecasts "no need to raise prices"
Conservationists favor	low forecasts "high prices encourage overproduction"	low forecasts "low prices encourage overconsumption"

The Personal Perspectives (P)

The personal perspective views the world through a unique individual. It sweeps in aspects that relate individuals to the system and are not captured by technical and organizational perspectives. The individual can make a crucial difference. An effective leader can impose his perspective on that of his followers and organization, changing a corporation or a society. The creative artist and charismatic leader, the entrepreneur and maverick are galvanized primarily by their own unique perspective.

From Pericles to Churchill, from Lincoln to Martin Luther King, from IBM's Thomas Watson to Microsoft's Bill Gates, individuals have provided leadership. From Socrates and his love of wisdom to Rachel Carson and her focus on the environment, individuals have set examples. Leaders' perspectives have unique qualities: they are farsighted and have a vision of the future; they are able to communicate that vision effectively to others and thus gain their support; they are willing to take "fuzzy gambles" and considerable risks.

Two hundred years ago, Adam Smith observed:

> The man of system...seems to imagine that he can arrange the different members of a great society with as much ease as the hand arranges the different pieces upon the chessboard; he does not consider that the pieces upon the chessboard have no other principle of motion besides that which the hand impresses upon them; but that, in the great chessboard of human society, every single piece has a principle of motion of its own altogether different from that which the legislature might choose to impress upon it.[10]

Cause and effect is a fundamental explanatory paradigm of the T perspective. As cyberneticist Heinz von Foerster tells us, it is inoperative in explaining the behavior of social systems. The law which transforms the past cause into the present effect is itself changed by the very effect it produces. Thus it is not very predictable. Indeed, we must learn to see things we cannot explain. Furthermore, we have a blind spot: we do not see that we do not see. [11]

A uniquely personal trait is intuition. In discussing inventions in mathematics, Jacques Hadamard writes:

> That those sudden enlightenments which can be called inspirations cannot be produced by chance alone is already evident...there can be no doubt of the necessary intervention of some previous mental process unknown to the inventor, in other words, of an unconscious one. [12]

More recently, Nobel Laureate Herbert Simon and associates explored the differences between experts and novices in solving physics problems. They found that the expert is mentally guided by large numbers of patterns serving as an index to relevant parts of the knowledge store. These patterns are rich schemata that can guide a problem's interpretation and solution and add crucial pieces of information. This capacity to use pattern-indexed schemata is probably a large part of what we call physical intuition. [13]

Each individual has a unique set of patterns that inform his or her intuition. In calling on the P perspective, we are thus augmenting the conscious, logical T process by opening ourselves to the deeper mental levels that store patterns of great potential value. Salk specifically stresses the need to cultivate both intuitive and reasoning realms—separately and together. Indeed the evolution of the human mind depends on this binary relationship. [14] Of course, business leaders have always appreciated the value of intuition:

> Walk through an office, and intuition tells you if things are going well.
>
> On each decision, the mathematical analysis only got me to the point where my intuition had to take over. [15]

Comparison of T, O, and P

We have described three types or classes of perspective, T, O, and P. Table 2 compares them and shows that they are clearly distinguished by their paradigms. It is a corollary that O and P differ from T not only in their way of focusing on problems, but in the way they obtain their input and communicate their output, as well as in their concern with "facts" and "perceptions".

Within each category there may be many different perspectives, corresponding to the various actors, parties, and models that view a system, problem, or situation. Indeed, we may define the complexity level of a system, clearly a property of its observers, as proportional to the number of different perspectives on it. By this we mean perspectives which cannot be made equivalent. [16]

Interactions Among the Perspectives

Recognizing the significance of the individual perspectives that bear on a given system, we also must consider their interaction and integrate them to derive deeper insight for decision and implementation.

Historically, multiple perspectives must be as old as human societies. The coexistence of individuals has always involved at least two and usually more perspectives. The individual has usually been involved simultaneously not only with the family, but at the very least with the civil community (the clan, the tribe, the town, the state) and the religious community (priesthood, temple, church). Only the T perspectives are a relatively new phenomenon.

Therefore, the interaction of perspectives and their integration are hardly novel activities. It is, of course, true that many organizations strongly discourage multiple O perspectives, viewing them as competition for the individual's loyalty and consequently a threat to their strength. This explains inquisitions, excommunications, wars between church and state, union busting, witch hunts, loyalty oaths, show trials, and brainwashing of sect members. Today, complex systems involve many interacting elements and generally imply many

interacting perspectives. At the same the limitations of the human brain are being challenged by the artifacts of information technology: richer interactions are possible and desirable.

Table 2 - Characteristics of Multiple Perspectives [3; pp.52, 231]

	Technical (T)	Organizational (O)	Personal (P)
World view	Science-technology	Unique group or institutional view	Individual, the self
Objective	Problem solving, product	Action, process, stability	Power, influence, prestige
System focus	Artificial construct	Social	Genetic, psychological
Mode of inquiry	Observation, analysis, data and models	Consensual, adversary, bargaining and compromise	Intuition, learning, experience
Ethical basis	Logic, rationality	Justice, fairness	Morality
Planning horizon	Far (low discounting)	Intermediate (moderate discounting)	Short for most (high discounting for most)
Other descriptors	Cause and effect	Agenda (problem of the moment)	Challenge and response, leaders and followers
	Optimization, cost- benefit analysis	Satisficing	Ability to cope with only a few alternatives
	Quantification, trade-offs	Incremental change	Fear of change
	Use of probabilities, averages, statistical, analysis, expected value	Reliance on experts, internal training of practitioners	Need for beliefs, illusions, misperception of probabilities
	Problem simplified, idealized	Problem delegated and issues and crisis management factored,	Hierarchy of individual needs (survival to self-fulfillment)
	Need for validation replicability	Need for standard operating procedures, routinization	Need to filter out inconsistent images
	Conceptualization, theories	Reasonableness	Creativity and vision by the few, improvisation
	Uncertainties noted	Uncertainty used for organizational self-preservation	Need for certainty
Criteria for "acceptable risk"	Logical soundness, openness to evaluation	Institutional compatibility, political acceptability, practicality	Conduciveness to learning, time-space distance to event
Scenario types	Probable	Preferable	Possible
Criterion	analytic (reproducible)	value	image
Orientation	exploratory (extrapolative)	normative (prescriptive)	visionary
Mode	structural	participatory	perceptual
Creator	think-tank teams	stakeholders	Individuals
Communications	Technical report, briefing	Insider language	Personality, charisma desirable

One of the most familiar examples of the interplay and integration of perspectives is the American courtroom. Each witness in a trial provides a perspective. The prosecutor selects and "cross-cues" certain perspectives, then integrates them in his summation into a single one which suggests that the defendant is guilty. The defense attorney selects others and goes through the same process to show that the defendant is innocent. The jury as decision maker may accept either integration or go back to the original testimonies and do its own interplay and integration.

Figure 1 schematically suggests the basic relationships among the perspective types we have considered [17]; Figure 2 is a simplified schematic version.

Figure 1. Perspective Interactions

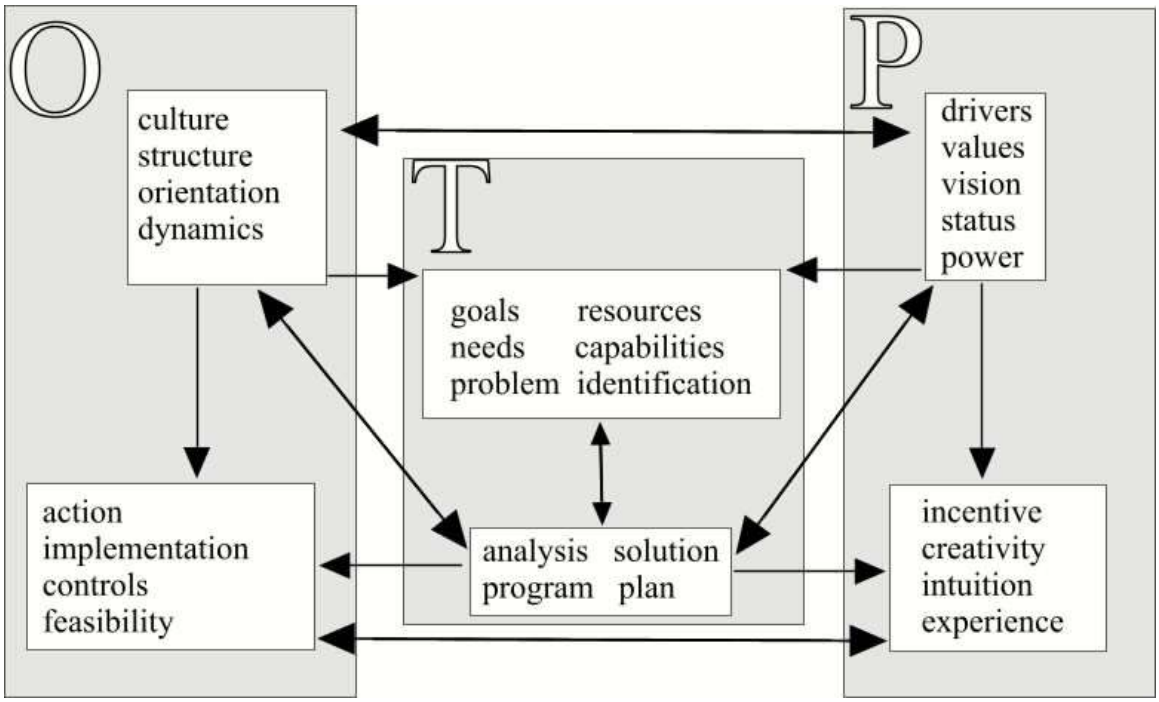
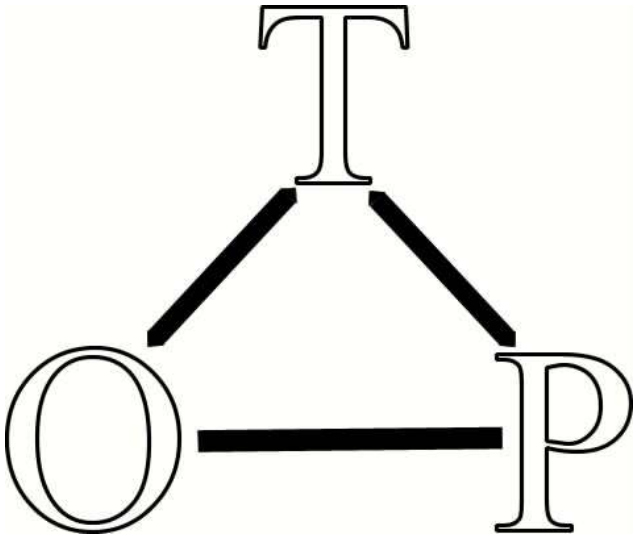


Figure 2. A schematic for T-O-P



Only uninhibited cross-cuing and feedback assure that important information is not overlooked. Bringing differences among the perspectives to the surface facilitates constructive resolution and integration. The perspectives are dynamic, that is, they can change over time, so that the cross-

cuing and integration process may require iteration. The entire procedure overcomes the attitude captured in Will Rogers' dictum: "It ain't what you don't know that hurts you, it's what you know that ain't so."

Experienced decision makers know that planning and action, or solution concept and implementation, draw on different perspectives. They know that people are not moved by reason (T) alone, that organization (O) and personal communicative or persuasive power (P) are equally important for success. They value diverse perspectives as well as the interactions among them, and they integrate them routinely without any weighting formula. In fact, the ability to integrate conflicting perspectives is the key to effective leadership.

A comment by President John F. Kennedy underscores the point:

> The essence of ultimate decision remains impenetrable to the observer—often, indeed, to the decider himself.... There will always be the dark and tangled stretches in the decision making process -- mysterious even to those who may be most intimately involved. [18]

III. HOW TO DO IT

General Guidelines

There is much flexibility in applying the concept. Five key guidelines should be observed:

1. T, O, and P together form a superior basis for decision making than T alone. Each type offers insights not attainable with the others. The interaction among the perspectives contributes further important insights. The analyst should present the different perspectives to the decision maker rather than only his or her integration of the perspectives. There should be recognition that the decision maker should be given the opportunity to do his or her own integration of the perspectives. The analyst may, however, offer a prototype integration together with the perspectives. (Recall the analogy to the American courtroom.)

2. The choice of perspectives requires judgment; it is usually not possible to consider all perspectives. A good balance among the three types is always desirable, but there exists no "correct" weighting formula. In business the ability to choose and integrate perspectives that marks the effective executive.

3. O and P are case-specific. Obtaining input for O and P uses different processes than it does for T (for example, one-on-one interviews).

4. Perspectives are dynamic and change over time. A decision process may involve different actors and different issues as it proceeds. This makes it advantageous to undertake development of the various perspectives in parallel and consider subsequent iterations.

5. T usually dominates in the planning phase, O and P dominate in the decision and implementation phases. P is particularly important for effective communication.

It is desirable to draw in individuals who have distinctly different backgrounds. For example, a legal background and an engineering/science background bring to bear a desirable diversity of paradigms. On the other hand, an electronics engineer and a mathematician do not, and they tend to be comfortable only with the T perspective. Thus they readily obtain insights from technical reports and systems analyses as well as forecasting tools such as trend analysis and growth curves. However, insights from the O and P perspectives must make use of other means, such as personal interviews. Consider a good investigative reporter: he or she interviews individuals and often draws significant clues from the interviewee that are not responses to formal questions asked. There is also a recognition that an organization chart may not reflect where the real power in an organization resides. Above all, the interviewer must be a perceptive and open-minded listener.

IV. STRENGTHS AND WEAKNESSES OF THE METHOD

The multiple perspective concept has proven an effective approach to facilitate the management of complex sociotechnical systems. It is an example of what systems philosopher West Churchman calls a Singerian inquiring system.[24] As such

- it is a meta-inquiring system, that is, it includes all the other inquiring systems, such as data-based, model-based, and dialectic;
- it is pragmatic, that is, the truth content is relative to the overall goals and objectives of the inquiry;
- it takes holistic thinking so seriously that it constantly attempts to "sweep in" new components; it is, in fact, non-terminating and explicitly concerned with the future;
- it postulates that the system designer is a fundamental part of the system; his psychology and sociology are inseparable from the system's physical representation.

An important advantage in the use of such an approach is that it reduces the reliance on quasi-theological faith in models and self-deluding theoretical analysis in decision making. Most importantly, it bridges the chasm between the forecaster/analyst/modeler and the real world of the manager.

Potential weaknesses include the following:

- there is no guarantee that all relevant perspectives have been included;
- there is no formal weighting formula for integrating perspectives;
- T often has a longer time horizon (or lower discount rate) than O and P, making integration difficult;
- the background of an individual may make it difficult for him or her to deal with perspectives other than those which have undergirded his/her training and experience.

V. FRONTIERS OF THE METHOD

Two recent developments are the following:

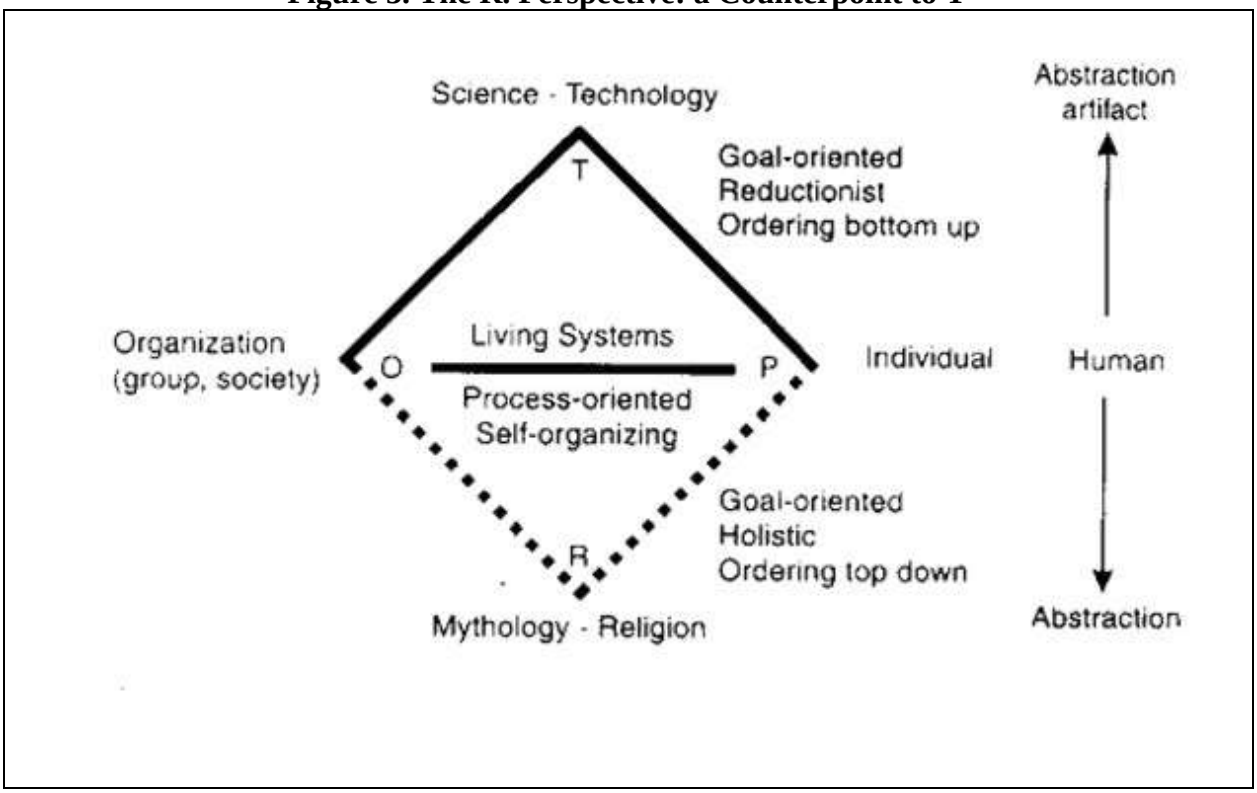
The R Perspective

The late Willis Harman believed that our society is undergoing a fundamental transformation. There is evidence of institutional and cultural breakdown with forces at work that suggest an emerging "transmodern society" characterized neither by a scientific/material nor by a religious/spiritual world view. Rather, it is a fusion of "scientific inquiry with the perennial wisdom at the core of the world's spiritual traditions".[21] It maintains confidence in scientific inquiry, but recognizes the limitations of science, including reductionism and objectivism, in other words, the technical perspective.

It is useful to recall that O and P deal with human beings whereas T is an artificial creation of the human mind. As already noted, in evolutionary terms O and P are much older than T. As the human mind developed, it created spiritual/mythological/religious perspectives, which we label R, as well as T (Fig. 3). These two human creations exhibit fundamental differences: T is reductionist and objective, R is holistic and subjective. Science struggles with the laws of self-organization (autopoiesis) bubbling up from lower to higher levels, while religion accepts a top-down systemic view (the myth of God the purposeful creator). But T and R also have striking similarities: both are goal-driven and employ abstract idealizations. Harman's conviction is that they will jointly form the basis of the transmodern society.

Evolutionary biologist and paleontologist Stephen Jay Gould considered science and religion as "non-overlapping magisteria" [22]. He recognized the empirical realm of science addressing the question: what is the universe made of (fact) and why does it work this way (theory), while religion extends over questions of ultimate meaning and moral value. In this view religion does not try to explain itself in scientific terms ("intelligent design" as an alternative to evolution or Jesus' divine and human status as analogous to light as both particle and wave). Nor is science viewed as a religion (the Big Bang as Genesis). Newton expressed a similar view: "We are not to introduce divine revelations into philosophy (science) nor philosophical opinions into religion".

Figure 3. The R. Perspective: a Counterpoint to T



Oriental Perspectives (WSR)

Zhichang Zhu has introduced an oriental set of three multiple perspective types, based on neo-Confucianism, to deal with complex sociotechnical systems. They are labeled WSR:

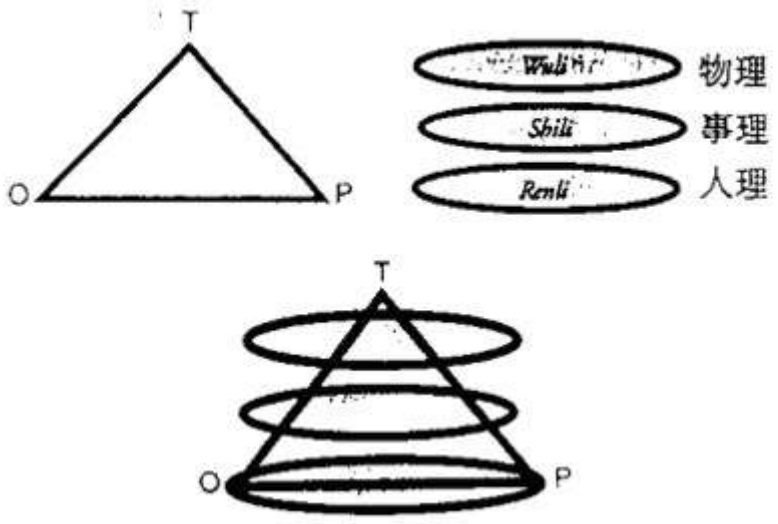
- *wuli*, denoting knowledge about physical world phenomena, material conditions as well as man-made constructions
- *shili*, ways of seeing, modeling, doing, relating humans to the physical world
- *renli*, relations among human beings

Even though they use different cultural languages, commonalities between TOP and WSR are evident: [23]

- both involve three perspective types;
- both are designed to deal with human-technical rather than merely technical systems;
- both move beyond the reductionist, objectivist mode of inquiry;
- both are concerned with action;
- both eschew cookbook or n-step procedures.

In our interpretation, *wuli* corresponds to T, *renli* deals with O and P, while *shili* connects T, O, and P. Fig. 4 schematically suggests the relationships.

Figure 4. Integrating Two Cultural Systems Views



Zhu sees WSR as a practical Oriental systems methodology to bridge the gulf between Western systems practice and Eastern culture. The concept of *li* is rooted in Confucianism and does not have a precise English translation. It may be rendered as "patterns or ways man's thinking and acting should take". Key neo-Confucian principles underlying WSR are the harmonious view of oneness, belief in the unity of knowledge and action, and the pursuit of multiple means of investigation.

VI. SAMPLES OF APPLICATIONS

A sampling of successful applications of the concept suggests their spectrum:

Technology assessments: electronic funds transfer, guayule commercialization, on-site solid waste treatment [2] (National Science Foundation Project)

Risk and crisis management: Bhopal chemical accident [19], Exxon Valdez Alaska oil spill [3]

Health care systems: perinatal health care in Los Angeles County [2]

Regional planning: agricultural development of China's Wei Bei region [20] (National Science Foundation Project)

As an illustration we shall very briefly summarize insights gained by this approach in the case of the 265,000 barrel oil spill by the tanker *Exxon Valdez* running aground in Prince William Sound, near Valdez, Alaska, on March 24, 1989. For details see [3].

T perspective

- verification of poor cleanup technology
- systems analysis: centralized control vs. decentralized control as function of systemic characteristics (simple--intricate interactions; tight--loose coupling); sample finding: coupling too loose as insurance rates not a function of safety record

O perspective

- corporate budget tightening: Exxon reducing crew size, Alyeska [2] disbanding emergency team, skimping on drills, underpowering tankers
- corporate power: Alyeska forbidding state inspectors on premises
- Coast Guard: overcommitted and underfunded, has little political clout
- State of Alaska: limited by powerful oil lobby (85% of state revenue from oil fund, all citizens received annual check)
- Dept. of Justice: politicized under Meese, Thornburgh, anxious to open Arctic Wildlife Refuge to oil exploration, wants quick settlement
- native fishing villages: livelihood threatened, can no longer be politically ignored

P perspective

- personal misperception of probabilities rampant: consultant study statements indicating that the "most likely" spill would be 1000-2000 barrels and that a 200,000+ barrel spill would occur "once every 241 years" were misinterpreted (example: there is only a 30-year oil reserve in the north, so no need to worry about a very large spill)
- human beings have a very difficult time dealing with events combining very low likelihood with very severe consequence, situations in which "expected values" tend to mislead
- arrogance on the part of Exxon leadership: for example, the abrasive chairman of Exxon did not bother to appear in Valdez after the accident

Integration of perspectives and sample recommendations

- recognize that technological fixes will not suffice
- design the system as safety-reinforcing (such as air transportation) rather than error-inducing (such as marine transportation)

- strengthen Coast Guard monitoring of ship movements and licensing of crews
- recognize the impracticality of "fail-safe" concept, aim for "safe-fail" system
- develop high reliability organization concept characterized by ability to shift instantly from hierarchical to flat structure in crisis, training to cope with the unexpected, inculcated sense of personal responsibility at all levels, near-failure almost as difficult to tolerate as actual failure
- recognize four levels in the decision process for risk management:

level 1 - seek means to reduce the likelihood of catastrophic consequences with the given system

level 2 - redesign the existing system to reduce the dangers

level 3 - probe conceptually different system solutions that avoid catastrophic consequences altogether (e.g., ship oil overland from Alaska rather than by sea)

level 4 - ask the ultimate question: can the consequence of a catastrophic accident be tolerated by the society or not?

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ENDNOTES

1. Other examples of three-fold perspective concepts: Freud's professional, political, and personal psychoarcheological layers; Braudel's view of history in terms of the physical environment, social groupings, and individual men; Steinbruner's analytic, cybernetic, and cognitive paradigms for decision. [2]

2. The oil company consortium organization in charge of pipeline and Valdez operations.